



# The 7<sup>th</sup> International Conference on Sciences and Social Sciences 2017

“ Innovative Research for Stability, Prosperity and Sustainability ”

**11-12 January 2018**

**Rajabhat Maha Sarakham University in co-operation with :**

- Finland University
- University of Technology Sydney
- Institute for Research and Development of New Technologies
- Vinh University
- National University of Laos
- Build Bright University
- Mahachulalongkornrajavidyalaya University, Khon Kaen Campus
- Mahamakut Buddhist University, Roi Et Campus
- Mahasarakham University
- Nakhon Phanom University
- Kalasin University
- Ubon Ratchathani Rajabhat University
- Phetchaburi Rajabhat University
- Loei Rajabhat University
- Buriram Rajabhat University
- Surindra Rajabhat University
- Roi Et Rajabhat University
- Sakon Nakhon Rajabhat University
- Chaiyaphum Rajabhat University

**Event Title:** The 7<sup>th</sup> International Conference on Sciences and Social  
Sciences 2017: Innovative Research for Stability, Prosperity  
and Sustainability

**Date:** 11 - 12 January 2018

**Venue:** Rajabhat Maha Sarakham University



## Organizers

**Organized by:** Rajabhat Maha Sarakham University

**In cooperation with:**

- Finland University
- University of Technology Sydney
- Institute for Research and Development of New Technologies
- Vinh University
- National University of Laos
- Build Bright University
- Maha Sarakham University
- Nakhon Phanom University
- Kalasin University
- Ubon Ratchatthani Rajabhat University
- Phetchaburi Rajabhat University
- Loei Rajabhat University
- Buriram Rajabhat University
- Surindra Rajabhat University
- Roi Et Rajabhat University
- Sakon Nakhon Rajabhat University
- Chaiyaphum Rajabhat University
- Mahachulalongkornrajavidyalaya University, Khon Kean Campus
- Mahamakut Buddhist University, Roi Et Campus

## Committees

### Advisory Committees

- ❖ Dr. Pekka T Saavalainen  
(Finland University)
- ❖ Professor Attila Brungs, BSc(Hons)(UNSW), DPhil (Oxon)  
(President of University of Technology Sydney)
- ❖ Assoc. Prof. Dr. Nguyen Huynh Phan  
(Institute for Research and Development of New Technologies)
- ❖ Professor Dr. Dinh Xuan Khoa  
(President of Vinh University)
- ❖ Prof. Dr. Somsy Gnophanxay  
(President of National University of Laos)
- ❖ H.E. Dr. In Viracheat  
(Chairman of Build Bright University)
- ❖ Prof. Dr. Sampan Rittidech; President of Maha Sarakham University  
(Maha Sarakham University)
- ❖ Assistant Professor Dr. Sungkom Phumiphan  
(Acting President of Nakhon Phanom University)
- ❖ Associate Prosser Jiraphan Huaysean  
(President of Kalasin University)
- ❖ Associate Prosser Thammarak La-ongnuan  
(President of Ubon Ratchatthani Rajabhat University)
- ❖ Assistant Professor Dr. Prayoon Limsuk  
(President of Phetchabun Rajabhat University)

- ❖ Assistant Professor Dr. Chao Inyai  
(President of Loei Rajabhat University)
- ❖ Associate Prosser Malinee Juthopama  
(President of Buriram Rajabhat University)
- ❖ Assistant Professor Kanok Tosurat  
(President of Surindra Rajabhat University)
- ❖ Assistant Professor Dr. Chaloei Phumiphan  
(President of Roi Et Rajabhat University)
- ❖ Assistant Professor Pricha Thammawinthon  
(President of Sakon Nakhon Rajabhat University)
- ❖ Assistant Professor Dr. Prasert Phoo-ngern  
(Acting President of Chaiphum Rajabhat University)
- ❖ Associate Prosser Dr. Phrasophon Phattanabundit  
(Vice-president of Mahachulalongkornrajavidyalaya University,  
Khon Kean Campus)
- ❖ Phrakroo Kittiwathon  
(Vice-president of Mahamakut Buddhist University, Roi Et Campus)

## Committees

### Organizing Committees

- Acting President
- Acting Vice President
- Dean, Faculty of Education
- Dean, Faculty of Humanities and Social Sciences
- Dean, Faculty of Sciences and Technology
- Dean, Faculty of Management
- Dean, Faculty of Agricultural Technology
- Dean, Faculty of Information Technology
- Dean, Faculty of Engineering
- Dean, The College of Laws and Governance
- Dean, Graduate College
- Director, Research and Development Institute
- Director, Office of International Relations and International Education
- Director, Office of President
- Director, Office of Academic Promotion and Records
- Director, Office of Academic Resources Center
- Director, Office of Arts and Cultures
- Director, Office of Information Technology
- Director, Office of Academic Services
- Director, Office of University's Standard and Quality Assurance
- Deputy Directors, Research and Development Institute
- Deputy Directors, Office of International Relations and International Education

## List of Reviewers

### Reviewer Name

### Reviewer Organization

Prof. Dr. Mohamed Dawabsheh	The Arab American University
Prof. Dr. John L Conant	Indiana State University, USA
Prof. Dr. Leslie Barratt	Roi-Et Rajabhat University
Prof. Dr. William Barratt	Roi-Et Rajabhat University
Prof. Dr. Voradej Chandarasorn	Suan Sunandha Rajabhat University
Prof. Dr. David Jenkins	University of Toronto, Canada
Prof. Dr. Clemens Fuchs	University of Applied Sciences, Germany
Prof. Dr. Kishio HATAI	Nippon Veterinary and Life Science University, Japan
Assoc. Prof. Dr. Subunn Ieamvijarn	Maha Sarakham University
Assoc. Prof. Dr. Virapong Saeng-Xuto	Chiang Mai University
Assoc. Prof. Dr. Charin Mangkhang	Chiang Mai University
Assoc. Prof. Dr. Prasart Nuangchalerm	Maha Sarakham University
Assoc. Prof. Dr. Gregory Alexander	Central University of Technology, South Africa
Asst. Prof. Dr. Choosak Nithikathkul	Maha Sarakham University
Asst. Prof. Dr. Suchart Khummanee	Maha Sarakham University
Asst. Prof. Dr. Krisanapong Somsuk	Udon Thani Rajabhat University
Asst. Prof. Dr. Choochart Wong-Anuchit	Maha Sarakham University
Asst. Prof. Dr. Amorn Suwannimitr	Maha Sarakham University
Asst. Prof. Dr. Thanatip Ruksilp	Loei Rajabhat University
Asst. Prof. Dr. Piyaat Moonsri	Phetchabun Rajabhat University
Asst. Prof. Dr. Nipasak Kongngarm	Surindra Rajabhat University
Asst. Prof. Dr. Amnuay Wattanakornsiri	Surindra Rajabhat University
Asst. Prof. Dr. Ampapan pongpaladisai	Surindra Rajabhat University
Asst. Prof. Dr. Sunan Siphai	Rajabhat Chaiyaphum University
Asst. Prof. Dr. Chaikon Paopan	Kalasin University
Asst. Prof. Dr. Somprasong Senarat	Roi-Et Rajabhat University
Asst. Prof. Dr. Primmala Khumkomkhet	Roi-Et Rajabhat University
Asst. Prof. Dr. Parichart Prasertsang	Roi-Et Rajabhat University
Asst. Prof. Dr. Jiraporn Chano	Maha Sarakham University
Asst. Prof. Dr. Niwat Srisawasdi	Khon Kaen University
Asst. Prof. Dr. Prasert Ruannakarn	Maha Sarakham University
Asst. Prof. Dr. Chaikon Paophan	Kalasin University
Asst. Prof. Dr. Chalida Niamnuy	Kasetsart University
Asst. Prof. Dr. Ratchaneewan Tangpakdee	Maha Sarakham University
Asst. Prof. Dr. Patthira Phon-ngam	Rajabhat Loei University
Asst. Prof. Dr. Akkarapon Nuemaihom	Buriram Rajabhat University
Asst. Prof. Dr. Prateep Khaeram	Surindra Rajabhat University
Asst. Prof. Dr. Theerarat Suwanaruang	Kalasin University
Asst. Prof. Dr. Pradub Reanprayoon	Surindra Rajabhat University
Asst. Prof. Dr. Luechai Butkhup	Maha Sarakham University
Asst. Prof. Dr. Wichai Soemphol	Khon Kaen University, Nong Khai Campus
Asst. Prof. Dr. Suphawadee Yeamkong	Pibulsongkram Rajabhat University
Asst. Prof. Dr. Surachai Rattanasuk	Roi-Et Rajabhat University



**Reviewer Name**

Asst. Prof. Dr. Buavaroon Srichaikul  
Asst. Prof. Dr. Rattana Panyapa  
Asst. Prof. Dr. Kewalin Simuang  
Asst. Prof. Dr. Prum Sopheanoeh  
Asst. Prof. Narathip Pawaree  
Asst. Prof. Ariyapong Pluapant  
Asst. Prof. Tannachart Wantang  
Asst. Prof. Surajitr Pramuang  
Asst. Prof. Songgrod Phimphisan  
Asst. Prof. Sittiporn Pantura  
Asst. Prof. Adisak Bootwong  
Asst. Prof. Suwichai Phunsa  
Asst. Prof. Srisunan Prasertsang  
Asst. Prof. Ampapan Pongpaladisai  
Dr. Chris McGrew  
Dr. Sarmad Saeed Khan  
Dr. Zahid Mushtaq Wani  
Dr. Ei Ei Phyto Myint  
Dr. Mean Sothy  
Dr. Satoshi Kubota  
Dr. Craig Wheway  
Dr. Nithiwatthn Choosakul  
Dr. Ratchada Kamjing  
Dr. Gordon Richard Bakker  
Dr. Gregory Drozdal  
Dr. Korbua Srichaikul  
Dr. Alexandra Bush  
Dr. Muenbua Srichaikul  
Dr. Brenton Grant Fredericks  
Dr. B. Fredericks  
Dr. Nick Naumov

**Reviewer Organization**

Maha Sarakham University  
Ubon Ratchatthani Rajabhat University  
Hankuk University of Foreign studies  
Build Bright University  
Udonthani Rajabhat University  
Udonthani Rajabhat University  
Phetchabun Rajabhat University  
Loei Rajabhat University  
Kalasin University  
Udonthani Rajabhat University  
Udonthani Rajabhat University  
Maha Sarakham University  
Roi Et Rajabhat University  
Surindra Rajabhat University  
Indiana State University, USA  
Malaria Control Islamabad  
Asian Institute of Technology  
University of Medicine Taunggyi  
University of South-East Asia, Cambodia  
Krabi Coastal Fisheries Research and Development Center  
Rajabhat Maha Sarakham University  
Rajamangala University of Technology Thanyaburi  
Uttaradit Rajabhat University  
Maha Sarakham University  
M.D. St. Michael Hospital, Canada  
M.D. St. Michael Hospital, Canada  
Health Informatics Nursing, Canada  
Innovation house, Oxentia, Oxford, United Kingdom  
Central University of Technology, South Africa  
Central University of Technology, South Africa  
University of Northampton, UK

## **Welcome Speech and Opening Address**

**Report on the 7<sup>th</sup> International Conference on Sciences and Social Sciences 2017:**  
“Innovative Research for Stability, Prosperity and Sustainability” January 11-12, 2018 at  
Rajabhat Maha Sarakham University

**By AJ. Vutipol Chutjaraskul**

**Vice-President of Rajabhat Maha Sarakham University**

**Associate Professor Dr. Assoc. Prof. Dr. Sittichai Busaman, Interim President of  
Rajabhat Maha Sarakham University, Chairman of the Opening Ceremony:**

On behalf of the organizing committee, I would like to express deep appreciation for your presiding over the opening ceremony of the 7th International Conference on Sciences and Social Sciences ICSSS 2017. This year's conference adopts the timely theme of Innovative Research for Stability, Prosperity and Sustainability. The aims of the ICSSS 2017 are promoting research dissemination and enhancing academic networks as well as generating knowledge exchanges in Science and Social Sciences among Thai and international scholars. This conference is organized by Rajabhat Maha Sarakham University in cooperation with the following educational institutions: Finland University, University of Technology Sydney, Institute for Research and Development of New Technologies, Vinh University, National University of Laos, Build Bright University, Maha Sarakham University, Nakhon Phanom University, Kalasin University, Ubon Ratchatthani Rajabhat University, Phetchaburi Rajabhat University, Loei Rajabhat University, Buriram Rajabhat University, Surindra Rajabhat University, Roi Et Rajabhat University, Sakon Nakhon Rajabhat University, Chaiyaphum Rajabhat University, Mahachulalongkornrajavidyalaya University, Khon Kean Campus, Mahamakut Buddhist University, Roi Et Campus. Without kind cooperation and shared resources from our partner universities, this event would not have been possible.

The ICSSS 2017, which is organized during January 11-12, is to present and share academic works or research studies through oral and poster presentations. For this conference, there are 172 research presentations (132 oral and 40 poster presentations), 6 keynote and invited speakers' presentations. It is expected that there are approximately 500 participants taking part in the activities organized during this event.

May I now invite Associate Professor Doctor Sittichai Budsamun, Interim President of Rajabhat Maha Sarakham University to declare open and address this International Conference on Sciences and Social Sciences 2017: Innovative Research for Stability, Prosperity and Sustainability.

Thank you.

## Welcome and Opening Address

the 7<sup>th</sup> International Conference on Sciences and Social Sciences 2017: “Innovative Research for Stability, Prosperity and Sustainability” January 11-12, 2018 at Rajabhat Maha Sarakham

University

**by Assoc. Prof. Dr. Sitthichai Budsamun**

**Interim President, Rajabhat Maha Sarakham University**

Chairman of the conference organizing committee, Professor Emeritus Dr. Suchit Bunbongkarn, keynote and Invited Speakers, Distinguished Guests, Ladies and Gentlemen:

It is a great pleasure and honor for me to welcome you to Rajabhat Maha Sarakham University and address the 7th International Conference on Sciences and Social Sciences (ICSSS 2017): Innovative Research for Stability, Prosperity and Sustainability. On behalf of Rajabhat Maha Sarakham University, I would like to congratulate the organizing committee from RMU and our partner universities on the mutual commitment in organizing this international event as an academic platform for scholars and researchers to share and update their work in pursuing academic excellence. This is a great opportunity for participants to become informed of new ideas and progress in various fields under the disciplines of sciences and social sciences, especially in attempting to provide and seek solutions in different areas for upgrading our practices toward community and regional development.

May I express sincere appreciation to the organizing committee for their hard work, to the supporting organizations for their kind assistance, to members of RMU Executive Board for their encouragement and moral support; and especially to all the partner universities taking part in this event, for their cooperation and generosity in sharing their resources and co-hosting this international conference.

I would like to extend my deep appreciation to all the participants, scholars and researchers, faculty and students of various universities, who submitted their papers for presentation at this conference in order to share their work and keep us informed of useful knowledge and research findings.

Last but not least, special appreciation goes to the opening keynote speaker, Professor Emeritus Dr. Suchit Bunbongkarn for his kind presentation, and other keynote and invited speakers for their kind cooperation to share their expertise and experience with the audiences of the different sessions. To all the participants and everyone involved, I wish you all a fruitful and successful conference and a very pleasant stay in Maha Sarakham Province.

May I now take this auspicious moment to declare open the International Conference on Sciences and Social Sciences (ICSSS 2017): Innovative Research for Stability, Prosperity and Sustainability.

Thank you.

## **Welcome Message from ICSSS 2017 Chairman**

Distinguished participants Ladies and Gentlemen

It is a pleasure and honor to be invited to give a welcome and opening address to the 7th International Conference on Science and Social Science, 2017 entitled “Innovative Research for Stability Prosperity and Sustainability, organized by Rajabhat Maha Sarakham University.

Let me first of all welcome all of you to the Conference. The objective of the Conference is to provide a meeting for experts, academicians, researchers and graduate students, both within the country and outside to present their research findings and to exchange ideas and perceptions on important issues and develop an agenda for future research. In addition, I hope this Conference and the research undertaken will promote a professional and academic network among university professors and graduate students in Thailand and its neighboring countries. The issues of innovation stability on sustainable development are of vital interest to a number of universities in Thailand and abroad. Despite the rapid progress in scientific and technological research which have provided us with several innovations, we continue to witness social ills, environmental degradation, political extremism and a widening gap between the rich and poor. Thus, innovation and sustainability must go together, and it is the responsibility for universities and research institutes to emphasize a wider scope in their research projects to ensure that innovations will not be in conflict with stability and sustainability.

As for those who come from abroad, I do hope you can find time to enjoy the beauty and charm of Esan provinces. Maha Sarakham and neighboring provinces have many things to offer, such as the famous archaeological site of Ban Chieng, a number of beautiful Buddhist temples and exotic and artistic handicrafts. Ladies and Gentlemen, I wish the conference a very success.

May I declare the Conference Open

Professor Emeritus Dr. Suchit Bunbongkarn

**Keynote Speaker**

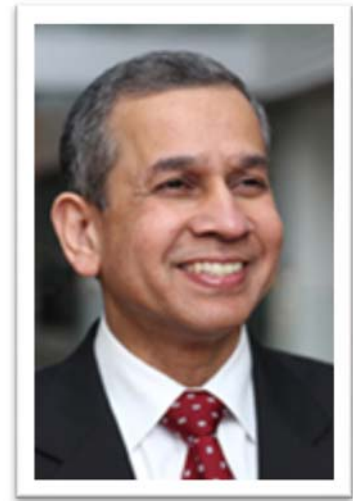


## **Biography of Professor Dr. Suchit Bunbongkarn**



Dr. Suchit Bunbongkarn is currently Professor Emeritus of the Faculty of Political Science, Chulalongkorn University and Senior Fellow at the Institute for Security and International Studies (ISIS Thailand). He also served as President of the Political Development Council, an independent organization established pursuant to the Constitution of the Kingdom of Thailand between 2008-2012 and as a justice of the Constitutional Court from 2000 to 2005. Previously, Dr. Suchit Bunbongkarn was a member of the National Legislative Assembly from October 2006 to January 2008 and served as a Justice of the Constitutional Court from February 2000 to December 2004. He held positions as both Professor and Dean of the Faculty of Political Science, Chairman of ISIS Thailand, Vice-Rector of Student Affairs of Chulalongkorn University, Deputy Dean for Academic Affairs and head of Department of Government, Faculty of Political Science, Chulalongkorn University. Dr. Suchit was an advisor to Prime Minister Prem Tinasulanonda and later served as a member of the Constitutional Drafting Assembly in 1997. Dr. Suchit has written numerous articles and books on Thai politics in both English and Thai, for example *The Military in Thai Politics 1981-1986*, (Singapore: Institute of East Asian Studies, 1987) Translated to Bahasa Indonesia in April 1990 and “Authoritarianism, Democracy and the Monarchy” in Suchit Bunbongkarn and Prudhisana Jumbala, ed. , “Monarchy and Constitutional Rule in Democratizing Thailand” (Institute of Thai Studies, Chulalongkorn University, Bangkok 2012) Dr. Suchit received his B.A. in political science from Chulalongkorn University, Thailand, and his M.A., M.A.L.D. and Ph.D. in comparative politics from the Fletcher School of Law and Diplomacy, Tufts University, the United States of America.

## **Biography of Professor Dr. Deepak Sharma**



Professor Deepak Sharma is currently the Director of the Center for Energy policy (CEP). He also holds the position of Associate Dean (International) , in the Faculty of Engineering and Information Technology. He has a Bachelor's degree in electricity engineering and Master's and Doctoral degrees in energy economics and policy. He has nearly thirty-five years of professional experience in academia, and public and private sectors. He is actively engaged in teaching, research, and consulting on infrastructure policy themes – in national and global contexts. Such themes include energy and water market reforms; infrastructure regulation energy-water-economy-climate change interface; environmental policy analysis; institutional economics and political economy. He is currently coordinating a major research project focusing on Energy-Food-Water security challenge in a global context. The general tenor his work is multidisciplinary policy oriented - underpinned by a recognition of the significance of global cultural, political and geo-strategic contexts. He is a member of the International Association for Energy Economics, has written extensively on energy and environmental policy themes, and made numerous invited presentations at national and international fora on a range of water, and environmental policy themes.

**Invited Speaker**

## **Dr. Sarmad Saeed Khan**



**PRESENT  
POSITION  
COUNTRY  
EXPERIENCE**

Directorate of Malaria Control Islamabad

Pakistan

- Provincial Coordinator Directorate of Malaria Control Islamabad
- Provincial Epidemiologist Malaria Control Programme
- Consultant for International Health Regulations, WHO
- Project Coordinator Merlin International, Balochistan
- National Programme Officer Malaria Control & Elimination (WHO)

Divisional Surveillance Officer in World Health Organization (WHO)

- Field Program Officer for FP & PHC
- Manager Health/ Project Coordinator RAHA (UNHCR)
- Medical Officer Health Department Government of Balochistan
- Medical Officer In-Charge B. H. U Cluster of PPHI (Peoples Primary Health Care Initiative)

## Dr. Ei Ei Phyo Myint



**PRESENT  
POSITION  
COUNTRY  
EXPERIENCE**

Lecturer

Myanmar

- Assistant Surgeon at Thingankyun Sanpya Hospital
- Assistant Lecturer at Department of Biochemistry, University of Medicine 1, Yangon
- Assistant Lecturer at Department of Biochemistry, University of Medicine Taunggyi, Taunggyi



## Dr. Nguyen Thi Hang Phuong



### **PRESENT POSITION COUNTRY EXPERIENCE**

Lecturer

Viet Nam

- Social activity major, Faculty of psychology – education, Education university
- Cadeaux consultation center. Psychotherapy officer for children and young kids, students and parents
- Social activity major, Thang Long University, Ha Noi
- Visiting lecturer – learning skill major, FPT University
- NT children research center, 46 Tran Hung Dao, Ha Noi. Psychotherapy officer for children facing psychological issues
- Share consultation center; Hoang Nhan consultation center. Psychotherapy officer for children and young kids, students and parents.
- psychology support and consultation center, University of social and human sciences, Freelancer. Working at home with children facing psychological issues
- Young – Central Union House, No.5, Nguyen Quy Duc, Thanh Xuan, Ha Noi, Freelancer, consultation officer for pregnancy health

## Conference Agenda

**The 7<sup>th</sup> International Conference on Sciences and Social Sciences 2017:**  
**“Innovative Research for Stability, Prosperity and Sustainability”**  
**January 11-12, 2018 at Rajabhat Maha Sarakham University**  
**Management Science Building (Building 34)**

Thursday, January 11, 2018	
08:30 AM to 09:00 AM	<b>Registration</b> (1 <sup>st</sup> Floor. Management Science Building: Building 34)
09:00 AM to 09:30 AM	<b>Welcome performance: Rajabhat Maha Sarakham University</b> (Theater Hall. Management Science Building: Building 34)
09:30 AM to 09:40 AM	<b>Report by: Assoc. Prof. Dr. Sittichai Busaman, President of Rajabhat Maha Sarakham University</b> (Theater Hall. Management Science Building: Building 34)
09:40 AM to 10:00 AM	<b>Welcome and Opening Address:</b> <b>Professor Emeritus Dr. Suchit Bunbongkarn</b> - Former Juror of Constitutional Court - President of Political Development Council - Member of Constitution Drafting Assembly (Theater Hall. Management Science Building: Building 34)
10:00 AM to 11:00 AM	<b>Key Note Speaker: Professor Emeritus Dr. Suchit Bunbongkarn</b> <b>Topic: “Research on Innovation, stability and Sustainability to Eradicate Poverty following the Late King Bhumibol’s footsteps”</b> (Theater Hall. Management Science Building: Building 34)
11:00 AM to 12:00 AM	<b>Key Note Speaker: Prof. Dr. Deepak Sharma</b> - Director of the Center for Energy policy (CEP), Sydney Australia <b>Topics: “Science and Social Science Interconnections: Some Ruminations”</b> (Theater Hall. Management Science Building: Building 34)
12:00 AM to 13:00 PM	<b>Lunch</b> (1 <sup>st</sup> Floor. Building 15)
13:00 PM to 14:20 PM	<b>Oral Presentation</b> (5 <sup>th</sup> – 6 <sup>th</sup> Floor. Building 34)
14:20 PM to 14:40 PM	<b>Break</b>
14:40 PM to 17:00 PM	<b>Oral Presentation</b> (5 <sup>th</sup> – 6 <sup>th</sup> Floor. Building 34)
18:00 PM to 20:00 PM	<b>Dinner: Welcome Party</b> (Takasila Hotel)

## Conference Agenda

**The 7<sup>th</sup> International Conference on Sciences and Social Sciences 2017:**  
**“Innovative Research for Stability, Prosperity and Sustainability”**  
**January 11-12, 2018 at Rajabhat Maha Sarakham University**  
**Management Science Building (Building 34)**

Friday, January 12, 2018		
08:30 AM to 09:00 AM	Registration (1 <sup>st</sup> Floor. Management Science Building. Building 34)	
09:00 AM to 12:00 AM	Oral Presentation (5 <sup>th</sup> Floor. Building 34)	Poster Presentation (1 <sup>st</sup> Floor. Building 34) (Conference Room 2)
10:20 AM to 10:40 AM	Break	
10:40 AM to 12:00 AM	Oral Presentation (5 <sup>th</sup> Floor. Building 34)	Poster Presentation (1 <sup>st</sup> Floor. Building 34) (Conference Room 2)
12:00 AM to 13:00 PM	Lunch (1 <sup>st</sup> Floor. Building 15)	
13:00 PM to 14:30 PM	Oral Presentation (5 <sup>th</sup> Floor. Building 34)	Poster Presentation (1 <sup>st</sup> Floor. Building 34) (Conference Room 2)
14:30 PM to 16:00 PM	Poster Presentation (1 <sup>st</sup> Floor. Building 34) (Conference Room 2)	
End of Conference		

# **Poster Presentations**

**The 7<sup>th</sup> International Conference on Sciences and Social Sciences 2017:  
 “Innovative Research for Stability, Prosperity and Sustainability”  
 January 11-12, 2018 at Rajabhat Maha Sarakham University  
 Management Science Building (Building 34)**

	<b>Poster Presentation</b>	<b>Page</b>
<b>ICSSS-0037</b>	<b>The Development of Multimedia for Supported The Chemistry Laboratory Learning</b>  <i>Patcharaporn Pimchan</i>	2
<b>ICSSS-0043</b>	<b>The Toxic Effect of Paraquat Dichloride on Some Tissue of Oreochromis Niloticus</b>  <i>Nawaphat Poldee</i>	8
<b>ICSSS-0054</b>	<b>Effect of Two Types of Total Mixed Ration (TMR) on Voluntary Feed Intake and Chewing Activity in Black Bengal Goats</b>  <i>Wantanee Polviset</i>	15
<b>ICSSS-0075</b>	<b>Application of The Wavelet Transform for Analysis of Bangkok Rainfall Data</b>  <i>Narin Juthasirorat</i>	19
<b>ICSSS-0078</b>	<b>The Development of Multimedia in The Virtual Reality Technology to Promote Attractions in Maha Sarakham Province</b>  <i>Natthapong Pralabraksa</i>	29
<b>ICSSS-0094</b>	<b>Effect of Supplementating Nepier Grass (Pennisetum Purpureum), Pangola Grass (Digitaria Eriantha), and Water Hyacinth (Eichhornia Crassipes) With Pelleted Feed on Growth Performance and Feed Cost of Turkey</b>  <i>Nattiya Prakobsaeng</i>	34
<b>ICSSS-0103</b>	<b>Food Sanitation Situation Of Store, Stall in Chaiyaphum Rajabhat University</b>  <i>Parichat Sattayarak</i>	40



	<b>Poster Presentation</b>	<b>Page</b>
<b>ICSSS-0132</b>	<b>Knowledge and Self-Care Practices to Prevent Dental Caries in Pre- School Children of Rajabhat Maha Sarakham University Demonstration School</b>  <i>Papavee Ruttanatam</i>	44
<b>ICSSS-0145</b>	<b>The Efficiency of Double Slope Solar Still of Heat Absorber from Black Gasket</b>  <i>Chawisorn Phukapak</i>	49
<b>ICSSS-0151</b>	<b>Participation Model for Caring the Chronic Kidney Disease Patient</b>  <i>Ranida Monkhlung</i>	58
<b>ICSSS-0157</b>	<b>Antibiotic Sensitivity of Aeromonas Hydrophila Isolated from Diseased Nile Tilapia (Oreochromis Niloticus)</b>  <i>Chutharat Kanchan</i>	65
<b>ICSSS-0160</b>	<b>Study of Physiological Responses of Chalolais Purebreed</b>  <i>Uthai Koatdoke</i>	69
<b>ICSSS-0168</b>	<b>Preliminary Investigation of Antagonistic Properties of Gliocladium SP. Against Chilli Anthracnose Disease Caused by Colletotrichum Acutatum</b>  <i>Kanchalika Ratanacherdchai</i>	72
<b>ICSSS-0181</b>	<b>Infographics Design for Public Relations Rajabhat Mahasarakham University</b>  <i>Narumol Intirak</i>	79
<b>ICSSS-0184</b>	<b>Design and Develop Smart Street Lighting System Based on Wireless Sensor Network</b>  <i>Pak Satanasaowapak</i>	86
<b>ICSSS-0286</b>	<b>Intestinal Parasitic Infections on Vegetables Market in Nakhon Ratchasima Municipality, Thailand</b>  <i>Piyathida Kusolrat</i>	92

	<b>Poster Presentation</b>	<b>Page</b>
<b>ICSSS-0007</b>	<b>The Political Participation of Women in Nong Muang Sub-District Administrative Organization, Borabue District, Mahasarakham Province.</b>  <i>Wanlapa Kotavinon</i>	99
<b>ICSSS-0048</b>	<b>The Role of Households in Start-Up Capability of Rural Labor in Nghe An Province, Vietnam</b>  <i>Thi Dieu Anh Ho</i>	108
<b>ICSSS-0069</b>	<b>Political Behavior of People in Yasothon Province</b>  <i>Sanook Singmatr</i>	114
<b>ICSSS-0141</b>	<b>A Study Potential of Community for Earning a Living in Agribusiness in Lardpattana Subdistrict, Muang District, Maha Sarakham Province</b>  <i>Ketjit Khamkula</i>	117
<b>ICSSS-0210</b>	<b>The Improvement of English Vocabulary Learning Ability by Using Games for Prathomsuksa 4 (Grade 4) Students of Chumchon Chiangmai Pattana School, Prochai District, Roi-Et Province, The Office of The Roi-Et Primary Eduactional Service Area 3</b>  <i>Apornsiri Phonraksa</i>	124
<b>ICSSS-0041</b>	<b>Non-Verbal Communication in Anger Expression in Vietnamese And English</b>  <i>Nguyen Ngan</i>	130
<b>ICSSS-0133</b>	<b>Generic Skills Among Graduates in King Mongkut's University of Technology Thonburi</b>  <i>Jiraporn Wongkerd</i>	136

# **Oral Presentations**

**The 7<sup>th</sup> International Conference on Sciences and Social Sciences 2017:  
 “Innovative Research for Stability, Prosperity and Sustainability”  
 January 11-12, 2018 at Rajabhat Maha Sarakham University  
 Management Science Building (Building 34)**

	<b>Oral Presentation</b>	<b>Page</b>
<b>ICSSS-0019</b>	<b>An Application of Task-Based Instruction in Teaching Reading Skills to Non-English Major Students at Vinh University</b>  <i>Tran Thi Phuong Thao</i>	146
<b>ICSSS-0027</b>	<b>Development of Teaching Skills and Learning Outcomes Evaluation in 21<sup>st</sup> Century of Teacher by Teacher Coaching to Enhancing Students’ Learning and Innovation Skills</b>  <i>Suphak Dulsamphan</i>	152
<b>ICSSS-0046</b>	<b>Using an English Modified Metacognition Instructional Package to Enhance High Vocational Education Certificate Students’ Vocabulary Knowledge</b>  <i>Kanokon Sripanya</i>	158
<b>ICSSS-0174</b>	<b>Assessing Classroom Learning Environment Inventory According to Constructivist Approach to Augmented Reality Technology (AR) Classes for Facilitating Creative Thinking Abilities of Secondary Students</b>  <i>Arpakorn Donvichan</i>	172
<b>ICSSS-0253</b>	<b>Some Thoughts of Looking Back The Process of Renovation in General Education</b>  <i>Bui Ngoc Nhan</i>	181
<b>ICSSS-0258</b>	<b>Continuous Fostering – The Method to Sustainably Develop the Management Officials of High Schools in the Northern Mountainous Area of Vietnam</b>  <i>Hoang Van Duong</i>	185
<b>ICSSS-0260</b>	<b>Comparison of Type of Story Related to Human-Fairy Marriage of Tales in Folk Stories Indonesia</b>  <i>Nguyen Minh Thu</i>	193

	<b>Oral Presentation</b>	<b>Page</b>
<b>ICSSS-0262</b>	<b>Si La People's Fork Song an original Form of Language Art</b>  <i>Vu Anh Tuan</i>	200
<b>ICSSS-0263</b>	<b>Improving Mathematical Modeling Competence for Students at Pedagogical Universities to Meet the Requirement of The New General Education Curriculum in Vietnam</b>  <i>Pham Xuan Chung</i>	204
<b>ICSSS-0264</b>	<b>The Algebraic Sets in The General Mathematics and Teaching Them</b>  <i>Le Thi Mai Huong</i>	211
<b>ICSSS-0079</b>	<b>Helping EFL Learners Achieve Effective Speaking</b>  <i>Mananya Potiracha</i>	220
<b>ICSSS-0265</b>	<b>Developing Mathematical Communication of Students Through Evaluating Debate in Science in Teaching Continuous Function</b>  <i>Phat Vuong Vinha</i>	229
<b>ICSSS-0269</b>	<b>Research on Several Solutions to Improve the Efficiency of Physical Education for University Students in Da Nang</b>  <i>Dao Thi Thanh Ha</i>	236
<b>ICSSS-0270</b>	<b>Developing a Tool to Evaluate Internship Result for Students Studying Social Work at Da Nang University</b>  <i>Bui Dinh Tuan</i>	241
<b>ICSSS-0271</b>	<b>Research on Kindergarten Children with Disorders Development and Teacher's Supporting</b>  <i>Dr. Nguyen Thi Hang Phuong</i>	249
<b>ICSSS-0272</b>	<b>Current Status of Aggressive Behaviors of Preschool Children in Da Nang City</b>  <i>Ho Thi Thuy Hang</i>	256

	<b>Oral Presentation</b>	<b>Page</b>
<b>ICSSS-0274</b>	<b>Formation of Vietnamese Communication Skill, For 5-6 Year-Old H'mong Children in Lao Cai Province, Vietnam Situation and Solutions</b>  <i>Dinh Van Vang</i>	263
<b>ICSSS-0275</b>	<b>Improving Training Cultural Communication Behaviors for Pre-School Children in Kindergarten School in Lao Cai Province</b>  <i>Giang Thi Gam</i>	272
<b>ICSSS-0028</b>	<b>The Investigation of Thai EFL's Vocabulary Learning Strategies</b>  <i>Nathaya Chomchiawchan</i>	278
<b>ICSSS-0276</b>	<b>The Factors Affecting the Capacity Professional Orientation of Students – Overview of Arguments</b>  <i>Ma Le Thi Duyen</i>	286
<b>ICSSS-0277</b>	<b>Current States of Attention Deficit Hyperactivity Disorder in Children and Parents' Awareness About Caring and Educating Children with This Syndrome</b>  <i>Nguyen Thi Phuong Trang</i>	293
<b>ICSSS-0279</b>	<b>Opportunities for The Formation and Development of Mathematical Representation Competence for Students Through Teaching Mathematics in Junior High School</b>  <i>Vu Thi Binh</i>	300
<b>ICSSS-0074</b>	<b>Path Analysis of Factors Affecting the Administration of Diamond Level Health Promoting Schools in Basic Education</b>  <i>Bussaba Boonkanan</i>	307
<b>ICSSS-0280</b>	<b>Inovating Scientific Research for Socio- Economic Development</b>  <i>Luong Phuc Duc</i>	313

	<b>Oral Presentation</b>	<b>Page</b>
<b>ICSSS-0282</b>	<b>An Investigation into Female Students' Levels of Anxiety About Physical Education at Da Nang University</b>  <i>Nguyen Xuan Hien</i>	318
<b>ICSSS-0284</b>	<b>Parents' Perception About Attention Deficit Hyperactivity Disorder in Children and The Influence Elements</b>  <i>Nguyen Thi Phuong Trang</i>	326
<b>ICSSS-0285</b>	<b>Supporting Children with Attention Deficit Hyperactivity Disorder at School – Teacher's Opinion</b>  <i>Nguyen Thi Phuong Trang</i>	332
<b>ICSSS-0290</b>	<b>Breaking the Detective Genre of Paul Auster In The New York Trilogy</b>  <i>Nguyen Thi Thanh Hieu</i>	338
<b>ICSSS-0055</b>	<b>Hedging in Academic Writing of Graduate Students</b>  <i>Pissamai Khunsri</i>	343
<b>ICSSS-0033</b>	<b>The Influence of Demographic Factors on Entrepreneurial Intention of The Fourth Year Students Faculty of Management Science, Sakon Nakhon Rajabhat University in An Academic Year Of 2017</b>  <i>Jitti Kittilertpaisan</i>	350
<b>ICSSS-0082</b>	<b>Concept and Local Plant Names, and Converstion, Non Phoo Thong, Sub-Village, Tha Changkhlong Village, Pha-Khaw Distict, Loei Province</b>  <i>Krissana Yodmongkhon</i>	357
<b>ICSSS-0064</b>	<b>High - Tech Agricultural Development with Tourism Development in North Central Coas, Vietnam</b>  <i>Phuong Nguyen Thi Minh</i>	364
<b>ICSSS-0093</b>	<b>The Human in William Faulkner's Novels: An Ecological Anthropology Approach</b>  <i>Anh Ho Thi Van</i>	368

	<b>Oral Presentation</b>	<b>Page</b>
<b>ICSSS-0107</b>	<b>Brand Building Strategy for Thai Frangrance To Global Brand</b>  <i>Wasi Aschakulporn</i>	375
<b>ICSSS-0146</b>	<b>Internal Factors Related to Community Empowerment of a Self-Sufficient Economy Village Model, Koh Chan District, Chonburi Province</b>  <i>Ausanakorn Tavarom</i>	381
<b>ICSSS-0155</b>	<b>Phonetic Characteristics of Intonation System of Tai in Quy Hop (Nghe An)</b>  <i>Chi Le Thi Sao</i>	386
<b>ICSSS-0251</b>	<b>The Philosophy of Education in Viet Nam Nowadays</b>  <i>Tran Minh Hieu</i>	391
<b>ICSSS-0164</b>	<b>An Analysis of English Spoken Language and Three Minute Thesis (3 MT) Presentation by Using Rhetorical Structure and Meta-discourse: A Case Study of the Undergraduate Students of Ubon Ratchathani Rajabhat University</b>  <i>Wassana Khawpong</i>	402
<b>ICSSS-0254</b>	<b>Study on The Characteristics of Distribution and Ecological of Cunninghamia Konishii Hayata In Pu Mat National Park and Some Solutions for Conservation</b>  <i>Nguyen Cong Truong</i>	410
<b>ICSSS-0256</b>	<b>Scenario and Solutions for Preserving Khmer Fairy Tales (Site: Soc Trang And an Giang Province)</b>  <i>Vu Anh Tuan</i>	416
<b>ICSSS-0268</b>	<b>Using Formative Assessment in The Second Language Class</b>  <i>Pham Thi Thang</i>	423



	<b>Oral Presentation</b>	<b>Page</b>
<b>ICSSS-0207</b>	<b>Potential Development of Knowledge Management Process of Community Enterprises Chiang Mai Province</b>  <i>Napatra Wisawakul</i>	430
<b>ICSSS-0129</b>	<b>An English Learning and Teaching Model Responding to Current Jobs Market Needs in The Asean Community: A Case Study of Rajabhat Universities in The North East of Thailand</b>  <i>Suwitchan Un-Udom</i>	435
<b>ICSSS-0257</b>	<b>Similarities in The Story Type of Heroes That Kill Monsters of Vietnamese And Southern Khmer People in Vietnam</b>  <i>Nguyen Thi Nhung</i>	441
<b>ICSSS-0259</b>	<b>Applying and Evaluating Infrastructure Solutions in Education Programs for Physical Degree Students of Pham Da Nang</b>  <i>Nguyen Thanh Giang</i>	449
<b>ICSSS-0261</b>	<b>Innovating State Management of Land in Nghe an Province in The Urbanization Process</b>  <i>Tran Thi Hoang Mai</i>	453
<b>ICSSS-0278</b>	<b>Non-Verbal Communication of Anger Expression Between Vietnamese and English</b>  <i>Nguyen Thi Ngan</i>	465
<b>ICSSS-0114</b>	<b>Vocabulary Size of Rajabhat University Students</b>  <i>Chawin Srisawat</i>	472
<b>ICSSS-0058</b>	<b>Systematic Learning Resources Knowledge Management Process Development: Participatory Action Research</b>  <i>Sarayuth Kanlong</i>	484

	<b>Oral Presentation</b>	<b>Page</b>
<b>ICSSS-0060</b>	<b>Affecting Science Teacher Interpersonal Behaviours in The 21<sup>st</sup> Century Through Learning Environment Inventories for Enhancing and Motivating Science Learning Achievement in Science Classes In Long Nok Tha School</b>	490
	<i>Warachaya Wangwonga</i>	
<b>ICSSS-0061</b>	<b>A Study of Science Teacher Interpersonal Learning Inventory Behaviour And Critical Thinking Abilities of Upper Secondary Students Under Secondary Educational Service Area Office 32</b>	503
	<i>Orapan Laminon</i>	
<b>ICSSS-0113</b>	<b>Model Development of Knowledge Management for Modern Agriculture Rice Farming to Promote Good Quality of Life for Farmer Groups in Middle Northeastern Provinces</b>	517
	<i>Chutipa Buddeevong</i>	
<b>ICSSS-0123</b>	<b>Model Development of Community Participation to Promote Life and Modern Agriculture Career Skills in Schools Under Office of The Basic Education Commission in The Northeast</b>	525
	<i>Peerapet Sirikul</i>	
<b>ICSSS-0176</b>	<b>Assessing Students' Perceptions of Their Learning Participations in Physics Laboratory Classes to Their Affecting Critical Thinking Abilities for Upper Secondary Students Under Secondary Educational Service Area Office 29</b>	533
	<i>Kanjana Bootjomchai</i>	
<b>ICSSS-0177</b>	<b>Determining Factors of Science Classroom Learning Environment Inventory Through Creative Thinking Abilities and Satisfactions of Secondary Students Under Secondary Educational Service Area Office 26</b>	545
	<i>Supachai Boonsearm</i>	
<b>ICSSS-0287</b>	<b>A Model of Dual Education Management System Through Community's Participation</b>	556
	<i>Sathaka Tanchai</i>	

	<b>Oral Presentation</b>	<b>Page</b>
<b>ICSSS-0178</b>	<b>Students' Perceptions of Their Classroom Learning Environment Inventories in the 21<sup>st</sup> Century in Physics Laboratory According to Enhance Creative Thinking Abilities Toward Science in Upper Secondary Education Under Office of Khon Kaen Provincial Private Education Commission</b>	<b>563</b>
	<i>Watcharawit Chaisaeng</i>	
<b>ICSSS-0179</b>	<b>Instructing Physics Teacher Interpersonal Behaviors on Science Process Skills Through Facilitating Experimental Laboratory Apparatus Skills for Upper Secondary Students in Roi-Kean-Sarn-Sin Provincial Group Under Provincial Administration Organization</b>	<b>573</b>
	<i>Suni Chansaman</i>	
<b>ICSSS-0186</b>	<b>Instructional Inventory with The Augmented Reality Technology (AR) For Facilitating Satisfactions and Critical Thinking Abilities of Upper Secondary Students in the 21<sup>st</sup> Century Under the Secondary Educational Service Area Office in The Central of The Northeast Region</b>	<b>584</b>
	<i>Wachira Waisan</i>	
<b>ICSSS-0189</b>	<b>A Study of Science Teacher Interpersonal Learning Inventory Behaviors and Critical Thinking Abilities of Upper Secondary Students Under Secondary Educational Service Area Office 32</b>	<b>597</b>
	<i>Orapan Laminon</i>	
<b>ICSSS-0208</b>	<b>The Development of English Reading Comprehension Ability Based on The Common European Framework of Reference for Language by Using Cooperative Integrated Reading and Composition for Mattayom Sueksa 3 Students</b>	<b>611</b>
	<i>Chalong Onputtha</i>	
<b>ICSSS-0062</b>	<b>The Applications of Concept Analysis Diagram Within Artificial Neural Networks in The Diagnosis of Direct Ignition Control System</b>	<b>617</b>
	<i>Weerayute Sudsomboon</i>	

	<b>Oral Presentation</b>	<b>Page</b>
<b>ICSSS-0011</b>	<b>Solving the Location Routing Problem of Biomass Power Plant by Applying a Mathematical Model</b>  <i>Chamanan Poonsawat</i>	626
<b>ICSSS-0289</b>	<b>Diversity of Zingiberaceae In Thanh Hoa Province</b>  <i>Dau Ba Thin</i>	636
<b>ICSSS-0067</b>	<b>A Proposed of Automotive Direct Ignition Coil Fault Diagnosis Through an Adaptive Fuzzy Logic Control</b>  <i>Weerayute Sudsomboon</i>	643
<b>ICSSS-0099</b>	<b>Trend and Change-Point Detection in River Runoff of The Hieu River, Vietnam</b>  <i>Ho Thi Phuong</i>	649
<b>ICSSS-0266</b>	<b>An Example Regarding the Meromorphic <math>\varphi</math>-Normal Functions</b>  <i>Dinh Bich Hao</i>	657
<b>ICSSS-0128</b>	<b>A Performance Study of Analytic Hierarchy Process for Organizing Dynamic Team in Multi-Player Online Games</b>  <i>Jakkrit Chotkiattikun</i>	661
<b>ICSSS-0098</b>	<b>The Photocatalytic Reaction of Tio2@ Sio2 Nanocomposites</b>  <i>Anchalee Makhin</i>	667
<b>ICSSS-0288</b>	<b>Diversity of Plants Producing Oil and Resin in Pu Mat National Park, Vietnam and Status of Exploitation and Management</b>  <i>Dao Thi Minh Chau</i>	678
<b>ICSSS-0281</b>	<b>Integrating Financial Education in Teaching the Content About Linear Equation and Linear Inequalities</b>  <i>Pham Sy Nam</i>	684

	<b>Oral Presentation</b>	<b>Page</b>
<b>ICSSS-0283</b>	<b>A Multidimensional Approach to Poverty Research (Practical in The Mountainous Areas of Nghe An, Vietnam)</b>  <i>Nguyen Thi Trang Thanh</i>	692
<b>ICSSS-0180</b>	<b>Film Cellulose from Cattail (Typha Angustifolia L.) In Saline Soil</b>  <i>A-Roonrat Uthaiku</i>	703
<b>ICSSS-0201</b>	<b>Physicochemical Properties and Antioxidant Activity of Fruit Yogurts</b>  <i>Sunan Butsat</i>	710
<b>ICSSS-0267</b>	<b>Experimental Study on The Heating Performance of R32 Heat Pump Using Natural Cold Source</b>  <i>Hoang Thanh Dat</i>	719
<b>ICSSS-0032</b>	<b>A Potential Difficulties in Applying the Quality Function Deployment (QFD) in Thailand</b>  <i>Watchanachai Joompha</i>	728
<b>ICSSS-0030</b>	<b>A Study of Learning Achievement with Practice Skills Exercises for Using Adobe Flash, Case Study of Students in Industrial Arts, 2<sup>nd</sup> Class, Faculty of Education, Rajabhat Mahasarakham Rajabhat University</b>  <i>Monthol Vachirakomen</i>	738
<b>ICSSS-0086</b>	<b>Maternal Preparation for Premature Infants</b>  <i>Thunyapatt Phaungsriken</i>	743
<b>ICSSS-0109</b>	<b>Family Developmental Task in Elderly Care</b>  <i>Paphatchaya Kucharin</i>	748
<b>ICSSS-0138</b>	<b>Xuan Dieu's Poetry from Ecocriticism Viewpoint</b>  <i>Nga Bien Thi Quynh</i>	753

	<b>Oral Presentation</b>	<b>Page</b>
<b>ICSSS-0010</b>	<b>Enhancing Reading Comprehension By Using Cooperative Language Learning Structures in Large-Sized Classes</b>	761
	<i>Lam Giang Nguyen Thi</i>	
<b>ICSSS-0112</b>	<b>A Study of Relationship Between Health Literacy and Obesity of Junior High School Students at The Central Part of The Northeastern Region in Thailand</b>	770
	<i>Kitpapon Srithanee</i>	

# POSTER PRESENTATION

**ICSSS2017**

The 7<sup>th</sup> International Conference on Sciences and Social Sciences

"Innovative Research for Stability, Prosperity and Sustainability"

Date: 11 - 12 January 2018, Venue: Rajabhat Maha Sarakham University, Thailand.

## THE DEVELOPMENT OF MULTIMEDIA FOR SUPPORTED THE CHEMISTRY LABORATORY LEARNING

Pacharaporn Pimchan

*Department of Chemistry, Faculty of Science and Technology, Rajabhat Maha Sarakham University, Maha Sarakham, 44000, Thailand*

*E-mail address: Patcharaporn145@gmail.com*

### ABSTRACT

The purpose for the research of the development of multimedia for supported the chemistry laboratory learning are to 1) creating the innovation for supported the chemistry laboratory learning, that high quality and accordance to TQF standard 7 topics 2) development the learning of chemistry laboratory by using multimedia 3) promoting the satisfaction for laboratory learning chemistry. The instruments of this study are the multimedia for supported the chemistry laboratory learning and the quality assessment evaluated by 3 specialists as well as the satisfaction assessment investigated by 25 students, who study the chemistry laboratory subject. The statistically analysis of the data consisted of means ( $\bar{X}$ ) and standard deviation (S.D)

From the study were observed

1. The multimedia for introduce and demonstrate the usability of equipment that relate to the chemistry laboratory subject in seven multimedia 1) volumetric apparatuses 2) graduated cylinder 3) pipet 4) burette 5) triple beam balance 6) electronic balance and 7) acid base titration were developed.

2. The quality assessment from specialist showed the dissemination of multimedia for supported the chemistry laboratory learning in highest level, that multimedia observed  $\bar{X}$  and S.D at 4.66 and 0.32, respectively for volumetric apparatuses at 4.81 and 0.19, respectively for graduated cylinder at 4.81 and 0.32, respectively for pipet at 4.74 and 0.32, respectively for burette at 4.77 and 0.25, respectively for triple beam balance at 4.70 and 0.38, respectively for electronic balance and at 4.70 and 0.32, respectively for acid base titration.

3. The satisfaction assessment from 25 students, who study the chemistry laboratory subject displayed the satisfaction in highest level, which showed the  $\bar{X}$  and S.D at 4.69 and 0.45, respectively for volumetric apparatuses at 4.93 and 0.11, respectively for graduated cylinder at 4.79 and 0.34, respectively for pipet at 4.93 and 0.11, respectively for burette at 4.87 and 0.22, respectively for triple beam balance at 4.79 and 0.34, respectively for electronic balance and at 4.87 and 0.21, respectively for acid base titration.

**KEYWORDS :** Chemistry, Chemistry Laboratory, Learning skill, Multimedia Product



## INTRODUCTION

In the present day, the accession to the knowledge and the information are quickly and easily due to the advances in technology. New generation, Generation Z are constructing their own individual identities, they can do many things in the same time. Moreover, they can quickly access and evaluate the theories by using the internet. The need for increased subject matter knowledge and pedagogical content knowledge are emphasize to the abilities to use this knowledge flexibly. [1] The students want to be understand the learning engendered by specific contexts. Teachers will be accurate in their content and adapt their teaching for access the learner. One technique to engage the learner and activate emotional states can lead to a positive effect on both affective and cognitive learning is multimedia. Multimedia is the digital video with audio enables similar information to be stored in both the verbal and visual channels; the brain is then able to make a link between the visual and audio, increasing the likelihood of learners to retain and recall the information. [2] Multimedia can be used to enhance online environments for collaboration by allowing users to participate in a distributed conversation by contributing a video clip rather than simply responding with text. Multimedia may also be the focus of a collaborative effort where any number of remote participants each share their unique perspective on the events taking place in the clip. [3] Chemistry laboratory subject are the course to teaching for students in chemistry and other fields. The content in chemistry laboratory is the practice subject, so that the students will be do with them self. The teacher is usually demonstrating at only 1 time, if in the classroom have many students may be misunderstanding or disremembering in the usability of equipment. The multimedia for demonstrating the usability of equipment are important. We have the idea to create the innovative teaching materials in the Chemistry laboratory subject for stimulate the interesting, increase the understanding and supported the learning skills.

## MATERIAL AND METHODS

### Target group

The samples were

1. 3 specialists who expert in the technical and content.
2. 25 students who study the chemistry laboratory

### Instruments

The multimedia for supported the chemistry laboratory learning were design from content in chemistry laboratory subject and the quality investigated by specialists in Rajabhat Maha Sarakham University.

The instrument was 10 items quality assessment as follow.

1. Concepts.
2. The appropriateness of explaining the knowledge
3. The appropriateness of the picture in the presentation of the content
- 4 The consistency of the image with the content
5. The appropriateness of the narrative
6. The consistency of the picture with the narrative
7. Sound quality.
8. The suitability of the letter
9. The appropriateness of the sequence
10. Multimedia can be published

The satisfaction assessment considered by 25 students, who study the chemistry laboratory subject by using the multimedia.

The instrument was 5 items quality assessment as follow.

1. The appropriateness of the narrative
2. Content clarity
3. Supporting to the understanding to content and using equipment
4. Easy to review content
5. Useful for learning chemistry laboratory 1

### Validity of content

The steps are as follows.

1. Studying the characteristic and the content of the chemistry laboratory subject as well as the multimedia production to support the learning.

2. Footage and editing the multimedia for 7 multimedia as follow: 1) volumetric apparatuses 2) graduated cylinder 3) pipet 4) burette 5) triple beam balance 6) electronic balance and 7) acid base titration.
3. Evaluation the quality by 3 specialists
4. Publication the multimedia for supported the chemistry laboratory learning.
5. Evaluation the satisfaction by 25 students
6. Summarizes the experimental results.

### **Analytics**

We study the technical and content quality of multimedia for supported the chemistry laboratory learning by using quality assessment and satisfaction assessment.

After watching the multimedia for supported the chemistry laboratory learning, specialists answered the quality assessment questionnaire 10 items for characterize the contentment of sample. The satisfaction was analyzed by mean and standard deviation. The analysis will use the average as compared with the evaluation criteria [4].

- |             |                            |
|-------------|----------------------------|
| 4.51 – 5.00 | means highest satisfaction |
| 3.51 – 4.50 | means high satisfaction    |
| 2.51 – 3.50 | means medium satisfaction  |
| 1.51 – 2.50 | means low satisfaction     |
| 1.00 – 1.50 | means lowest satisfaction  |

The average criteria of satisfaction in this study were higher than 4.51.

### **RESULTS AND DISCUSSION**

This aimed of this study are 1) creating the innovation for supported the chemistry laboratory learning, that high quality and accordance to TQF standard 7 topics 2) development the learning of chemistry laboratory by using multimedia 3) promoting the satisfaction for laboratory learning chemistry. The results were as follows:

1. The characteristic and the content of the chemistry laboratory subject can be development the multimedia in 7 topics.
  - 1) Volumetric apparatuses
  - 2) Graduated cylinder
  - 3) Pipet
  - 4) Burette
  - 5) Triple beam balance
  - 6) Electronic balance
  - 7) Acid base titration
2. Footage and editing the multimedia for explain the content and demonstrate use of equipment
  - 1) Volumetric apparatuses  
Demonstrate the use of volumetric apparatuses.



- 2) Graduated cylinder  
Demonstrate the use of graduated cylinder.



3) Pipet  
Demonstrate the use of pipet.



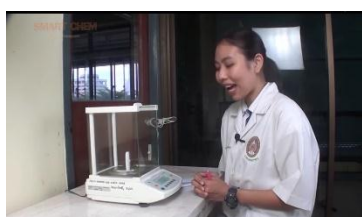
4) Burette  
Demonstrate the use of burette.



5) Triple beam balance  
Demonstrate the use of triple beam balance



6) Electronic balance  
Demonstrate the use of electronic balance



7) Acid base titration  
Demonstrate the acid base titration.





The multimedia for supported the chemistry laboratory learning were successfully prepared. Then the technical and content quality were investigated by 3 specialists.

### 3. Evaluation the quality by 3 specialists

After sample watch the multimedia for supported the chemistry laboratory learning, the results of assessment were show as the Table 1, 2 and 3.

**Table 1** showed the Mean and S.D. of quality of multimedia for supported the chemistry laboratory learning in the topic of volumetric apparatuses, graduated cylinder and pipet

Item	Volumetric apparatuses			Graduated cylinder			Pipet		
	$\bar{X}$	S.D.	level	$\bar{X}$	S.D.	level	$\bar{X}$	S.D.	level
1. Concepts.	5.00	0	highest	5.00	0	highest	4.66	0.57	highest
2. The appropriateness of explaining the knowledge	4.33	0.57	high	5.00	0	highest	4.66	0.57	highest
3. The appropriateness of the picture in the presentation of the content	4.33	0.57	high	5.00	0	highest	5.00	0	highest
4 The consistency of the image with the content	5.00	0	highest	5.00	0	highest	4.66	0.57	highest
5. The appropriateness of the narrative	4.66	0.57	highest	4.66	0.57	highest	5.00	0	highest
6. he consistency of the picture with the narrative	5.00	0	highest	5.00	0	highest	4.66	0.57	highest
7. Sound quality.	5.00	0	highest	5.00	0	highest	5.00	0	highest
8. The suitability of the letter	4.33	0.57	high	4.33	0.57	high	4.66	0.57	highest
9. The appropriateness of the sequence	4.33	0.57	high	4.66	0.57	highest	5.00	0	highest
10. Multimedia can be published	4.66	0.57	high	500	0	highest	4.66	0.57	highest
<b>Average</b>	<b>4.66</b>	<b>0.32</b>	<b>highest</b>	<b>4.85</b>	<b>0.19</b>	<b>highest</b>	<b>4.81</b>	<b>0.32</b>	<b>highest</b>

**Table 2** showed the Mean and S.D. of quality of multimedia for supported the chemistry laboratory learning in the topic of burette and triple beam balance

Item	Burette			Triple beam balance		
	$\bar{X}$	S.D.	level	$\bar{X}$	S.D.	level
1. Concepts.	5.00	0	highest	5.00	0	highest
2. The appropriateness of explaining the knowledge	4.66	0.57	highest	4.66	0.57	highest
3. The appropriateness of the picture in the presentation of the content	4.33	0.57	high	4.66	0.57	highest
4 The consistency of the image with the content	5.00	0	highest	5.00	0	highest
5. The appropriateness of the narrative	5.00	0	highest	5.00	0	highest
6. he consistency of the picture with the narrative	4.66	0.57	highest	4.33	0.57	high
7. Sound quality.	4.66	0.57	highest	5.00	0	highest
8. The suitability of the letter	4.33	0.57	highest	4.33	0.57	high
9. The appropriateness of the sequence	5.00	0	highest	5.00	0	highest
10. Multimedia can be published	5.00	0	highest	5.00	0	highest
<b>Average</b>	<b>4.74</b>	<b>0.32</b>	<b>highest</b>	<b>4.77</b>	<b>0.25</b>	<b>highest</b>

**Table 3** showed the Mean and S.D. of quality of multimedia for supported the chemistry laboratory learning in the topic of electronic balance and acid base titration

Item	Electronic balance			Acid base titration		
	$\bar{X}$	S.D.	level	$\bar{X}$	S.D.	level
1. Concepts.	4.33	0.57	high	4.67	0.577	highest
2. The appropriateness of explaining the knowledge	4.66	0.57	highest	4.67	0.577	highest
3. The appropriateness of the picture in the presentation of the content	4.66	0.57	highest	4.00	0	high
4 The consistency of the image with the content	5.00	0	highest	4.67	0.57	highest
5. The appropriateness of the narrative	4.66	0.57	highest	5.00	0	highest
6. he consistency of the picture with the narrative	4.66	0.57	highest	5.00	0	highest
7. Sound quality.	5.00	0	highest	5.00	0	highest
8. The suitability of the letter	4.33	0.57	high	4.67	0.57	highest
9. The appropriateness of the sequence	5.00	0	highest	4.67	0.57	highest
10. Multimedia can be published	5.00	0	highest	5.00	0	highest
<b>Average</b>	<b>4.70</b>	<b>0.38</b>	<b>highest</b>	<b>4.70</b>	<b>0.32</b>	<b>highest</b>

The sample who watching 7 multimedia production for supported the chemistry laboratory learning were evaluated the quality at the highest level. The  $\bar{X}$  and S.D was 4.66 and 0.32, respectively for volumetric apparatuses was 4.81 and 0.19, respectively for graduated cylinder was 4.81 and 0.32, respectively for pipet was 4.74 and 0.32, respectively for burette was 4.77 and 0.25, respectively for triple beam balance was 4.70 and 0.38, respectively for electronic balance and was 4.70 and 0.32, respectively for acid base titration. From this observed indicating that the multimedia was high quality, that can be supported the chemistry laboratory learning.

#### 4. Evaluation the satisfaction by 25 students

The 25 students who study the chemistry laboratory subject by using the multimedia watch the multimedia for supported the chemistry laboratory learning, the results of the assessment were show as the Table 4, 5 and 6.

**Table 4** showed the Mean and S.D. of satisfaction of multimedia for supported the chemistry laboratory learning in the topic of volumetric apparatuses, graduated cylinder and pipet

Item	Volumetric apparatuses			Graduated cylinder			Pipet		
	$\bar{X}$	S.D.	level	$\bar{X}$	S.D.	level	$\bar{X}$	S.D.	level
1. The appropriateness of the narrative	4.64	0.48	highest	5.00	0	highest	4.66	0.57	highest
2. Content clarity	4.64	0.48	high	5.00	0	highest	4.66	0.57	highest
3. Supporting to the understanding to content and using equipment	4.72	0.45	high	5.00	0	highest	5.00	0	highest
4. Easy to review content	4.88	0.33	highest	5.00	0	highest	4.66	0.57	highest
5. Useful for learning chemistry laboratory 1	4.64	0.48	highest	4.66	0.57	highest	5.00	0	highest
<b>Average</b>	<b>4.69</b>	<b>0.45</b>	<b>highest</b>	<b>4.93</b>	<b>0.11</b>	<b>highest</b>	<b>4.79</b>	<b>0.34</b>	<b>highest</b>

**Table 5** showed the Mean and S.D. of satisfaction of multimedia for supported the chemistry laboratory learning in the topic of burette and triple beam balance

Item	Burette			Triple beam balance		
	$\bar{X}$	S.D.	level	$\bar{X}$	S.D.	level
1. The appropriateness of the narrative	5.00	0	highest	5.00	0	highest
2. Content clarity	5.00	0	highest	4.64	0.57	highest
3. Supporting to the understanding to content and using equipment	4.66	0.57	highest	5.00	0	highest
4. Easy to review content	5.00	0	highest	4.72	0.57	highest
5. Useful for learning chemistry laboratory 1	5.00	0	highest	5.00	0	highest
<b>Average</b>	<b>4.93</b>	<b>0.11</b>	<b>highest</b>	<b>4.87</b>	<b>0.22</b>	<b>highest</b>

**Table 6** showed the Mean and S.D. of satisfaction of multimedia for supported the chemistry laboratory learning in the topic of electronic balance and acid base titration

Item	Electronic balance			Acid base titration		
	$\bar{X}$	S.D.	level	$\bar{X}$	S.D.	level
1. The appropriateness of the narrative	4.66	0.57	highest	4.70	0.48	highest
2. Content clarity	5.00	0	highest	4.67	0.57	highest
3. Supporting to the understanding to content and using equipment	4.66	0.57	highest	5.00	0	highest
4. Easy to review content	4.66	0.57	highest	5.00	0	highest
5. Useful for learning chemistry laboratory 1	5.00	0	highest	5.00	0	highest
<b>Average</b>	<b>4.79</b>	<b>0.34</b>	<b>highest</b>	<b>4.87</b>	<b>0.21</b>	<b>highest</b>

After the students watching 7 multimedia production for supported the chemistry laboratory learning were evaluated the satisfaction at the highest level. The  $\bar{X}$  and S.D was 4.69 and 0.45, respectively for volumetric apparatuses was 4.93 and 0.11, respectively for graduated cylinder was 4.79 and 0.34, respectively for pipet was 4.93 and 0.11, respectively for burette was 4.87 and 0.22, respectively for triple beam balance was 4.79 and 0.34, respectively for electronic balance and was 4.87 and 0.21, respectively for acid base titration. From this observed indicating that the multimedia can be supported the positive attitude to learning.

#### CONCLUSIONS

The seven multimedia for supported the chemistry laboratory learning 1) volumetric apparatuses 2) graduated cylinder 3) pipet 4) burette 5) triple beam balance 6) electronic balance and 7) acid base titration were prepared. The quality of techniques and content showed at highest level. The students who study by using the multimedia were exposed the satisfaction at the highest level. From this observed indicating that the multimedia can be supported the chemistry laboratory learning and positive attitude to learning.

#### ACKNOWLEDGEMENTS

This research was supported by the research and development institute, Rajabhat Maha Sarakham University and thank you for the Faculty of Science and Technology Rajabhat Maha Sarakham University.

#### REFERENCES

- [1] Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15, 4-14.
- [2] Salina L., Ruffinengo C., Garrino L. (2012). Effectiveness of an educational video as an instrument to refresh and reinforce the learning of a nursing technique: a randomized controlled trial. *Perspectives on Medical Education*, 1 (2), 67-75
- [3] Pea, R., Mills, M., Rosen, J., Dauber, K., Effelsberg, W., & Hoffert, E. (2004). The DIVER™ project: Interactive digital video repurposing. *IEEE Multimedia*, 11 (1), 54-61.
- [4] Keawbunma, W. (2009). *A Computer Assisted Instruction Package on Intranet Network on Basic Internet for Prathomsuksa 6 Based on Constructionism Theory*. Master of Education (Curriculum and Instruction). Rajabhat Utaradit University.
- [5] Smeeton, M. J., Williams, A. M., Hodges, N. J., Ward, P. (2005). The relative effectiveness of various instructional approaches in developing anticipation skill. *Journal of Experimental Psychology. Applied*, 11 (2), 98-110
- [6] Tobin, K., & Garnett, P. (1988). Exemplary practice in science classrooms. *Science Education*, 72, 197-208.
- [7] Vaughan, T. (1993). *Multimedia: Making It Work*. First edition. Osborne: McGraw-Hill, Berkeley.
- [6] Dechawut Wanichsan and Sasithorn Chookaew. (2012). Interactive computer media instruction using a flowchart strategy to support students in computer programming course. *Proceedings of the 1<sup>st</sup> International Conference on Innovation in Education*. Thailand.
- [7] O'Brien, J. (1999). *Management Information Systems – Managing Information Technology in the Internetworked Enterprise*. Boston: Irwin McGraw-Hill.

## TOXIC EFFECT OF PARAQUAT DICHLORIDE ON THE TISSUE OF OREOCHROMIS NILOTICUS

Nawaphat Poldee<sup>1,\*</sup>, Thiwaporn Jakpha<sup>2</sup>, Nongnuch Chailob<sup>2</sup>, Naiyana Nooyod<sup>2</sup>,  
Sinjai Khongkahon<sup>2</sup>, Sureerat Netwong<sup>2</sup>

<sup>1</sup>*Department of Biology, Faculty of Science and Technology, Rajabhat Maha Sarakham University,  
Mahasarakham 44000, Thailand*

<sup>2</sup>*Department of Biology, Faculty of Education, Rajabhat Maha Sarakham University, Mahasarakham 44000,  
Thailand*

Author correspondence, e-mail : taweebot.nwp@gmail.com

### ABSTRACT

The effect of paraquat dichloride on histopathological changes in *Oreochromis niloticus* was assessed in this study. Fish were exposed to 0, 10, 15 and 20 mg/L of paraquat for 72 h and histopathological alterations in the gill, liver and kidney were examined by paraffin section method. Exposure of fish to paraquat caused histopathological changes in the gill lamellae, in which numerous giant cells were present with lamellar aneurysms found in the fish exposed to 15 and 20 mg/L. The *Oreochromis niloticus* exposed to 10, 15 and 20 mg/L of paraquat revealed lamellar fusion, disarray, curling of all gills and increased numbers of epithelium causing epithelial thickening. Exposed to 15 and 20 mg/L, the fish showed swelling of the kidney and enhancement of the other lesions. For all concentrations, fat deposits were found in the kidney with reduced glomerular size and also some of the disintegration of the nuclei and cytoplasmic destruction in the ureter. The findings obtained that the toxicity of paraquat in *Oreochromis niloticus* was in a concentration-dependent manner and its toxic effects should be examined at different concentrations.

**KEYWORDS:** *Oreochromis niloticus*; Toxic; Paraquat; Histopathology

## INTRODUCTION

Paraquat (1,1-dimethyl-4,4-bipyridinium), which is one of the most common contact and non-selective herbicides for exterminating vegetative pests, is extensively used for controlling terrestrial weeds and aquatic plants in different countries and its presence has been reported in many water sources of the world [1]. Herbicides usually get into aquatic environments through accidents or runoffs from the nearby farmlands. The effects of herbicides on aquatic life including fish has been well-documented [2]. Herbicides at high concentrations are known to reduce the survival and growth of fish as well as to produce various visible adverse effects to fish [3, 4]. Moreover, they are known to cause a number of diseases and alterations in fish blood cells, resulting in the loss in aquaculture [5]. Both pesticides and herbicides have also been reported to cause damages to several important organs of fish like kidney, liver, gill, stomach, brain and muscle [6].

Paraquat has been reported to cause slight-to-moderate toxic effects to a variety of aquatic life with an average threshold toxicity of about 100 mg/L to fish [7, 8]. The literature has revealed that aquatic weeds accumulate paraquat at significant amounts following a short-term exposure. For instance, [9] reported that weeds exposed for 4 d to paraquat showed significant residual levels of the herbicide. Moreover, paraquat at high levels has also been shown to inhibit the photosynthesis of some algae in stream waters.

In fish, the literature has revealed that the 96-h LC<sub>50</sub> for paraquat is 32 mg/L in rainbow trout and 13 mg/L in brown trout [8]. In addition, the LC<sub>50</sub> for the aquatic invertebrate *Daphnia pulex* is 1.2 to 4.0 mg/L [7]. In rainbow trout exposed for 7 d to paraquat, the herbicide was detected in the gut and liver but not in the meat of the fish [8].

Several studies have been made in attempts to clarify the effect of herbicides on histopathological changes in a wide variety of aquatic life, especially in fish. For example, [10] examined the histopathological changes in fish following exposure to a variety of noxious agents like pesticides, phenols and heavy metals and found that the gill showed histopathological alterations such as hyperplasia and hypertrophy, epithelial lifting, aneurysm and increase in mucus secretion. Other than the gill, the liver is also a very important organ that breaks down numerous chemicals and as a result, liver cells are often amongst those damaged by toxic chemicals. [11] studied histopathological alterations in Nile tilapia after exposure to the herbicide glyphosate and observed that the herbicide markedly caused several histopathological changes including cell proliferation, lamellar fusion, lamellar cell hyperplasia and epithelial lifting. The major effects observed on the gills were edema, epithelial lifting, and thickening of the primary lamellar epithelium and fusion of secondary lamellae.

## MATERIALS AND METHODS

### Chemicals

Paraquat dichloride was purchased from Syngenta Crop Protection Co. Ltd. All other chemicals used for preparation of fish tissues were of analytical grade, provided by local chemical manufacturers. The stock solution (100 mg/L) of paraquat dichloride was prepared in methanol.

### Experimental fish

120 apparently, healthy, 2-month-old *Oreochromis niloticus* with an average body weight of  $5.7 \pm 2.12$  g and an average length of  $8.6 \pm 0.79$  cm were purchased from the Inland Fisheries Research and Development Center, Maha Sarakham province, and transported alive in a large plastic water container with a source of air supplied by battery aerators.

### Experimental design

The toxicity of paraquat was assessed by exposing *Oreochromis niloticus* to different concentrations of paraquat for 72 h. Three replicates groups of 5 *Oreochromis niloticus* were placed in 20 aquariums with a 10L capacity, each containing 5L of water. The desired amount of paraquat was added 60 min prior to introducing the fish to the aquariums. The appropriate control was when less than 5 percent of fish died. The groups were exposed to 10, 15 and 20 mg/L of paraquat. In this study, there was no mortality in both the control and the treated groups. At a given timepoint five fish were captured and sacrificed for examining the tissue histopathological changes.

### Analysis of tissue histopathological changes

The fish captured at a given timepoint were dissected and various tissues were collected and washed in a 0.9% normal saline solution. The dissected gill, liver and kidney were fixed into 10% phosphate buffered formalin (10% PBF) for 24 h, decalcified with EDTA, dehydrated through graded alcohol series (20-99.99%),



cleared in xylene and embedded in paraffin. About 5 to 7  $\mu\text{m}$  thick paraffin sections were cut and stained with haematoxylin and eosin (H&E). Changes induced by paraquat treatment in the gill, liver and kidney were photographed and analyzed under a light microscope.

## RESULTS

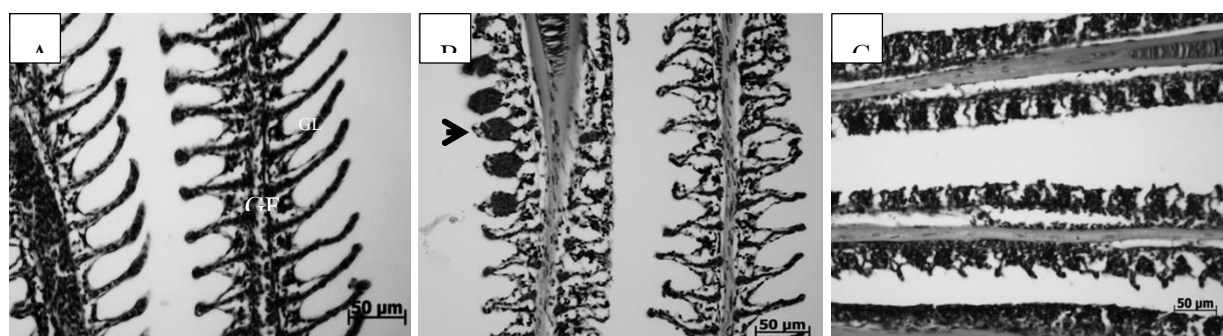
This study was designed to investigate the effects of paraquat on the *Oreochromis niloticus*. The gill, liver and kidney tissues of *Oreochromis niloticus* were observed after the 72-h paraquat exposure treatments using three different concentrations of paraquat (10, 15 and 20 mg/L) and the results demonstrated the histopathological changes in the studied tissues in a concentration-dependent manner.

### 1. Histopathology of the gill

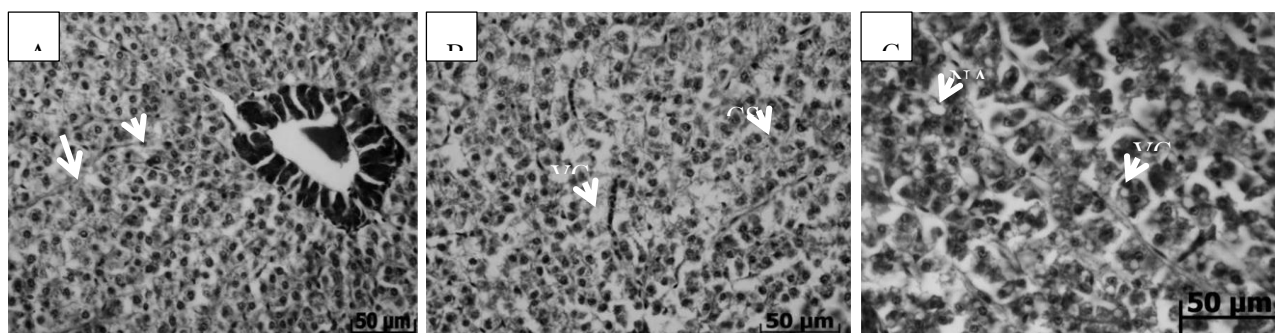
The gill morphology of *Oreochromis niloticus* in the untreated controls is similar to that of other teleost fish species. The gill is made up of double rows of filaments, arising perpendicularly the lamellae (primary lamellae and secondary lamellae). The lamellae are lined with a squamous epithelium, which is composed by pavement and non-differentiated cells. Below that epithelium are lamellar blood sinuses separated by pillar cells. Between the lamellae, the filament is lined with a thick stratified epithelium constituted by several cellular types such as chloride, mucous and pavement cells (Fig. 1A). The histopathological changes observed in the gill lamellae revealed a numerous giant cells with lamellae aneurysms found in the fish groups exposed to 15 and 20 mg/L. In the groups exposed to 10, 15, 20 mg/L paraquat, the histopathological structure of the gill exhibited lamellar fusion, disarray, hemorrhage in the gill lamellae, curling of all gills and increased numbers of epithelium causing epithelial thickening.

### 2. Histopathology of the liver

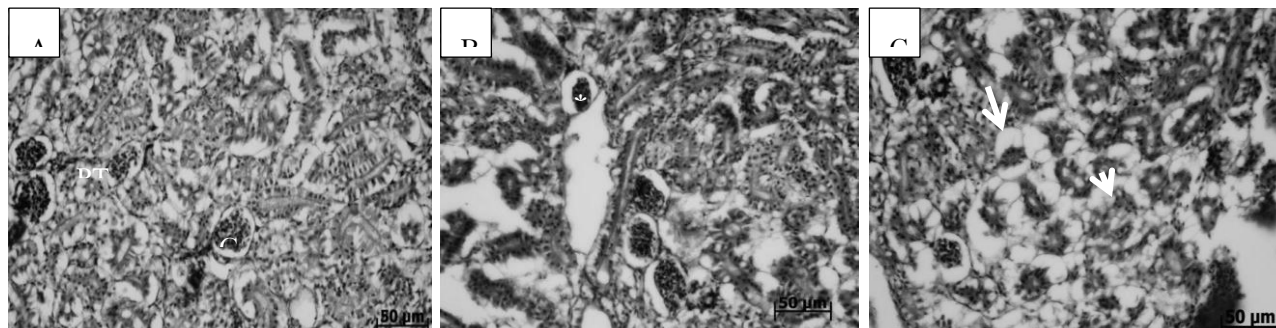
The structure of the normal liver of the *Oreochromis niloticus* consists of a continuous mass of large hexagonal cells. The hepatocytes are large in size with homogenous granular cytoplasm and either centrally located distinct nuclei. Each cord is separated by the thick wall of the peripheral cells (Fig. 2A). The histopathological appearance of the liver exposed to 10 mg/L of paraquat showed inflammatory, increase in the size of sinusoids and blood congestion in sinusoids and vacuolization of cell cytoplasm and hepatocyte swelling. It was obvious that an increase in paraquat concentrations caused cytoplasmic vacuolation, cellular degeneration, damage of nuclei and cellular necrosis in hepatic tissues.



**Fig. 1.** The gill section showing normal cellular pattern, ranging from gill lamellae (GL), gill filament (GF) (1A) ; The gill exposed to 15 and 20 mg/L of paraquat showing lamellae aneurysms (short arrows) (1B) ; The gill exposed to 10, 15 and 20 mg/L of paraquat showing disarray and epithelial hyperplasia (1C).



**Fig. 2.** The liver section micrograph of in the control, showing normal shaped hepatic cells, sinusoids (arrows), Kupffer cells (short arrows) (2A) ; Liver of 10 *Oreochromis niloticus* mg/L of paraquat treated fish showing increased vacuolization of cell cytoplasm (VC), hepatocyte swelling (CS). (2B) ; Liver of 15 and 20 mg/L of paraquat treated fish showing increased cellular degradation with cytoplasm vacuolization (VC) and nucleus atrophy (NA) (2C).



**Fig. 3.** The kidney section micrograph in the control group showing normal appearance of glomeruli (G) and proximal tubule (PI) (3A) ; Kidney of 15 and 20 mg/L of paraquat treated fish showing reduced glomerular size (asterisk), disintegration of the nuclei (short arrows) and showing extensive hydropic swelling of tubules and accumulation of vacuoles (arrows) in tubular cells (3B,3C).

### 3. Histopathology of the kidney

The kidney is composed of numerous renal corpuscles with developed glomeruli and a system of tubules. The proximal segment is covered by tall columnar epithelial cells with basal nuclei and brush border located along the cell apices. The distal segment is lined with large, relatively clear columnar epithelial cells with central nuclei and the brush border is reduced or absent. The collecting duct or glomerulus is larger in diameter than the distal segment, containing columnar epithelial cells with basal nuclei and no brush border (Fig. 3A). At concentrations of 15 and 20 mg/L of paraquat, the results showed swelling of the kidney and enhancement of the other lesions. For all concentrations, fat deposits are found in the kidney along with reduced glomerular size, hydropic swelling of tubules and accumulation of vacuoles. The disintegration of the nuclei and cytoplasmic destruction in the ureter are also observed.

## CONCLUSIONS AND DISCUSSION

The release of pollutants into aquatic environments particularly causes toxic effects to aquatic life including fish. Fish mortalities have been elucidated to be associated with the river receiving various pollutants [12]. The results obtained in this study demonstrated that exposure of Nile tilapia to 15 and 20 mg/L of paraquat dichloride resulted in histopathological alterations in the gill, liver and kidney. The histopathological structure of the gill exhibited lamellae aneurysms, lamellar fusion, disarray and epithelial hyperplasia, which was in good agreement of earlier studies [13, 14] elucidating the hyperplasia of the gill lamellae and the increased gill lamellae thickness, which resulted in fusion and necrosis. Hyperplasia of the epithelial lining of the secondary lamellae, necrosis and shortening of the secondary lamella, abnormal raising or swelling of the epithelium, as well as fusion of the secondary lamellae, edematous changes and excessive mucus secretion were also observed in the fish exposed to paraquat. The findings obtained in the current study were consistent with an earlier study [15], which demonstrated the filament and the lamellae with more marked congestion and lamellar hyperplasia in fish exposed level of 1.02 mg/L and unraveled that the gill of fish exposed to a toxicant concentration of 2.0 mg/L showed atrophy with a progressive disruption of the gill filament and lamellae observed in the fish exposed to 11.2, 12 and 13.6 mg/L of the toxic compound. Due to the fact that gill is one of the most important organs directly in contact with pollutants and any kind of damage to the gill tissues of fish leads to disorder in the gas exchange process and also the decrease of ion regulation efficiency via this organ [16].

The results presented in this study also showed that the liver exposed to paraquat at concentrations of 10, 15 and 20 mg/L exhibited inflammatory, vacuolization of cell cytoplasm and hepatocyte swelling, damage of nuclei, cellular necrosis, which was similar to a previous study [17] demonstrating a lower eosinophilia and an increase of cytoplasmic vacuolization with the necrotic cells appearing in the periphery of vascular regions and the membrane of hepatocytes revealed rupture. The liver plays a primary role in the metabolism of xenobiotic compounds with biochemical alterations occurring in some toxic conditions [18], and it is a detoxification organ

essential for the excretion of toxic substances in fish [19]. In this study, the kidney exposed to paraquat concentrations of 15 and 20 mg/L displayed extensive hydropic swelling of tubules and accumulation of vacuoles, fat deposits and reduced glomerular size. The findings obtained in this study were in agreement with an earlier study [14], which examined the toxicity of paraquat to juvenile African catfish *Clarias gariepinus* and observed that the kidney exposed the herbicide showed necrosis, degenerate kidney tubule and pyknosis with haemorrhagic areas. The literature has revealed that the 96-h LC<sub>50</sub> for paraquat is 12.25 mg/L in *Oreochromis niloticus* [15]. Paraquat can lead to production of products such as hydrogen peroxide, super oxide radical, oxygen and hydroxyl radical, which have a great role in creating oxidative stress and the occurrence of cellular toxicity in animal and plant cells [20]. Attacking vital macromolecules, free radicals change the function and nature of their targets and make the ground for many pathological damages [21, 22, 23].

The present study has highlighted the toxic effects of paraquat dichloride on histopathological changes in Nile tilapia following exposure to various concentrations. The results demonstrated that the organ and tissue (gill, liver and kidney) damage in Nile tilapia was due to the direct toxicity of paraquat. The results also showed that degree of the tissue distortion was proportional to the concentration of paraquat applied. The findings obtained in this study suggest that histopathological changes in fish are a useful indicator in assessing the toxicity of toxic chemicals.

### ACKNOWLEDGEMENTS

The authors would like to thank the Inland Fisheries Research and Development Center, Maha Sarakham, for providing Nile tilapia throughout the whole study.

### REFERENCES

- [1] Eisler, R., 1990. *Paraquat hazards to fish, wildlife, and invertebrates: A synoptic review*. U.S. Fish and Wildlife Service Patuxent Wildlife Research Center, Laurel, Maryland.
- [3] Weldal, H., Russo, M., 1979. Monarch Chem./3,850. In: *The Use and Significance of Pesticides on the environment*, McEwan, F.L. and Stephenson G.R. (Eds.), Wiley, New York.
- [4] McKim, M.J., Benoit, D.A., Biesinger, K.K., Brungs, W.A., Siefert, R.E., 1975. Effect of pollution on fresh water fish. *Journal of the Water Pollution Control Federation* 47, 1711-1764.
- [5] Rahman, M.Z., Hossian, Z., Mollah, M.F.A., Ahmed, G.U., 2002. Effect of diazinon 60EC on *Anabas testudineus*, *Channa punctatus* and *Barbodes gonionotus* Naga. *The ICLARM Quarterly* 25, 8-11.
- [6] Dorucu, M., Girgin, A., 2001. The effect of cypermethrin on some hematological parameters of *Cyprinus carpio*. *Aquaculture International* 9, 389-424.
- [7] Omitoyin, B.O., Ogunsanmi, A.O., Adesina, B.T., 1999. Studies on acute toxicity of Piscicidal plant extract (*Tetrapleura tetraptera*) on tilapia (*Sarotherodon galilaeus*) fingerlings. *Tropical Journal of Animal Science* 2, 91-97.
- [8] U.S. National Library of Medicine, 1995. *Hazardous Substances Databank*. Bethesda, MD, 10-9.
- [9] Weed Science Society of America, 1994. *Herbicide Handbook*, Seventh Edition. Champaign, IL, pp. 10-59.
- [10] Stevens, J.T., Sumner, D.D., 1991. *Herbicides. In Handbook of Pesticide Toxicology*. Hayes, W. J., Jr. and Laws, E. R., Jr., Eds. Academic Press, New York, NY., 10-88.
- [11] Nowak, B., 1992. Histological changes in Gills induced by residues of Endosulfan. *Journal of Aquatic Toxicology* 23, 63-84.
- [12] Ayoola, S.O., 2008. Toxicity of glyphosate herbicide on Nile tilapia (*Oreochromis niloticus*) juvenile. *African Journal of Agricultural Research* 3, 825-834.
- [13] Prashanth, M.S., David, M., Mathad, S.G., 2005. Behavioural changes in freshwater fish, *Cirrhinus Mrigala* (Hamilton) exposed to cypermethrin. *Journal of Environmental Biology* 26, 141-144.
- [14] Banaee, M., Davoodi, M.H., Zoheiri, F., 2013. Histopathological changes induced by paraquat on some tissues of gourami fish (*Trichogaster trichopterus*). *Open Veterinary Journal* 3, 36-42.
- [15] Omitoyin, B.O., Ajani, E.K., Fajimi, O.A., 2006. Toxicity of Gramoxone (paraquat) to Juvenile African Catfish *Clarias gariepinus* (Burchell, 1822). *American-Eurasian Journal of Agricultural & Environmental Sciences* 1, 26-30.
- [16] Babatunde, M.M., Oladimeji, A.A., 2014. Effect of paraquat on the growth and behaviour of *Oreochromis niloticus*. *Environmental Research Journal* 8 (2) : 44-47.
- [17] Ajani, F., Olukunle, O.A., Agbede, S.A., 2007. Hormonal and haematological responses of *Clarias gariepinus* (Burchell, 1822) to nitrate toxicity. *Journal of Fisheries International* 2, 48-53.

- [18] Figueiredo-Fernandes, A. Fontainhas-Fernandes, A., Rocha, E., Reis Henriques, M.A., 2006. The effect of paraquat on hepatic EROD activity, liver and gonadal histology in male and female of Nile tilapia, *Oreochromis niloticus*, exposed at different temperatures. *Archives of Environmental Contamination and Toxicology* 4, 626-632.
- [19] Van Dyk, J.C., Pieterse, G.M., van Vuren, J.H., 2007. Histological changes in the liver of *Oreochromis mossambicus* (Cichlidae) after exposure to cadmium and zinc. *Ecotoxicol Environ Saf* 66, 432-440.
- [20] Hinton, D.E., Lauren, D.J., 1990. *Liver structural alterations accompanying chronic toxicity in fishes: potential biomarkers of exposure*. In: McCarthy, J. F., Shugart, L. R. (Eds.), Biomarkers of environmental contamination. Lewis, Boca Raton, pp. 17-57.
- [21] Martin-Rubi, J.C., Marruecos-sant, L., Palomar- Martinez, M., Martinez-Escobar, S., 2007. Immuno-suppressive treatment due to paraquat poisoning. *Med. Intensiva*. 31, 331-334.
- [22] Banaee, M., Sureda, A., Mirvagefi, A.R., Ahmadi, K., 2013. Histopathological alterations induced by diazinon in rainbow trout, (*Oncorhynchus mykiss*). *International Journal of Environmental Research* 7, 735-744.
- [23] Sureda, A., Box, A., Ensenat, M., Alou, E., Tauler, P., Deudero, S., Pons, A., 2006. Enzymatic antioxidant response of a labrid fish (*Coris julis*) liver to environmental caulerpenyne. *Comparative Biochemistry and Physiology - Part C: Toxicology & Pharmacology* 144, 191-196.
- [24] Tejada, S., Sureda, A., Roca, C., Gamundí, A., Esteban, S., 2007. Antioxidant response and oxidative damage in brain cortex after high dose of pilocarpine. *Brain Research Bulletin* 71, 372-375.



## EFFECT OF TWO TYPES OF TOTAL MIXED RATION (TMR) ON VOLUNTARY FEED INTAKE AND CHEWING ACTIVITY IN BLACK BENGAL GOATS

Wantanee Polviset <sup>a,\*</sup>, Nattiya Prakobsaeng <sup>a</sup>, Uthai Koatdoke <sup>a</sup>, Pimwimon Mutalai <sup>a</sup>, Sutanyarat Prakobkam <sup>a</sup>, Nontarwat Parthumtao <sup>a</sup> and Surat Paungchan <sup>a</sup>

<sup>a</sup>*Program in Animal Science, Faculty of Agricultural Technology, Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000*

*\* Corresponding author. Tel.:006643725439; fax: 006643725439*

*E-mail address: polviset@hotmail.com*

### ABSTRACT

The comparison two types of total mixed ration (TMR), which used rice straw and fermented napier as the roughage sources in a paired T-Test, four female Black Bengal Goats per treatment. The animals were fed *ad libitum* a total mixed ration 40: 60 (roughage: concentrate). The total experimental period was 42 days (21 days per phase). The results of present experiment showed that crude protein (CP) contain were 16.30 and 16.70, total dry matter intake of TMR with fermented napier was 312.81g/head/day and TMR with rice straw was 290.63 g/head/day. ( $P>0.05$ ). Chewing activity in goats fed TMR with fermented napier was 54.91 times/bolus, and 58.14 times/bolus fed TMR with rice straw respectively ( $P>0.05$ ).

Overall, according to the findings of the present study, TMR with fermented napier could be used as a roughage source supplementation in ruminant diets because after fermentation the crude fiber was soft and NDF was lower than in rice straw that is the reason why chewing activity was lower and rate of passage in feed was faster pass to lower gut than feeding with rice straw.

**KEYWORDS:** Rice straw, Fermented Napier, Chewing activity, Black Bengal Goats

## INTRODUCTION

Nowadays, Goat is an important livestock animal in Thailand not only grow faster than beef cattle but meat of goat is healthier than beef also because of low fat and cholesterol [1]. Furthermore the goat has exported to Asean such as Vietman and Laos but the populations have not enough [2]. The strategy of Thai government promotes to the farmer, who want to have goat farm especially in the Northeast region. In addition, the quality feed and the practical feed are necessary for animal management, particularly in developing countries depend on fibrous feeds mostly crop residues and low quality of roughages [3]. However, the main to improve the quality feed in ruminant is Total mixed ration (TMR), that include of roughage and concentrate mixed together and the other supplementary nutrients as well in desired proportion capable to balance nutrient requirements of animals. However, the roughage quality influenced for having behavior ruminants. The roughage low cell wall content having easier to be chew than the roughage high cell wall content and total chewing was affected by forage type [4]. Furthermore, particle size and texture have effect of chewing duration ruminating according to [5] who reported that the ruminating behavior of goat influenced by diet. Our hypothesis that roughage types would affect feed intake and the chewing duration ruminating in goats.

## MATERIALS AND METHODS

### Animal and experimental design

Four female goats were included 1-2 years old with a body weight (BW) of  $13.00 \pm 3.2$  kg (mean $\pm$ SD). The animals were adapted to the experimental diets for 2 weeks before start collecting data. The goats were housed in individual pen (1.5 m<sup>2</sup>) with bamboo bedding. The dietary treatments were given at *ad libitum* level feeding, which two different of roughage sources as rice straw and fermented napier in total mixed raion (TMR). The two group of animals were received all treatments (Table 1), but in different period. In each period all of animals were fed the first treatment in 21 days and then swapped over to the second treatment in 21 days also with the same animals. The animals were fed at 07:00 and 16:00 h.

### The diets

The table 1 has shown the ingredients and chemical compositions of two dietary treatments consist of rice straw and fermented napier were used 40 percentage in TMR. The percentage of crude protein were 16.30 and 16.70, percentage of TDN were 58.30 and 67.70, percentage of NDF were 50.60 and 45.90 and percentage of ether extract were 1.70 and 1.40 respectively (by calculation). Normally, it was added limestone, which could be used a source of rumen buffering agent. Urea was used of non-protein nitrogen source (NPN) to compensate for the nitrogen deficiency in fibrous feed, and salt was used for sodium–potassium pumps in plasma membrane to get energy in the animals.

**Table 1** Feed ingredients and chemical composition of Total mixed ration (TMR)

Ingredients (KgDM)	T1	T2
Rice straw	40.0	-
Fermented Napier	-	40.0
Cassava chips	33.0	41.5
Soybean meal	20.5	12.0
Urea	2.0	2.0
Molass	3.0	3.0
Limestone	1.0	1.0
Premix	0.3	0.3
Salt	0.2	0.2
Total	100.0	100.0
Chemical composition, by calculation		
DM	12.5	28.9
CP	16.3	16.7
TDN	65.3	67.7
NDF	50.6	45.9
EE	1.7	1.4

T1= TMR (Rice straw as a roughage source)

T2= TMR (Fermented Napier as a roughage source)

DCP= Dicalcium Phosphate; CP= Crude protein; TDN= Total digestible nutrient

NDF= Neutral Detergent Fiber; EE= Ether extract

### Sample collection

1. The voluntary feed intake was recorded twice daily at 7:00 a.m. and 16:00 p.m. and the feed residue was recorded in the morning of the next day. The voluntary feed intake was calculated as the difference between total feed and feed residue per day in each animal.
2. The BW of the goats were measured on the first and the last days of each experimental period.
3. Recording the chewing per bolus activity for 5 days before finish each period.
4. Chewing activity (chewing/bolus) was estimated according to [6] for 3 days before finish in each period at 07:00 h and continued until 72 h.

### Statistical analysis

The value of voluntary feed intake and chewing activity were conducted as a paired t-test with two treatments. Analysis were analysed using the General Linear Model (GLM) procedures. [7]

## RESULTS AND DISCUSSION

### Results

#### Total DM intake and Chewing activity

All treatments were not different ( $P>0.05$ ) between T1 and T2 on total DM intake was 290.63 gDM/d and 312.81 gDM/d; in addition, Chewing activity (chewing/bolus) was 54.91 and 58.14. Initial weight was started  $13.00 \pm 3.2$  kg (mean $\pm$ SD), and Final weight was  $16.85 \pm 3.9$  kg (mean $\pm$ SD) respectively (Table 2).

**Table 2** Total dry matter intake (g/d), Body weight (kg) and Chewing activity in Black Bengal Goat

Item	T1	T2	P-value
Total DM intake g/d	290.63	312.81	0.54
Initial weight (kg)	$13.00 \pm 3.2$	$14.20 \pm 3.3$	-
Final weight (kg)	$14.20 \pm 3.3$	$16.85 \pm 3.9$	-
Chewing activity (chewing/bolus)	54.91	58.14	0.53

## DISCUSSION

### Total DM intake

Total DM intake was observed in this study was lower than [4] because of the different breeds, in this study was used female Black Bengal goat with a BW of  $13.00 \pm 3.2$  kg, but in another study was used Danish Landrace goats with a BW of  $45 \pm 5$  kg. Furthermore, the DM intake relative to BW [8] according to this experiment the BW of goats fed with fermented napier were higher than fed with rice straw.

### Chewing activity

Generally high chewing activity when fed with low-quality forage. Ruminants normally spend much more time ruminating than eating [9]. The ability of physical mastication to reduce poor-quality forage (high NDF) to be small particles was increased chewing activity [5] agreement with this results feeding TMR with rice straw was higher chewing activity than feeding TMR with fermented napier diets probably is ascribed to more NDF in TMR with rice straw (50.6%) than TMR with fermented napier (45.9%) agreed with [10] who reported bulk density in diet, ruminating and total chewing were increased linearly as NDF intake increased. and according to the duration of ruminating cycles appeared to increase when feeding with low-quality forage [4].

## CONCLUSIONS

Based on the present study, TMR with fermented napier could be use as a source for goat supplementation. Crude fiber in fermented napier was easier to chew than rice straw then the feed can pass to lower gut, and the goat could increase feed intake. It was suggested that the roughage source for goat could be used TMR with fermented napier in the goat feed containing with roughage: concentrate of 40: 60.

## ACKNOWLEDGEMENTS

Authors would like to express their most sincere gratitude and appreciation to Program in Animal Science Faculty of Agricultural and Technology Rajabhat Maha Sarakham University, Thailand, for their kind support on research facility.

## REFERENCES

- [1] Ozdal, G. (2013). Growth, slaughter and carcass characteristics of Alpine × Hair goat, Saanen × Hair goat and Hair goat male kids fed with concentrate in addition to grazing on rangeland. *Animal Nutrition*, 109 (2-3), 65-79.
- [2] Thairat. (2017). *The strategy to increase the goat for exporting to Vietnam - Laos market*. Available from: URL: <https://www.thairath.co.th/content/571103> 12 November 2017. (12 November 2017).
- [3] Elham, K., Morteza, C. and Tahereh, M. (2017). Effects of physical form of diet on nutrient digestibility, rumen fermentation, rumination, growth performance and protozoa population of finishing lambs. *Animal Nutrition*, 3 (2), 139-144.
- [4] Jalali, A.R., Nørgaard, P., Weisbjerg, M.R. and Nielsen, M.O. (2012). Effect of forage quality on intake, chewing activity, faecal particle size distribution, and digestibility of neutral detergent fibre in sheep, goats, and llamas, *Small Ruminant Research*, 103 (1-2), 143– 151.
- [5] Oshiro, S., Or-rashid, M., Shalla, W., Ryoji, O., Hirayama, T., Hirakawa, M. and Higoshi, H. (2000). Effects of fatty acids and acetone infusions on the ruminating behavior of goats. *Small Ruminant Research*, 35 (2), 117-122.
- [6] Schleisner, C., Norgaard, P. and Hansen, H.H. (1999). Discriminant analysis of patterns of jaw movement during rumination and eating in a cow. *Acta agriculturae Scandinavica. Section A, Animal science*, 49 (4), 251–259.
- [7] Statistical Analysis Systems. (1998). *SAS/STAT User's Guide*, Version 8.2. SAS Institute, Cary, NC, USA.
- [8] Martin, F., Bryant, F.C. (1989). Nutrition of domesticated South American llamas and alpacas. *Small Ruminant Research*, 2 (3), 191–216
- [9] Dulphy, J.P., Remond, B., Theriez, M. (1980). Ingestive behaviour and related activities in ruminants. In: Ruckebusch, Y., Thivend, P. (Eds.), *Digestive Physiology and Metabolism in Ruminants*. MTP Press Ltd., Lancaster, UK, pp. 103–122.
- [10] Beauchemin KA. (1991). Effects of dietary neutral detergent fiber concentration and alfalfa hay quality on chewing, rumen function, and milk production of dairy cows. *Journal of Dairy Science* 74 (9), 3140-3151.



## APPLICATION OF THE WAVELET TRANSFORM FOR ANALYSIS OF BANGKOK RAINFALL DATA

N. Juthasirorat<sup>1\*</sup>, K. Thongchan<sup>1</sup>, P. Anusasananan<sup>1</sup>, S. Suwanarat<sup>1</sup> and N. Thangprasert<sup>1</sup>

<sup>1</sup>*Department of Physics, Faculty of Science, Ramkhamhaeng University, Bangkok, Thailand 10240.  
Corresponding E-mail address: narinzg36@hotmail.com)*

### ABSTRACT

Everytime the heavy rain hit Bangkok, it will cause several problems in the area. Water will turn many streets of the city into canals and seriously worsened rush-hour traffic, causing many commuters to arrive late at works or schools. Thus, in this research we study the rainfall frequencies in Bangkok using wavelet analysis, i.e. the wavelet power spectrum, the global wavelet power spectrum, the scale-average wavelet power and the decomposition of the wavelet. The wavelet power spectrum shows a strong one-year oscillation clearly with the 95% confidential level. This frequency is connected with natural seasonal effects since the rain in Bangkok is under the influence of southwest monsoon and northeast monsoon that have a seasonal character. The low-frequency fluctuations from 2 to 8 months band is observed occasionally in the years 1958, 1960, 1966, 1973, 1988, 1990, 1994 and 2000 with less power. These oscillations are confirmed by the global wavelet power spectrum. Knowledge of rainfall information will help the government in better prepared to cope with the water that comes regularly in the rainy season and caused the problem every year in Bangkok.

**KEYWORDS:** Wavelet transform, Rainfall data, Non-stationary, Flooding, Oscillation, Power spectrum.

## INTRODUCTION

The wavelet transform has been developed and widely used as a time-frequency tool [1-5]. It is able to detect variations of power within the non-stationary data that contain information at different time scales. Many studies using wavelet analysis have been carried out. Among these studies are intra-decadal changes in Enso monsoon system [6], intra-seasonal oscillations in wind speed and oceanic wave [7], the relationships between wind speed and temperature [8], power density of surface wind speed [9] and temperature and global warming [10-16].

Mathematically wavelet is a function with a zero average which can be defined as following:

$$\int_{-\infty}^{\infty} \psi(t) dt = 0$$

The mother wavelet is scaled (or dilated) by a factor of  $a$  and translated (or shifted) by a factor of  $b$  to give (under Morlet's original formulation) [17]:

$$\psi_{a,b}(t) = \frac{1}{\sqrt{a}} \psi\left(\frac{t-b}{a}\right)$$

Where  $a$  and  $b$  are scale and translational position parameters respectively while wavelet transform is the convolution of function  $f(t)$  and the conjugate complex of  $\psi(t)$  which it can be called as daughter wavelet.

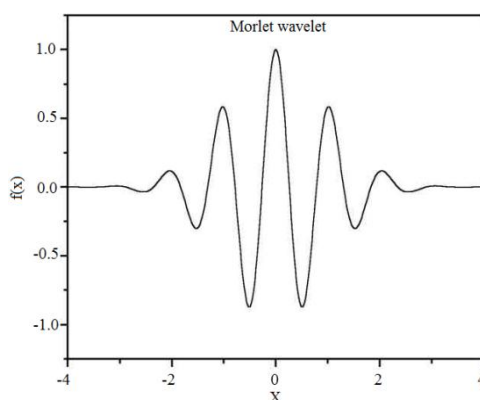


Figure 1. Morlet wavelet is a wavelet composed of a complex exponential (carrier) multiplied by a Gaussian window (envelope).

There are many types of wavelet to be chosen as mother wavelet from wavelet families such as Harr wavelet, Morlet wavelet, Mexican hat wavelet, Paul wavelet or Meyer wavelet depending on the characteristic of the time series we wanted to examine. In our study we choose Morlet wavelet as mother wavelet since its shape is closed to our rainfall data. Morlet wavelet is defined as the product of Gaussian envelope and an exponential function,

$$\psi(\eta) = \eta^{-1/4} e^{i\omega_0 \eta} e^{-\eta^2/2}$$

where  $\psi(\eta)$  is the wavelet function depended on a non-dimensional parameter time  $\eta$  and the dimensionless frequency  $\omega_0$  which should be 6 in order to satisfy the admissible condition (i.e. the function must have zero mean and be localize in both time and frequency space to be admissible as a wavelet). Moreover the Morlet wavelet transform method is applied to music transcription. It produces very accurate results that were not possible using Fourier transform techniques. In music the Morlet wavelet transform is capable of capturing short bursts of repeating and alternating music notes with a clear start and end time for each notes. Wavelet transform is defined for given scales as:

$$w(s) = \sqrt{\frac{\delta t}{s}} \sum_{n'=0}^N x_{n'} \psi_0 \left[ (n' - n) \frac{\delta t}{s} \right]$$

Where  $(\delta t/s)^{1/2}$  is the normalization faction,  $\psi_0(\eta)$  is the mother function that should satisfy the following wavelet admissibility condition:

$$\int_{-\infty}^{\infty} \frac{|\psi_0(w)|^2}{|w|^2} dw < \infty$$

Where  $\psi(w)$  is the Fourier transform of  $\psi_0(\eta)$  [18].

## MATERIALS AND METHODS

The daily and monthly rainfall data used in this study were taken from the meteorological station at Donmaung international airport, Bangkok, Thailand and the World Bank Organization, respectively. Bangkok, the capital city of Thailand, is located at 13.75 latitude and 100.50 longitude and it is situated at the elevation 1.5 meters above sea level. Bangkok has an estimated population of 8 million making it the biggest city in Thailand. The city occupies 1,568.7 square kilometers in the Chao Phraya river.



Figure 2. Map of Bangkok, Thailand.

The amount of rainfall are collected and recorded every day from the period of 1951 to 2010, the total of more than 20,000 data points have been analyzed. In this wavelet analysis of rainfall signals, the time series of the signal level variation is mapped into a set of wavelets pertaining to different scales and time instants using the Morlet function. The actual computation of the wavelet transform (FT) using Python programming language was done by the following algorithm: (1) choose Morlet wavelet as a mother wavelet ; (2) find the FT of the motherwavelet ; (3) find the FT of the rainfall time series ; (4) choose a minimum scale  $s_0$  and all other scales as above ; (5) for each scale do : (a) compute the daughter wavelet at that scale using

$\psi(sw_k) = (2\pi s / \delta t)^{1/2} \hat{\psi}_0(sw_k)$  where  $\hat{\cdot}$  indicates the FT. (b) Normalize the daughter wavelet by dividing by the square-root of the total wavelet variance. (c) Multiply by the FT of our rainfall time series. (d) Inverse transform back to real space using  $w_n(s) = \sum_{k=0}^{N-1} \hat{x}_k \hat{\psi}(sw_k) e^{i w_k \eta \delta t}$  where  $w_k$  is the angular frequency, equal to  $2\pi k / N \delta t$  for  $k \leq N/2$  or equal to  $-2\pi k / N \delta t$  for  $k > N/2$  and (6) finally make a contour plot.

To decompose the rainfall data, the Mallat's algorithm is used according to the following equation

$$w_{m,n} = 2^{-m/2} \sum_{i=0}^{N-1} x_i \psi(2^{-m} \tau n) \text{ where } w_{m,n} \text{ is wavelet coefficient for the discrete wavelet (DWT) of scale } s =$$

$2^m$  and location  $\tau = 2^m n$  [18]. The process includes some successive filtering steps. Firstly, the signal is decomposed into an approximation and accompanied detail, and then the iteration algorithm with approximation is decomposed in turn, so that the signal is divided into many lower resolution components.

## RESULTS

The raw data of the total daily rainfall at Bangkok from 1951 to 2010 is shown in figure 3 (a). The amounts of heavy daily rain are (a) 207.7 mm (on 07/04/1990), (b) 210.7 mm (on 05/11/1998), (c) 148.4 mm (on 06/09/1972), (d) 129.5 mm (on 28/09/1980), (e) 122.2 mm (on 09/12/1985), and (f) 132.9 mm (on 01/10/1957). Insight into this figure does not give much information about rainfall potential to help in predicting the future amount of rainfall. There are much longer fluctuations superimposed on this signal. To separate this signal we will compute statistics such as the mean or variance for different time periods and observe if they are significantly different. In figure 3 (b) we have plotted a time series of the average variance in a 2-8 day band. Now we can see a one year periodic very clearly. The dry period appears in the first half of the year, while the wet period is in the second half.

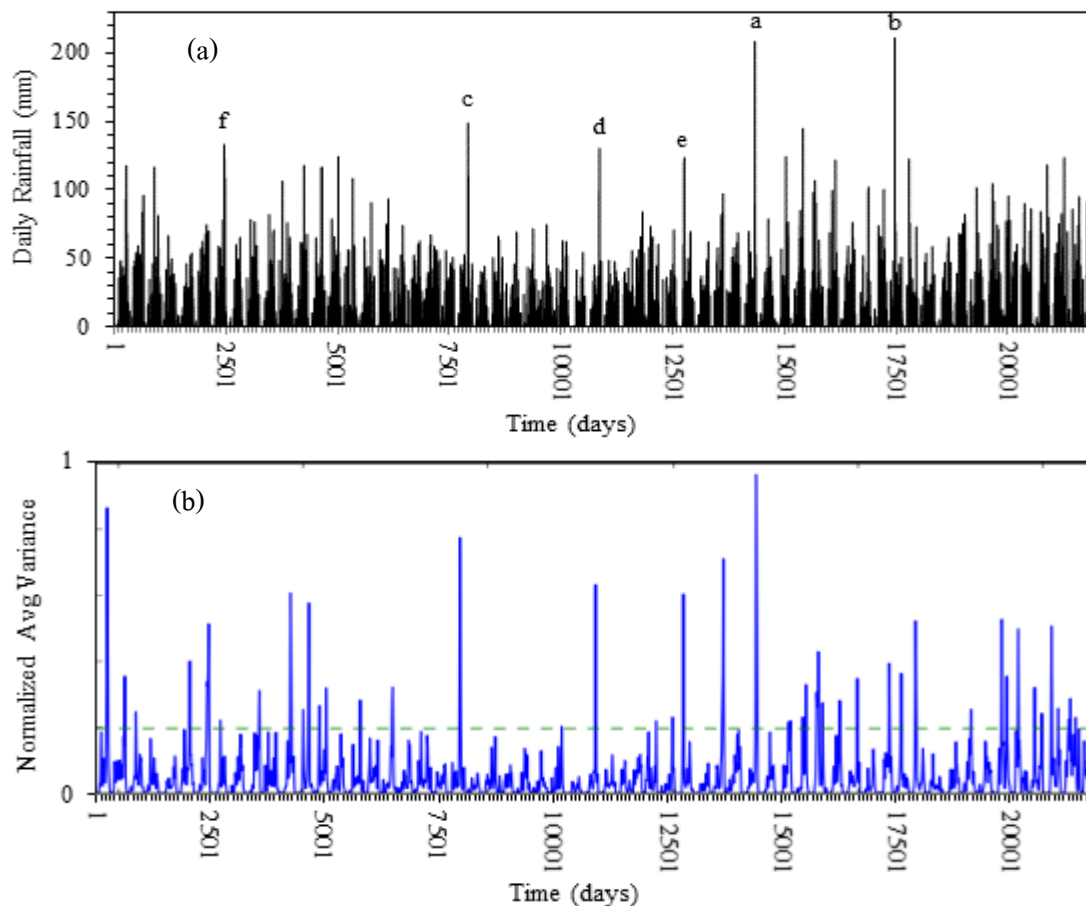


Figure 3 (a) The daily rainfall in Bangkok from 1951 to 2010. (b) The average variance in 2-8 day band of the rainfall time series. The yearly periodic can be clearly observed.

We study the amount of rainfall in one year period in detail by calculating the average of rainfall in each month over the period of 105 years from 1901 to 2015 (the total of 12 averaged months) as shown in figure 4. We can clearly observe that the dry period begins from January, February, March to April that not much rain during these months. Then it is more rain in May and July since some tropical cyclones often develop at the Northwestern Pacific bringing the rain to Bangkok. The wet period start from August until October since some tropical cyclones from South China sea bring a very heavy rain to Thailand. Almost every years The maximum rainfall in Bangkok occurred on September with the averaged amount of 227.6 mm.

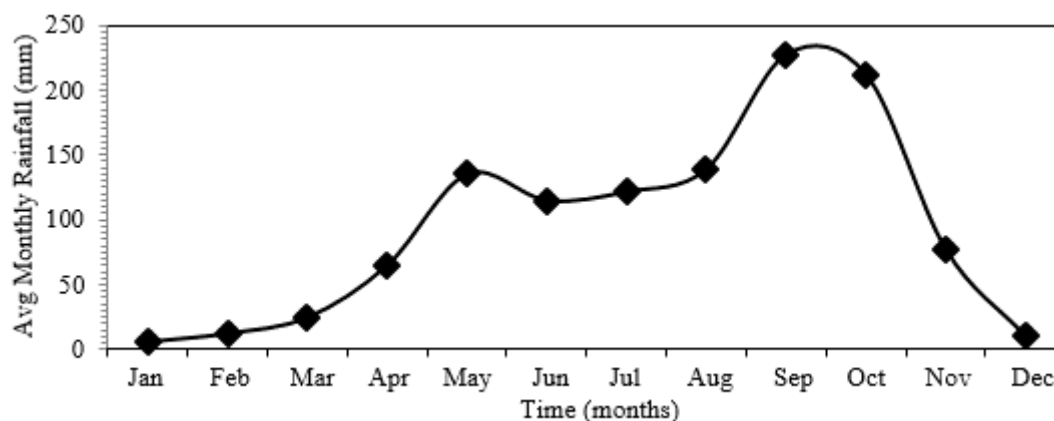


Figure 4. Averaged monthly rainfall over period from 1901 to 2015.  
Data provided by the World Bank Organization.

To observe the variation of rainfall over period of years, we calculate the total rainfall per year as shown in figure 5. In this 60 year period, the heavy rainfall occurred in the year 1972 (2382 mm), 1986 (2277 mm) and 1998 (2383 mm). The wet period occurred from the years 1980 to 1988 and from 1990 to 2001. The dry period from the years 1959 to 1969 and 1974 to 1982. The fewest rainfall is 586.4 mm. in the year 1979.

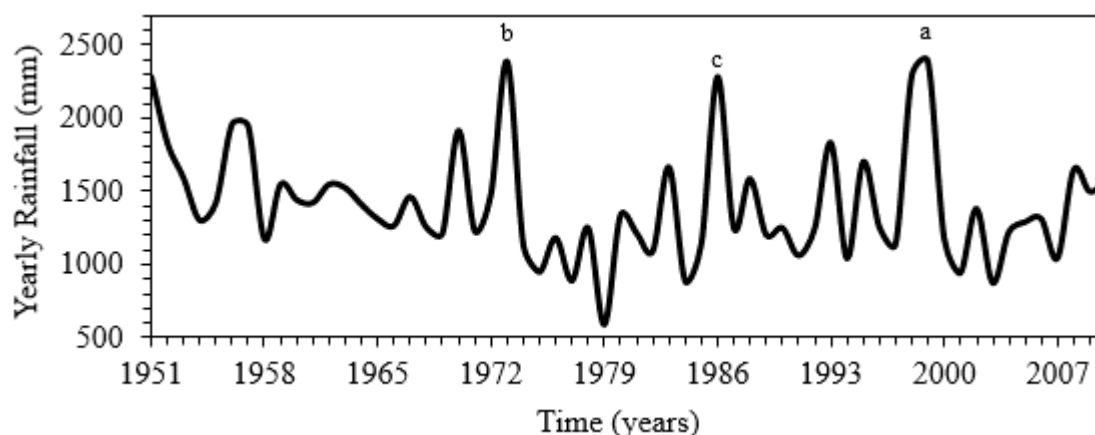


Figure 5. The total rainfall per year. The fewest rainfall is 586.4 mm. in year 1979.

#### Trend analysis of wavelet components

Wavelet analysis can detect the overall trend of a signal. The original signal (S) in figure 6 contains several noises that its overall shape is not apparent upon visual inspection. We used Mallat's algorithm to decompose the signal into 8 levels. This approach provides several information i.e. detection of discontinuous and breakdown points, detection of self-similarity, identifications of pure frequency and detection of long term trend. From figure 6 we can observed that the trend becomes more and more clearly with each approximations. The trend represents the slowest part of the signal. As the scale increases, the resolution decreases, producing better estimate of the unknown trends. Figure 6 presents the time series of 8 components which include 2 month mode (D1), 4 month mode (D2), 8 month mode (D3), 16 month mode (D4), 32 month mode (D5), 64 month mode (D6), 128 month mode (D7), 256 month mode (D8) and the approximation for standardized rainfall data series. The D transform coefficients elaborate rainfall variations and scale at different periods of the whole long-term data set. For example, in D3, we can observe the dry period between 1974 and 1983. We can also think about this approximation as successive calculation of several steps in the average. The time series of D3 8 month mode and D4 14 month mode are the closest to the average yearly rainfall..

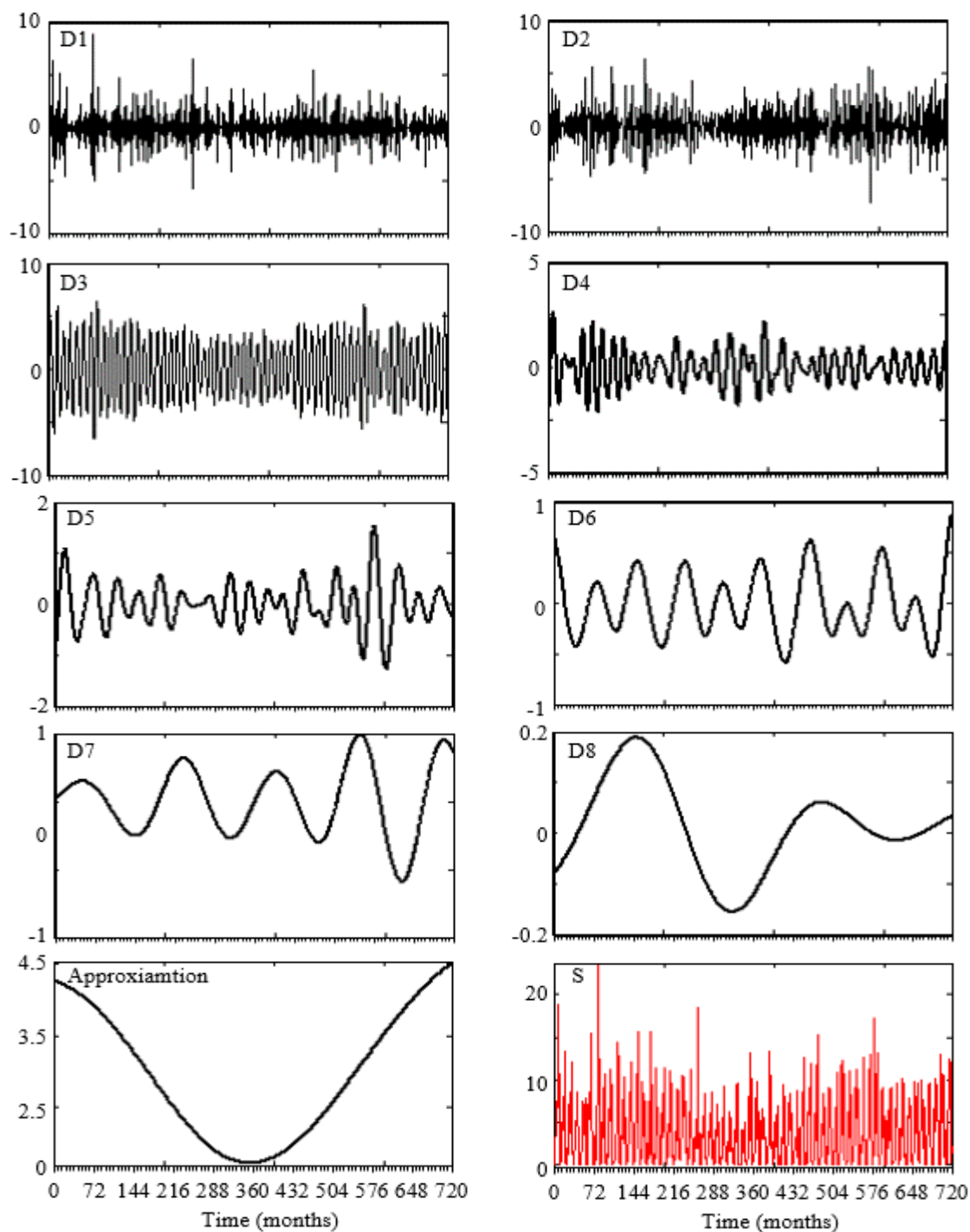


Figure 6. Decomposition of the monthly rainfall time series (D1) 2 month mode, (D2) 4 month mode, (D3) 8 month mode, (D4) 16 month mode, (D5) 32 month mode, (D6) 64 month mode, (D7) 128 month mode, (D8) 256 month mode, and approximation. The original signal  $S = A + D1 + D2 + D3 + D4 + D5 + D6 + D7 + D8$ .



### Wavelet power spectrum

Total daily rainfall, monthly rainfall and yearly rainfall are used for the analysis. The parameters for the daily rainfall wavelet analysis are set as the time interval  $\delta t = 1$  day, the start scale  $S_0 = 2$  days, the scale width  $\delta i = 0.25$ , which will do 4 sub-octaves per octave. For the monthly rainfall,  $\delta t = 1$  month, the start scale  $S_0 = 2$  months, the scale width  $\delta i = 0.25$  and for the yearly rainfall,  $\delta t = 1$  year, the start scale  $S_0 = 2$  years and  $\delta i = 0.2$ . The wavelet power spectrum for daily rainfall fluctuation in Bangkok from years 1951 to 2010 has been presented in figure 7 (a). The x-axis represented time in days and y-axis represented power (absolute value)<sup>2</sup>. In this figure some more low frequency components are presented although it is not clear in the daily rainfall data. The wavelet power spectrum for monthly rainfall fluctuation in Bangkok in this 60 year period has been presented in figure 7 (b). The x-axis represented time in months. We also observed the annual frequency from 1951 to 1973, and from 1987 to 2010 with power reduction from 1974 to 1984. We can also observe low frequency fluctuations from 2 to 8 month band clearly. The low frequencies can be observed in the year 1958, 1960, 1966, 1973, 1988, 1990, 1994 and 2000 with less power than the annual cycle. To study the period more than one year, we plotted the power for yearly rainfall fluctuation as shown in figure 7 (c). The 4-7 year band can be observed in the year 1953 to 1958 with less power from 1983 to 2006.

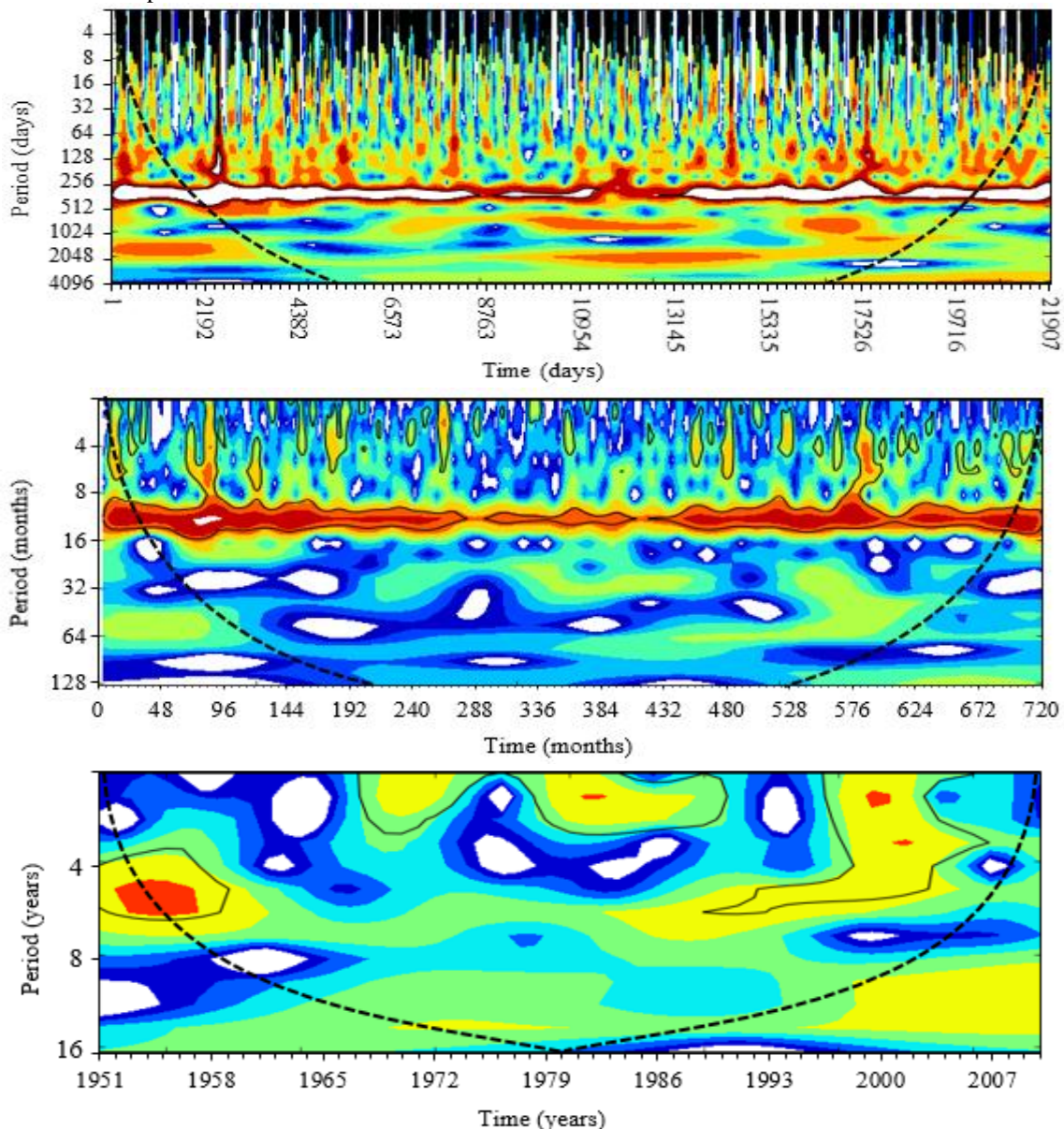


Figure 7. The wavelet power spectrum using Morlet mother wavelet.

The dash line is the cone of influence using a white-noise background spectrum.

### Global wavelet power spectrum

The global wavelet power spectrum of daily and monthly rainfall time series is shown in figure 8 (a). It is obtained by the time-average of power over time and used to confirm the main component frequencies of the time series. The annual frequency, periodicity at 8-16 month band of this rainfall time series is confirmed by an integration of power over time with shows only one significant peak above the 95% confidence level for the global wavelet spectrum, assuming white-noise represented by the dashed line. Figure 8 (a) also presents the significant low frequency peak centered in the 2 to 8 months band. In figure 8 (b), the longer frequencies between 4 and 8 years band is presented one significant peak although the power in wavelet spectrum is low.

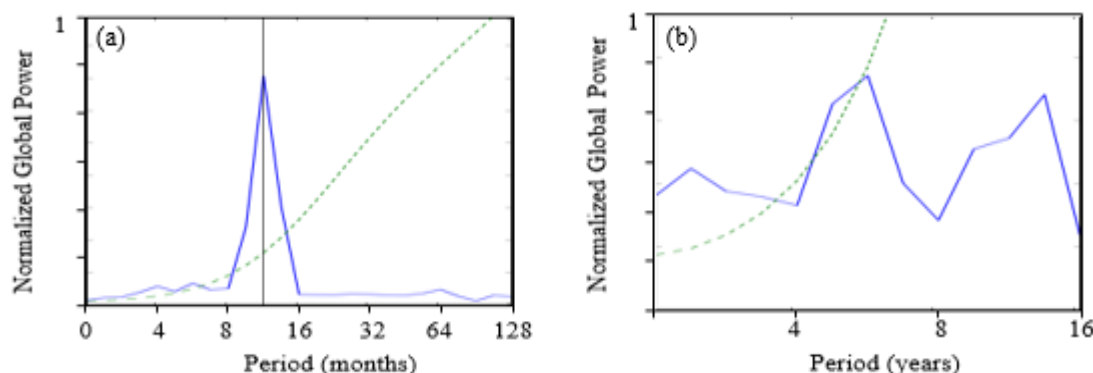


Figure 8. Global wavelet power spectrum

### Scale-average time series

The scale-average wavelet powers as shown in figure 9 are the time series that gives a measure of the average variance versus time in a certain band. In our case, we use 2-8 month band, 8-16 month band and 36-84 month band to examine the modulation of one time series by another, or the modulation of one frequency by another within the same time series since these three bands are observed from the wavelet power spectrum (figure 7) and the global wavelet power spectrum (figure 8).



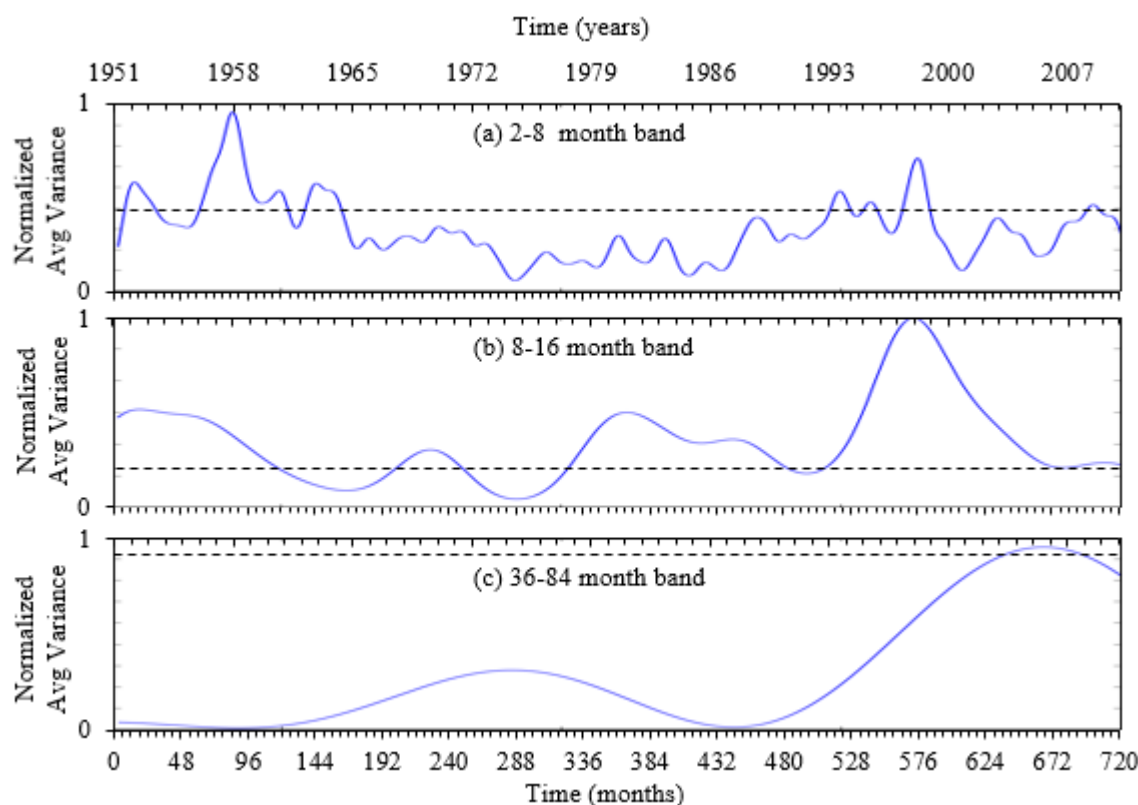


Figure 9. Scale average monthly rainfall time series.

These figures are made by the average of figure 7 over all scales between 2-8 months, 8-16 months and 36-84 months, which gives a measure of the average a few month variance (figure 9 (a) ), one year variance (figure 9 (b) ) and several years variance (figure 9 (c) ) versus time. The distribution in time of the averaged variance of the signal can show which events are responsible for the peaks revealed in the wavelet power spectrum and global wavelet power spectrum. For the 2-8 month band, the important peaks in the scale-average time series can be identified for years 1951 to 1965 and years 1993 to 2000 clearly indicating a period wetter than another years. For the 8-16 month band (annual), the variance plot shows the dry years at 1966 and 1975 indicated the strong annual oscillation almost all the entire 60 year period. For the 36-84 month band (biennial band), only one important peak at 2006 with a little more than 95% confidence level. This peak may be connected with the ENSO cycle.

## CONCLUSIONS AND DISCUSSION

We have applied the wavelet transform to the daily, monthly and yearly rainfall data recorded at the station in Bangkok over the period of 60 year from the years 1951 to 2010. The wavelet power spectra revealed the existence of three significant oscillations in the 2-8 month band, 8-16 month band and 36-84 month band as confirmed by the global wavelet power spectrum. Rain in Bangkok is under the influence of southwest monsoon and northeast monsoon. The southwest monsoon which starts in May brings rain from the Indian Ocean causing abundant of rain over Bangkok. Rainfall during this period is not only caused by the southwest monsoon but also by the Tropical Convergence Zone (ITCZ) and tropical cyclones which produce a large amount of rainfall. These situations are responsible for low oscillation (2-8 month band) in the wavelet power spectrum. In August the ITCZ will lie over the Northern and Northeastern parts of Thailand and moving down over Bangkok in September brings the heavy rain to the area. September is the wettest month in Bangkok. These two monsoon system have a seasonal character causing the strong one year oscillation (8-16 month band) in the wavelet power spectrum. The scale-average time series shows the wet and dry periods during these 60 years. Bangkok pulls on average 1500 mm of rainfall per year. On the average there are 80 days per year with more than 70 mm of rainfall. Nowadays Bangkok still flood every time the heavy rain hit the city. The government must better prepare for the flood water. This study shows very strong fluctuation in one year period. The first come of rainy season is on May and the last until November. The best time to prepare for flooding water is February, March and April by maintain the drainage

system to make sure that it can work properly and also better prepared all water pumps that use to decrease the water levels in the canals. Better prediction and better preparation before the raining season will help the government to solve the flooding problem in Bangkok.

### ACKNOWLEDGEMENTS

The authors are grateful to Thai Meteorological Department and World Bank Organization for the rainfall data, to Department of Physics, Faculty of Science, Ramkhamhaeng University, Bangkok, Thailand for the support.

### REFERENCES

- [1] Grinsted, A., Moore, J. C. and Jevrejeva, S. (2004). Application of the Cross Wavelet Transform and Wavelet Coherence to Geophysical Time Series, *Nonlinear Processes in Geophysics*, 11, 561-566.
- [2] Farge, M. (1992). Wavelet Transforms and their Applications to Turbulence. *Annu. Rev. Fluid Mech.*, 24, 395-457.
- [3] Ronald RC. (1975). Meteor Wind Measurement at Durham, New Hampshire (43°N, 71°W), *J. of the Atmospheric Sciences*, 32, 1689-93.
- [4] Santos, C. A. G., Galvão, C. O., Suzuki, K. & Trigo, R. M. (2002). Application of Wavelet Analysis to Hydrological regionalization in transboundary basins, *First International Symposium on Transboundary Waters Management*, pp. 479-486.
- [5] Smith, L. C., Turcotte, D. L. & Isacks, B. L. (1998) Stream Flow Characterization and Feature Detection Using a Discrete Wavelet Transform, *Hydrol. Processes*, 12, 233-249.
- [6] Torrence, C. and Compo, G. P. (1998). A Practical Guide to Wavelet Analysis, *Bull. Am. Met. Soc.*, 79 (1), 61-78.
- [7] Hwang HK. (1970). Power Density of Surface Wind Speed on Palmyra Island, *Monthly Weather Review*, 98 (1), 70-74.
- [8] Thangprasert, N. and Suwanarat S. (2017). The Relationships between Wind Speed and Temperature Time Series in Bangkok, Thailand, *J. Phys.: Conf. Ser.* 901 012043, 1-4.
- [9] Lee BB, Wu LC, Kao CC. (2007). Seasonal variations of wind and wave over Taiwan waters. *Marine Geophysical Researches*, 28, 183-90.
- [10] Balina, S. P. Frick, Sokoloff D. & Soon W. (1997). Time Scales and Trends in the Central England Temperature Data (1659-1990), *A Wavelet Analysis Geographical Res. Lett.*, 24, 1351-1354.
- [11] Collinean, S. (1994). Some Remarks About the Scalograms of Wavelets and Their Application, *Kluwer Academic Publishers*, 325-329.
- [12] Geogiou, E. F. & Kumar P. (Eds) (1994). *Wavelets in Geophysics*, Academic Press, Sandiago.
- [13] Mak, M. (1995). Orthogonal Wavelet Analysis: Inter-annual Variability in the Sea Surface Temperature, *Bull. Amer. Meteorological Soc.*, 76, 2179-2186.
- [14] Percival, D. B. & Walden A. T. (2000). *Wavelet Methods for Time Series Analysis*, Cambridge University Press.
- [15] Shimomai, T., Yamanaka M. D. & Fukao S. (1996). Application of Wavelet analysis to wind Disturbances Observed with MST Radar Techniques, *J. Atmospheric and Terrestrial Physics*, 5-8, 683-685.
- [16] Yamada, M. & Sasaki F. (1998). *Wavelet Analysis of Atmospheric Wind, Turbulent Fluid and Seismic Acceleration Data*, in M. Kibushi, Ed, Wavelet and Their Application, Case Studies, SIAM, Philadelphia.
- [17] Grossman, A. & Morlet, J. (1984). Decomposition of Hardy functions into square integrable wavelet of constant shape, *SIAM J. Math. Anal.*, 15, 723-736.
- [18] Daubechies, I. (1992). *Ten Lectures on Wavelets CBMS-NSF*, Regional Conference Series in Applied Mathematics, SIAM, Philadelphia U. S. A.

## THE DEVELOPMENT OF MULTIMEDIA IN THE VIRTUAL REALITY TECHNOLOGY TO PROMOTE ATTRACTIONS IN MAHA SARAKHAM PROVINCE

Natthapong Pralabraksa

*Department of Technology Multimedia and Animation, Faculty of Information Technology,  
Rajabhat Maha Sarakham University, Maha Sarakham, 44000, Thailand  
Corresponding e-mail:natthapong.pr@rmu.ac.th)*

### ABSTRACT

The purposes of the development of multimedia in the virtual reality technology (VR) to promote attractions in Maha Sarakham province research are to 1) study the characteristic and the requirement of the public as well as the multimedia production to promote Maha Sarakham province by using virtual reality technology (VR) 2) development the VR for promote Maha Sarakham province 3) publication the VR for promote Maha Sarakham province. The landmark in Maha Sarakham province that were sampled to production in this study were Phrathat Nadun, Ku San Tarat, Ku Ban Khwao and Praput MongKol. The operations of multimedia production to promote Maha Sarakham province by using VR was divided into 4 stages: characteristic analysis, footage and editing, published and evaluate. The instruments of this study are VR to promote attractions in Maha Sarakham province and a quality assessment from 3 specialists. The statistically analysis of the data consisted of means (X) and standard deviation (S.D). From the study were observed

1. The four multimedia in the VR for promote Maha Sarakham province at 1) Phrathat Nadun 2) Ku San Tarat 3) Ku Ban Khwao and 4) Praput MongKol were obtained.

2. The quality of multimedia to publication must be evaluated from three specialists, that the opinion of sample toward the VR showed in the high level, mean was 4.28, standard deviation was 0.60 for Phrathat Nadun and mean was 4.17, standard deviation was 0.61 for Ku San Tarat, and in highest level that mean was 4.54, standard deviation was 0.39 for Ku Ban Khwao and mean was 4.56, standard deviation was 0.36 for Praput MongKol. From this study suggesting that VR have a high-quality multimedia that is one attractive way to public relations the tourist attractions.

**KEYWORDS:** Maha Sarakham province, Touriste attraction, Virtual reality technology (VR)

## INTRODUCTION

The Maha Sarakham province also houses a sacred Buddha image and has many historical sites, with the province being the former site of the ancient Dvaravati city of Nakhon Champa Si.[1]



VR is one attractive way to public relations the tourist attractions. This research we focus on the production process of multimedia to promote Maha Sarakham province with community participation by using virtual reality technology (VR). [2-3]

## OBJECTIVE

- 1) Study the characteristic and the requirement of the public as well as the multimedia production to promote Maha Sarakham province by using virtual reality technology (VR)
- 2) Development the VR for promote Maha Sarakham province
- 3) Publication the VR for promote Maha Sarakham province.

## MATERIALS AND METHODS

The steps are as follows.

1. Characteristic analysis about the requirement of the multimedia production to promote Maha Sarakham province with community participation through electronic media.
2. Footage and editing the multimedia in the virtual reality technology (VR) to promote attractions in Maha Sarakham province that the samples at 1) Phrathat Nadun 2) Ku San Tarat 3) Ku Ban Khwao and 4) Praput MongKol.
3. Evaluation the quality by 3 specialists
- 4 Publication the virtual reality technology (VR) to promote attractions in Maha Sarakham province.
5. Summarizes the experimental results.

## RESULTS

1. Characteristic analysis about the requirement.  
Analysis the virtual reality multimedia for promotes (1) Phrathat Nadun, (2) Ku San Tarat, (3) Ku Ban Khwao and (4) Praput MongKol. From the study of public relations and multimedia for promotes tourist attraction, the most of it explain
  - 1.1 The history and story of place.
  - 1.2 The specific characteristics of the location
  - 1.3 The daily life of the residents
  - 1.4 Routes and itinerary
2. Footage and editing the virtual reality multimedia for promote Phrathat Nadun, Ku San Tarat, Ku Ban Khwao and Praput MongKol.  
Preparation the footage and editing for the virtual reality multimedia of Phrathat Nadun, Ku San Tarat, Ku Ban Khwao and Praput MongKol as follows:
  - 2.1 Phrathat Nadun





2.2 Ku San Tarat



2.3 Ku Ban Khwao



2.4 Praput MongKol



The virtual reality multimedia for promotes Phrathat Nadun, Ku San Tarat, Ku Ban Khwao and Praput MongKol were successfully prepared. The virtual reality multimedia was publicized in facebook application and youtube channel from below links.





3. The satisfaction of people who watching the virtual reality multimedia  
After sample watch the virtual reality multimedia (VR) the results show as Table 1

**Table 1** showed the Mean and S.D. of quality of virtual reality multimedia for Phrathat Nadun, Ku San Tarat, Ku Ban Khwao and Praput MongKol (n=3)

Item	Phrathat Nadun			Ku San Tarat			Ku Ban Khwao			Praput MongKol		
	$\bar{X}$	S.D.	level	$\bar{X}$	S.D.	level	$\bar{X}$	S.D.	level	$\bar{X}$	S.D.	level
1. Concepts.	4.40	0.70	High	4.30	0.60	High	4.40	0.70	High	4.30	0.60	High
2. The appropriateness of explaining the knowledge	4.30	0.60	High	4.20	0.60	High	4.30	0.60	High	4.20	0.60	High
3. The appropriateness of the picture in the presentation of the content	4.30	0.50	High	4.20	0.40	High	4.62	0.28	Highest	4.82	0.28	Highest
4 The consistency of the image with the content	4.30	0.50	High	4.40	0.60	High	4.84	0.24	Highest	4.30	0.24	Highest
5. The appropriateness of the narrative	4.50	0.60	High	4.20	0.60	High	4.36	0.44	Highest	4.86	0.34	Highest
6. he consistency of the picture with the narrative	4.20	0.70	High	4.00	0.60	High	4.87	0.34	Highest	4.87	0.34	Highest
7. Sound quality.	4.00	0.40	High	4.00	0.70	High	4.62	0.44	Highest	4.40	0.34	Highest
8. The suitability of the letter	4.40	0.80	High	4.40	0.70	High	4.40	0.32	High	4.83	0.32	Highest
9. The appropriateness of the sequence	4.00	0.40	High	4.00	0.60	High	4.40	0.24	High	4.30	0.24	High
10. Multimedia can be published	4.40	0.80	High	4.00	0.70	High	4.63	0.32	Highest	4.83	0.32	Highest
<b>Average</b>	<b>4.28</b>	<b>0.60</b>	<b>High</b>	<b>4.17</b>	<b>0.61</b>	<b>High</b>	<b>4.54</b>	<b>0.39</b>	<b>Highest</b>	<b>4.56</b>	<b>0.36</b>	<b>Highest</b>

The specialists who watching were satisfied the virtual reality multimedia as a whole at a high level for Phrathat Nadun and Ku San Tarat and at a highest level for Ku Ban Khwao and Praput MongKol. This observation indicating the multimedia was high quality that can be used to promote Phrathat Nadun, Ku San Tarat, Ku Ban Khwao and Praput MongKol.

## CONCLUSIONS AND DISCUSSION

The virtual reality multimedia for promotes Maha Sarakham province were successfully prepared. The 3 specialists who expert in the technical and content toward the virtual reality multimedia were satisfied at high level mean = 4.28, standard deviation = 0.60 for Phrathat Nadun and mean = 4.17, standard deviation = 0.61 for Ku San Tarat and at highest level that mean = 4.54, standard deviation = 0.39 for promote Ku Ban Khwao and

mean = 4.56, standard deviation = 0.36 for Praput MongKol. From this study suggesting that virtual reality multimedia (VR) is suitable to promote Maha Sarakham province.

#### ACKNOWLEDGEMENTS

This research was supported by the research and development institute, Rajabhat Maha Sarakham University and thank you for the Faculty of Information Technology, Rajabhat Maha Sarakham University.

#### REFERENCES

- [1] Springer, S.L., Gadh, R. (1996). State-of-the-art virtual reality hardware for computer-aided design. *Journal of Intelligent Manufacturing*, 7 (6), 12.
- [2] Feng, Y., Jun-feng, Z., Yousen, Z., Ji-chun, Z., Cuiping, T. Ru-peng, L. (2010). The Research and Application of Virtual Reality (VR) Technology in Agriculture Science. *Virtual Reality (VR) Technology in Agriculture Science*, 317, 546.
- [3] Kaufmann H. & Schmalstieg D. (2003). Mathematics and geometry education with collaborative augmented reality. *Computers and Graphics*, 27 (3), 7.
- [4] Surakiat Achananuparp. (2010). *General Treatment Textbook 1*. Second Edition. Bangkok: Moh ChaoBan Publishing.

**EFFECT OF SUPPLEMENTATING NEPIER GRASS (*PENNISETUM PURPUREUM*), PANGOLA GRASS (*DIGITARIA ERIANTHA*), AND WATER HYACINTH (*EICHHORNIA CRASSIPES*) WITH PELLETED FEED ON GROWTH PERFORMANCE AND FEED COST OF TURKEY**

Nattiya Prakobsaeng\*, Nuchsa Boontep, Thanwa Thumala, Wutthiphat Phinyosak and  
Wantanee Polwiset

Program in Animal Science, Faculty of Agricultural Technology, Rajabhat Maha Sarakham  
University, Maha Sarakham, Thailand 44000

Correspondence, e-mail : nattiya06@hotmail.com, Fax +6643-725-439)

**ABSTRACT**

The objective of this study was to investigate the effect of supplementating fresh nepier grass, pangola grass, and water hyacinth with commercial pelleted feed on growth performance and feed cost of turkeys. Thirty-six crossbred turkeys (American bronze x Beltsville small white), 4 weeks old were randomly distributed in cages according to a completely randomized experimental design. The turkeys were divided into 4 treatments with 3 replications, 3 birds each. Birds were fed 100% commercial pelleted feed for treatment 1 (T1) and 75% commercial pelleted feed supplemented with 25% fresh chopped nepier grass, pangola grass, and water hyacinth for treatment 2 (T2), 3 (T3) and 4 (T4), respectively. Feed intake (FI) and body weight were recorded weekly for 7 weeks. The results indicated that average FI was the highest in T1 (78.19 g/b/d) following by T3, T2 and T4 ( $P < 0.01$ ). Average daily gain, feed conversion ratio (FCR), and feed cost per kilogram weight gain (FC) of all treatment groups were not significant difference ( $P > 0.05$ ). T4 tended to have lower FCR (4.51;  $P > 0.05$ ), whereas T2 tended to have lower FC (65.24 baht/kg;  $P > 0.05$ ). In conclusion, nepier grass, pangola grass, and water hyacinth can be used as feed supplementation of turkey diets, which not affect on their growth performance.

**KEYWORDS :** Growth performance, Nepier grass, Pangola grass, Turkey, Water hyacinth



## INTRODUCTION

At present, livestock farmers face an increasing cost of production since the cost of animal feed is increased, whilst agricultural products are sold at low prices. This makes some farmers interested in alternative economic animal production which is easy to rise, resistant to disease, and can adapt to local food sources.

Turkey is the domesticated animal that is reared primarily for meat especially in America and European countries due to high quality of meat, high protein, and low cholesterol. Turkey is a menu mainstay for Christmas feasts for all nationalities. Turkey meat can also be cooked as many menu as chicken [1] and can meet the market's demand especially in high end consumer or niche market.

Global turkey meat production is about 5.7 million tons/year and over 60% is produced in North America [2]. In the United States, Minnesota is the top turkey producing state which farmers raise 45 million turkeys a year followed by North Carolina, Arkansas, Indiana, and Missouri [3]. In Thailand, pork and poultry are the two most widely consumed meat products. Chicken contributed approximately 97% of the total flock, while other poultry meat, such as duck, turkey, and goose are rarely raised locally for consumption [4]. The department of livestock development reported that the most number of turkeys in Thailand found in the northeastern region, which farmers about 3,500 households raise more than 39,000 turkeys [5]. In particular, Maha Sarakham province has been widespread support for turkey production.

Since, Thailand has an embargo on raw turkey being imported [1]. Turkey meat that is consumed in the country is from smallholder farmer production. Normally, in Thailand, farmer raises the turkey in backyard like native Thai chicken because it can eat a variety of foods, such as grass, banana, hyacinth, and vegetable waste [6]. Most of the farmers are mainly fed the turkey with concentrate feed and then supplemented with local feedstuffs. The most commonly used feedstuffs are rice bran, broken rice, and paddy rice for 56.04%, 26.09%, and 12.56%, respectively [7]. Turkeys can eat high fiber feeds, such as fresh grasses, fresh beans, and plant residues because they have long cecum, so they can digest a certain amount of fiber [8].

In current trends, consumer preferences are shifting towards grass- and pasture-based meats, due to perceived benefits for the environment, local economy, welfare of the animals, and consumer health. Raising poultry on pasture allows the birds to express natural behaviors, exercise, and increase intake of green plants, which alters fatty acid composition [9]. It has been reported that pastured chickens displayed a lower omega-6:omega-3 ratio, which has positive health implications for consumers [9]. In these reasons, the study of supplementation of green plants, including grasses, vegetables, and some fast growing plant in turkeys feed is more interest.

Particularly, green grass plays an important role in ruminant feeding. Nowadays, many farmers plant imported grasses, such as nepier and pangola grasses instead of native grasses for feeding cattle because they produced more quality and quantity than the native ones. There is no reported data on nepier and pangola grasses usage in turkey feeding and its effect on growth performance. It has been reported that diet replacement with grass meal did not alter growth and slaughter performance of geese [10]. In addition, supplementation of grass and dried sugar beet pulp meal in diet 10% at starter and 20% at grower period can be suggested for growing geese feeding [11]. Thus, the aim of this study was to investigate the effects of feeding commercial pelleted supplemented with fresh nepier grass, pangola grass, and water hyacinth on growth performance and feed cost of turkey.

## MATERIALS AND METHODS

### Animals and experimental design

Thirty six crossbred turkeys (American bronze x Beltsville small white), 4 weeks old were randomly distributed in cages according to a completely randomized experimental design. The turkeys were divided into 4 treatments with 3 replications, 3 birds each. Birds were fed 100% commercial pelleted feed for treatment 1 (T1) and 75% commercial pelleted feed supplemented with 25% fresh chopped nepier grass, pangola grass, and water hyacinth for treatment 2 (T2), 3 (T3) and 4 (T4), respectively (Table 1). The commercial pelleted feed was commercial native chicken feed from 3 weeks old to finish. Feed and water were offered *ad libitum* during the experimental period. The study was conducted over a period of 7 weeks. Feed consumption and body weight were recorded weekly for calculate feed intake (FI), average daily gain (ADG), feed conversion ratio (FCR), and feed cost per kilogram weight gain (FC).

**Table 1.** The diet composition of the experimental treatments.

Feedstuffs	CP (%)	Composition (%)			
		T1	T2	T3	T4
Commercial pelleted feed	14	100	75	75	75
Nepier grass	12.6	-	25	-	-
Pangola grass	7.5	-	-	25	-
Water hyacinth	11.5	-	-	-	25
Total (%)	-	100	100	100	100
CP (%)	-	14	13.65	12.37	13.28

### Statistical analysis

Data analysis of treatments were subjected to analysis of variance using one-way ANOVA procedures and significant differences among the treatments were determined by Duncan's multiple range test with SPSS software [12]. Differences were considered to be significant at the 5% probability.

## RESULTS

### Feed intake (FI)

Average FI was the highest in T1 following by T3, T2 and T4 ( $P < 0.01$ ). Supplementation of commercial pelleted feed by fresh nepier grass, pangola grass, and water hyacinth statistically affected feed consumption (Table 2).

**Table 2.** Feed intake (g/b/d) of turkeys fed different type of diets.

Age (weeks)	T1	T2	T3	T4	SEM	P-value
5	59.44	41.52	41.79	39.30	1.59	0.5676
6	55.72	37.59	38.38	35.96	1.05	0.2613
7	71.83 <sup>a</sup>	37.15 <sup>b</sup>	40.29 <sup>b</sup>	37.14 <sup>b</sup>	1.06	0.0273
8	68.65 <sup>a</sup>	38.84 <sup>b</sup>	42.40 <sup>b</sup>	38.09 <sup>b</sup>	0.94	0.0312
9	88.81 <sup>a</sup>	40.29 <sup>b</sup>	44.50 <sup>b</sup>	38.46 <sup>b</sup>	1.36	0.0157
10	87.62 <sup>a</sup>	41.19 <sup>b</sup>	47.26 <sup>b</sup>	39.13 <sup>b</sup>	1.51	0.0349
11	115.32 <sup>a</sup>	42.56 <sup>b</sup>	48.51 <sup>b</sup>	39.42 <sup>b</sup>	1.74	0.0062
Avg 5-11	78.19 <sup>a</sup>	39.88 <sup>b</sup>	43.30 <sup>b</sup>	38.21 <sup>b</sup>	0.69	0.0011

<sup>a-b</sup> Means with different superscripted letters within the same row indicate significant difference ( $P < 0.05$ )

### Average daily gain (ADG)

In overall the study ADG of the turkeys did not differ among the group (Table 3) except in 9 weeks old, the highest daily weight gain was found in T1 (22.86 g/b/d;  $P < 0.05$ ).

**Table 3.** Average daily gain (g/b/d) of turkeys fed different type of diets.

Age (weeks)	T1	T2	T3	T4	SEM	P-value
5	9.98	6.11	8.89	6.90	0.25	0.4426
6	18.41	16.73	13.65	10.71	0.58	0.4954
7	16.66	5.63	6.19	11.75	0.45	0.1158
8	22.53	14.34	16.38	11.42	0.47	0.1850
9	22.86 <sup>a</sup>	8.81 <sup>b</sup>	7.62 <sup>b</sup>	9.52 <sup>b</sup>	0.29	0.0023
10	11.51	10.00	9.04	10.95	0.37	0.9088
11	20.95	18.81	25.56	24.52	1.27	0.9425
Avg 5-11	17.56	11.49	12.47	12.25	0.21	0.0753

<sup>a-b</sup> Means with different superscripted letters within the same row indicate significant difference ( $P < 0.05$ )

### Feed conversion ratio (FCR)

T4 showed better feed conversion than other group in overall the study ( $P > 0.05$ ). Supplementation of commercial pelleted feed by fresh nepier grass, pangola grass, and water hyacinth tended to decrease in FCR, especially after 10 weeks old (Table 4).

**Table 4.** Feed conversion ratio of turkeys fed different type of diets.

Age (weeks)	T1	T2	T3	T4	SEM	P-value
5	6.22	7.11	5.73	6.34	2.97	0.9521
6	3.35	2.55	2.81	4.00	1.22	0.5112
7	4.98	7.50	8.21	4.58	3.66	0.5642
8	3.09	2.68	2.61	5.23	1.94	0.3640
9	3.96	4.67	6.28	4.91	2.32	0.6780
10	10.77	4.37	5.55	3.65	4.36	0.2575
11	8.93	3.93	4.08	2.86	5.13	0.5120
Avg 5-11	5.90	4.69	5.04	4.51	1.90	0.8135

#### Feed cost per kilogram weight gain (FC)

Supplementation of commercial pelleted feed by fresh nepier grass, pangola grass, and water hyacinth tended to decrease in FC but no statistical difference among the groups can be found (Table 5). After 10 weeks old, T1 tended to have the highest feed cost ( $P>0.05$ ).

**Table 5.** Feed cost per kilogram weight gain (baht/kg) of turkeys fed different type of diets.

Age (weeks)	T1	T2	T3	T4	SEM	P-value
5	93.36	98.88	75.91	94.00	3.58	0.9178
6	50.38	35.46	37.26	59.37	1.50	0.3739
7	74.75	104.36	108.63	67.90	4.31	0.7089
8	46.39	37.36	34.58	77.63	2.39	0.3066
9	59.44	65.05	83.13	78.82	2.76	0.8328
10	161.66	60.83	73.43	54.10	5.42	0.2295
11	133.98	54.74	54.03	42.44	6.19	0.4544
Avg 5-11	88.57	65.24	66.71	66.89	2.34	0.7100

## DISCUSSION AND CONCLUSIONS

Fresh grass and water hyacinth supplementation significantly decreased FI of turkeys. The decreasing in FI may be related to higher crude fiber intake of the turkey fed with fresh grasses and water hyacinth. When we calculated the intake of fresh grasses as a dry matter base, FI was decreased, since fresh grasses and water hyacinth had high moisture and more bulky. Normally, swine and poultry do not like bulky feed. It is suitable for feeding ruminants because their digestive system is large and can storage more feedstuff and has many microorganisms in the digestive tract to utilize fiber [13]. In geese, bulky feeds are suitable for their feeding physiology [11]. Supplementation of diet by grass and sugar beet pulp did not statistically affect feed consumption. Geese fed with grass and sugar beet pulp meal showed a slightly increase feed consumption compared to control animals. This might be related to the decreased energy content of diets containing grass and sugar beet pulp supplementation that led geese to consume more feed to reach their energy requirement [11].

Fresh nepier grass, pangola grass, and water hyacinth supplementation in diet did not affect ADG, FCR, and FC of turkeys. The results of this study were in accordance with Arslan [11], although grass and sugar beet pulp supplementation decreased energy and nutrient content of diets, they did not adversely affect on live weight development of geese [11]. Supplementation of nepier grass, pangola grass, and water hyacinth tended to decrease in FCR (4.69, 5.04, and 4.51, respectively) compare by feeding only commercial feed (5.90). In this case, the ADG of all groups were not difference, even though the FI of T1 was the highest, especially at 10 to 11 weeks old. Turkeys in T1 seemed to have more FRC, since their ADG was very low when compared with FI. These might be attributed to low energy density on feed intake of commercial pelleted feed. It is suggested that, the nutrition composition of feed play a pivotal role on growth performance of turkeys. The results of this study were in agreement with Ampaporn et al. [8], the influence of fibrolytic enzymes in diet contained tomato pomace as a fiber sources did not affect on initial body weight, final body weight, and ADG of turkeys. Supplementation of 10% tomato pomace with 0.2% fibrolytic enzyme was the highest feed efficiency (5.65) and the lowest FI (119.81 g/b/d). It was suggested that, the use of enzyme in diet contained tomato pomace as a fiber sources can improve feed efficiency and reduces color of breast meat in turkey [8]. Moreover, non-starch polysaccharide-degrading enzymes can be used to improve the nutritional value of diets for young turkeys [14].

In addition, feeding turkeys with commercial broiler diet at different protein levels (21%, 19% and 17%) found that growth rate of the turkey from 4 to 28 weeks did not significantly different between diets. Moreover, FI and FCR of all treatments were not significantly difference. Turkey fed with 17% protein feed had the lowest feed cost per kilogram weight gain (40.43 baht/kg) [15]. In our study, the feed cost was quite high. The lowest feed cost was found in nepier grass supplementation (65.24 baht/kg). The higher cost of feed may associate with low protein content in commercial pelleted feed (14%) which affect on growth performance in all groups. It has been reported that, meat quality of Beltsville Small White turkey fed with instant feed and fermented banana stalk feed did not significant difference. It was suggested that, turkey could be fed with fermented banana stalk feed substitute instant feed for the purpose to decrease the investment cost for the farmer [6].

It has been reported that, crude fiber in the diet decrease the absorption of fatty acids and, consequently, cholesterol in poultry [16]. Guinea fowl reared in a free-range system had significantly less abdominal fat than indoor production system [17]. Body weight of turkeys raise in intensive system before slaughter, carcass weight no hair, and carcass weight no entrails were higher than free-range system. It was suggested that, intensive system was affected on carcass quality better than free-range system [18]. Alternatively, it has been reported that grass meal and alfalfa meal are rich sources of carotenoids, mainly xanthophylls, lutein and zeaxanthin [19, 20], which play a vital role in reproduction, antioxidant properties and regulate the immune response of animals [21]. Although, in pasture rearing system, turkeys can forage for some of their diet on the pasture, but grazing alone will not provide the nutrition required for proper growth. The supplemental feeding of turkeys with a nutritionally complete feed can be advantageous as the birds will receive essential vitamins and minerals that may not be consumed during foraging [22].

In conclusion, nepier grass, pangola grass, and water hyacinth can be used as feed supplementation of turkey diets which not affect on their growth performance.

#### ACKNOWLEDGEMENTS

The authors would like to thank Animal Science Program of Rajabhat Maha Sarakham University for providing the experimental barn.

#### REFERENCES

- [1] Sunrise Tacos. (2017). Turkey feast for the holidays. (Accessed November 29, 2017). <https://www.sunrisetacos.com/turkey.html>.
- [2] Poultry Hub. (2017). Turkey. (Accessed November 29, 2017). <http://www.poultryhub.org/species/commercial-poultry/turkey/>.
- [3] Brown, H. (2017). How did Minnesota become the top turkey producing state? CBS Minnesota. (Accessed [4] November 29, 2017). <http://minnesota.cbslocal.com/2017/11/22/good-question-minnesota-turkeys/>.
- [5] Frost & Sullivan. (2014). Independent market research on the animal farming industry in Thailand. Final Report, pp. 1-37.
- [6] Information Technology Center. (2015). Information of the country animal husbandry. Department of livestock development. (Accessed November 30, 2017). [http://ict.dld.go.th/th2/index.php/th/report/447-report-thailand-livestock/reportservey 2558-1/870-report-survey58-1](http://ict.dld.go.th/th2/index.php/th/report/447-report-thailand-livestock/reportservey%202558-1/870-report-survey58-1).
- [7] Vittayaphattananurak Raksasiri, B., Techakriengkrai, T., Khiannga, S. and Rungrojn, A. (2013). The study of meat quality of beltsville small white turkey to feed with commercial diet and fermented banana stalk feed. *Thaksin University Journal*, 16 (suppl. 3), 153-158.
- [8] Prasert, C. and Saenkhunthow, U. (2017). Study on the system of production and marketing of turkey in the upper north-eastern region. Research report, Division of livestock extension and development. (Accessed November 30, 2017). <http://region4.dld.go.th/webnew/images/stories/vichakarn/04-3-04-60.pdf>.
- [9] Ampaporn, K., Bureenok, S., Vasupen, K., Yuangklang, C. and Seanmahayak, B. (2014). Effect of fibrolytic enzyme and tomato pomace as a fiber sources on carcass quality of turkeys. *Khon Kaen Agriculture Journal*, 42 (suppl. 1), 317-322.
- [10] Dunn, M. and Howk, S. (2013). Nutrient composition of poultry from different farms and management systems. *Practical farmer of IOWA*, 1-4.
- [11] Timmler, R. and Jeroch, H. (1997). Influence of mixed feed rations with graduated portions dried grass meal on growth, slaughter performance and meat quality of young fattening geese. *Archiv für Geflügelkunde*, 61, 274-279.

- [12] Arslan, C. (2005). Effects of feeding by diets supplemented with grass meal and sugar beet pulp meal on growth, slaughter performance and some blood parameters in geese. *Revue de Médecine Vétérinaire*, 156 (10), 475-481.
- [13] SPSS Inc. (2005). SPSS Base 14.0 Users Guide. SPSS Inc, Illinois, USA.
- [14] Jirapan, T. (2006). Feed and feeding animal. *E-learning*, Nakhonsawan Rajabhat University. (Accessed November 30, 2017). [http://elearning.nsrui.ac.th/web\\_elearning/animal/index2.php](http://elearning.nsrui.ac.th/web_elearning/animal/index2.php).
- [15] Mikulski, D., Juskiewicz, J., Przybylska-Gornowicz, B., Sosnowska, E., Slominski, B.A., Jankowski, J. and Zdunczyk, Z. (2017). The effect of dietary faba bean and non-starch polysaccharide degrading enzymes on the growth performance and gut physiology of young turkeys. *Animal*, 11 (12), 2147-2155.
- [16] Saythong, S. (2011). Effect of broiler feeds on growth performances and feed cost of turkey. *Proceeding of STOU Research 2011*, 279-288.
- [17] Fisher, H. and Griminger, P. (1976). Cholesterol lowering effects of certain grains and oat fractions in the chick. In: Sturkie, P.D. (ed.) *Avian Physiology*, Academic Press, New York, pp. 258-261.
- [18] Yamak, U.S., Sarica, M., Boz, M.A. and Ucar, A. (2017). Effect of production system (barn and free range) and slaughter age on some production traits of guinea fowl. *Poultry Science*, doi: 10.3382/ps/pex265.
- [19] Promket, D., Ruangwittayanusorn, K. and Somchan, T. (2017). The study of turkey system on carcass quality. *Khon Kaen Agriculture Journal*, 45 (suppl. 1), 649-653.
- [20] Puchajda-Skowrońska, H., Strusińska, D., Trojanowska, E. and Kozłowski, K. (2010). Effect of diets containing grass meal and alfalfa meal on the content of carotenoids, vitamin A and vitamin E in the egg yolk and selected reproduction parameters in geese. *Journal of Applied Animal Research*, 37 (2), 191-195.
- [21] Iwanska, S., Pysera, B. and Strusinska, D. (1997). Carotenoid content of green forage and preserved feed. *Acta Academiae Agriculturae ac Technicae Olstenensis Zootechnica*, 47, 117-128.
- [22] Biard, C., Surai, P.F., Anders, P. and Moller, P. (2005). Effects of carotenoid availability during laying on reproduction in the blue tit. *Oecologia*, 144, 32-44.
- [23] Grimes, J., Beranger, J., Bender, M., and Walters, M. (2007). Pasturing turkeys. In: Hawes, R.O. (ed.) *How to raise heritage turkeys on pasture*, American livestock breeds conservancy, North Carolina, pp. 19-26.

## FOOD SANITATION SITUATION OF STORE, STALL IN CHAIYAPHUM RAJABHAT UNIVERSITY

Parichat Sattayarak<sup>a</sup>, Karuna Chuntum<sup>a</sup>, Kanlayarat Kamlangluea<sup>b</sup>

<sup>a</sup> Faculty of art and science, Department of community health, Chaiyaphum Rajabhat University, Chaiyaphum, Thailand.

<sup>b</sup> Faculty of Education, Department of Physical Education, Chaiyaphum Rajabhat University, Chaiyaphum, Thailand

Corresponding author. Tel.: 062-443-2993 E-mail address: prch2499@hotmail.com

### ABSTRACT

The main objective of this survey study was to monitor the food sanitation stalls around Chaiyaphum Rajabhat University, Nafai Sub-district, Muang District, Chaiyaphum. The samples consist of 58 food store and 49 food stalls around Chaiyaphum Rajabhat University. The data were collected by questionnaire enquiring the shop owners, food shops and food stalls on food sanitation listed by the Department of Health, in the Ministry of Public Health. The researcher updated the questionnaire in order to be consistent with the samples. The data were analyzed by frequency, percentage, mean, standard deviation, and independent samples t-test.

The study indicated that most of the stores catered for 62.1 percent of the cooked to order shops, noodle shops at 25.9 percent. The survey found that there were 4 chef, 4 waiter and only 2 people trained in food sanitation. Each shop had the area of over 200 square meters 82.1 percent, revealed that most the question that most standard of store : Do not prepare food on the floor, in a toilet, prepare food on the table at least 60 centimeters from the floor for 100 percent and the question at the restaurant is not the highest standard : Chopping boards and knives must be in good condition, the store does not separate chopping board cooked meat / raw meat / vegetable / fruit, not passed standard 31.00 percent. Stalls were located in public areas for 77.6 percent, sell cook to order 34.7 percent, sell Som Tam- Grilled Chicken for 22.4 percent, and noodles for 12.2 percent. The question that most standard of stalls is number 4: Drinking water must be clean, packaged in a clean container, the lid is closed cover with tap or pour the water 95.90 percent. The question that is not highest standard of stalls is number 6.4 : Do not soak foods with ice to eat, fail the benchmark 40.80 percent. Training should be provided to enable entrepreneurs to have knowledge about food sanitation standards, hazards from unsafe food, personal hygiene of food handlers, Laws related to food handlers and store owners and criteria for obtaining a license also promoted and supported the establishment of an entrepreneurial club with ongoing activities to ensure sustainability of operations.

**Keyword:** Food Sanitation Situation, Food shop, Food Stall, Stores



## INTRODUCTION

From the National Strategic Plan for Environmental Health No. 3, 2017 – 2021, the promotion of health and the environment is emphasized. According to the vision of the Department of Health to achieve the goal of the Ministry of Health which intends to expand the average life expectancy of people to 85 years and The average age of good health is 75 years (National Strategic Plan for Environmental Health No. 3, 2016) The development of food and water sanitation is one of the key missions in the strategic plan that is in line with the Department of Health's core mission and according to the direction of the National Economic Development Plan No. 12 (2017 – 2021) which focuses on growth and environmentally friendly development.

From Chaiphaphum Province, there are many attractions, especially Tat Ton Waterfall, which is located in the same area as Chaiphaphum Rajabhat University. Srrounded by stores, stalls for tourists and people. Therefore, food safety surveillance in stores and stalls around Chaiphaphum Rajabhat University and Tat Ton Waterfall is an important goal in the field of public health. Chaiphaphum Rajabhat University has focused on promoting the development and upgrading of such places to meet standards by integrating an awareness of sanitation of the places in teaching and learning. Therefore, food safety surveillance in store and stalls around Chaiphaphum Rajabhat University. The quality of the establishment must be regularly and continuously monitored for the development of food handlers and related agencies. The dissemination of knowledge to consumers in the purchase clean food, safe food to prevention cause gastrointestinal disease.

## MATERIALS AND METHODS

This study was a survey research is primarily aimed at monitoring food sanitation in stores and stalls by studying the sanitary condition of stores and - stalls around Chaiphaphum Rajabhat University, Tambon Na Fai, Muang District, Chaiphaphum Province. The questionnaire and survey were developed by the Department of Health, Ministry of Public Health. The alpha coefficient was tested and the confidence was 0.84 and the percentage, mean, standard deviation.

## RESULTS

### 1. General information

1.1 Store Food : The main objective of this survey study was to monitor the food sanitation stalls around Chaiphaphum Rajabhat University, Nafai Sub-district, Muang District, Chaiphaphum. The samples consist of 58 food store. The results showed that most store sold by order accounted for 62.1 percent, sell noodle shops at 25.9 percent, there were 4 chef, 4 waiter, and only 2 people trained in food sanitation. Each shop had the area over 200 Square meters. 82.1 percent

1.2 Stall Food : The samples consist of 49 food stalls. Most stalls are located in public areas 77.6 percent and sell food is cooked to order shops at 34.7 percent, sell Som Tam- Grilled Chicken for 22.4 percent, and noodles for 12.2 percent. Details are in Table 1.

**Table 1** : Shows the demographic characteristics of food store and food stalls.

General information	The results of the physical food sanitation inspection			
	store		stall	
	number	percent	number	percent
Area				
Public way	-	-	38	77.6
private	-	-	11	22.4
Total	-	-	49	100
Food categories				
noodle	15	25.9	6	12.2
fried pastry	-	-	3	6.1
sweets	1	1.7	1	2
fruit	-	-	1	2
Spicy minced pork-beef	-	-	4	8.2

General information	The results of the physical food sanitation inspection			
	store		stall	
	number	percent	number	percent
Som-Tam,Grilled Chicken	4	6.9	11	22.4
cook to order	36	62.1	17	34.7
fried food	-	-	3	6.1
Cooked food	-	-	1	2
Grilled Foods	-	-	1	2
Jaew Hon	2	3.4		
Total	58	100.0	49	100.0
Number of cooks (people)	(1:4)		(1:2)	
(Lowest value: highest value)				
waiter (people)	(1:4)		(1:2)	
(Lowest value: highest value)				
trained in food sanitation (people)	(1:2)		(1:2)	
(Lowest value: highest value)				
Size area				
More than 200 square meters	32	82.1	-	-
Less than 200 square meters	7	17.9	-	-
Total	39	100	-	-

## 2. The results of the food sanitary inspection.

2.1 Store Food : The study revealed that most the question that most standard of store : Do not prepare food on the floor, in a toilet, Prepare food on the table at least 60 centimeters from the floor for 100 percent and the question at the restaurant is not the highest standard : Chopping boards and knives must be in good condition, do not use the same cutting board cooked meat- raw meat- vegetable-fruit,not passed standard 31.00 percent.

2.2 Stall Food : The study revealed that most the question that most standard of stall : The question that most standard of stalls is number 4: Drinking water must be clean, clean container, and cover with a tap or tepid water 95.90 percent and question that most pass standard of stall is number 12 : The chef who has a wound to his hands must cover the wound for 95.90 percent and the question at the restaurant is not the highest standard : Do not soak ice with other foods,not passed standard 40.80 percent.

## CONCLUSIONS AND DISCUSSION

The study of the sanitary condition of the store, stalls around Chaiphum Rajabhat University 58 Stores and 48 food stalls were inspected. Survey results of store surveyed by Department of Health. Ministry of Health 15 items is the survey of sanitary ware around Chaiphum Rajabhat University.

1. Store Food : The study have samples consist of 58 food store indicated that most of the stores catered of the cooked to order shops and noodle shops. The survey found that there were 4 chef, 4 waiter and only 2 people trained in food sanitation. Each shop had the area of over 200 square meters. The store does not separate chopping board cooked meat / raw meat / vegetable / fruit.

2. Stall Food : The study have samples consist of 49 food stalls. Most stalls are in public areas, sell cook to order Som Tam- grilled chicken, noodles. There are most 2 chefs cooking and and only 2 people trained in food sanitation also store food. Most stalls are soak foods with ice to eat, fail the benchmark.

This study has found that the memory arrangement the agency concerned can not promote news / knowledge of food sanitation and no tests standardized of store stall because Chaiphum Rajabhat University has expansion of education and have new store food / stall food. It is recommended to have a store / stall inspection physical and biological every year and establish a food sanitary operation system with a network partner.To be a food safety standard and to surveillance health of students and the people.

## ACKNOWLEDGEMENTS

Study on food sanitation store, Stalls around Chaiphum Rajabhat University with the help and kindness of the staff, Chaiphum Rajabhat University provides counseling and guidance to check the language. We also have a short list of Stores and food stalls around Chaiphum Rajabhat University, which cooperate to collect the survey data as well as the unidentified agencies.



### REFERENCES

- [1] Naraumon Veerapun and Pranee Thongkum. (2550). Factors Affecting Food Sanitation Performance following the Standards of Food Establishments for Food Shops in Muang District, Pattani Province. Songklanakarin Journal of Social Sciences and Humanities 13 (2) Apr. - Jun. 2007 : 187-200.
- [2] Thanacheap Perathornich and Group of Researchers. (2015). *The Analysis of Factors Influencing Food Sanitation in Phitsanulok Municipality, Phitsanulok Province*. Journal of Public Health Vol.45 No.3 (Sep-Dec 2015).
- [3] Wongpiyachon S. Perathornich T. Chaitiemwong N. A Study of the Present Situation, System and Standard Operating Procedure (SOP) of Food Sanitation in Thailand. Journal of Public Health. 2013; 43 (2) : 201-13.

# **KNOWLEDGE AND SELF-CARE PRACTICES TO PREVENT DENTAL CARIES IN PRE-SCHOOL CHILDREN OF RAJABHAT MAHASARAKHAM UNIVERSITY DEMONSTRATION SCHOOL**

Papavee Ruttanatam\*, Nutnicha Kudrangnok, Kitapon Srithanee and Rutchanun Srisupak

*Major in Community Public Health, Faculty of Sciences and Technology, Rajabhat Maha sarakham University  
Corresponding e-mail : papavee1@gmail.com*

## **ABSTRACT**

This research was a descriptive study. The objective of this study was to investigate knowledge and self-care practices to prevent dental caries in pre- school children of Rajabhat Maha Sarakham University Demonstration School which could be divided in 4 parts: Part 1-3 were all about interviewing sample groups through their parents who would answer interviewing questionnaires as they are the people who takes care of the sample groups who are children being unable to write and answer questions on their own. And the part 4 was the results of oral health clinical examination which answered by dentistry personnel of Rajabhat Maha Sarakham Medical Center. The details of each part are as follows: Part 1, questionnaires about general information of parents. Part 2, questionnaires concerning knowledge of dental caries prevention in pre-school children, Part 3, questionnaires concerning self-care practices for dental caries prevention in pre-school children and Part 4, the oral health clinical examination in pre- school children, kindergarten level (by dentistry personnel). The research could be discussed the results in accordance with the objectives as per the details below:

1. After the activity of knowledge reinforcing and motivation encouraging for dental caries prevention in the sample groups consisted of pre-school children, kindergarten level of Rajabhat Maha Sarakham University Demonstration School was carried out, it was found that parents and the sample groups had the highest score level of knowledge in preventing dental caries totally 21 persons estimated to 77.78 %, 6 persons of them had high score level estimated to 22.22 % and corresponded with the research conducted by Orasa Jansri et al. (2017) supporting that knowledge and attitude of parents had an impact on the reduction of dental caries. It was found that to receive advice about dental health from teachers who take care of children corresponded with parent's behavior in brushing their child's teeth with statistical significance. Moreover, it was also associated with the research of the Division of Oral Health, Department of Health, (2004) {1} that obtaining dental health education and mother's dental self-care related to the incident of tooth decay of children under their supervision.

2. After the activity of knowledge reinforcing and motivation encouraging for dental caries prevention in the sample groups consisted of pre-school children, kindergarten level of Rajabhat Maha Sarakham University Demonstration School was carried out, it was found that the sample groups, totally 14 persons, had the highest scores level of self-care practices estimated to 51.85%, 13 persons having high scores level estimated to 48.15% corresponded with the research conducted by Tarapawn Buamkhuntos, Wirat Pansila and Parinya Pakanont, (2015) {2} describing the result of the research about the process of behavior modification in preventing dental caries of primary school students in Sawang Sub-district, Ponthong District, Roi Et Province by applying motivation theory to raise students' awareness of severity of tooth decay. The awareness of tooth decay risk could minimize the plaque on teeth greater than before the experiment by applying health and hygiene education to shape up their experiences through activities carried out weekly to reinforce their knowledge and skill in caring the dental health appropriately, change their behavioral patterns in preventing tooth decay. In addition, a social support through engagement technology was a group discussion by discussing the problems among parent, teachers, authorities/organizations and public health personnel to get to know supporting roles and duties in dental health care treatment and encouraging the collaboration of activities to exchange knowledge in terms of emotion, evaluation of information sources and resources leading to active involvement in dental health care and effective prevention.

**KEYWORDS:** Self-care practice of decay caries prevention, Pre-school children, Parents, Dental caries

## INTRODUCTION

Dental health problem is an important public health problem, especially in Thai children, occurred by various causes such as food consumption behavior especially the amount of consumed flour and sugar that higher than needed in children who like to eat snacks during meals more than 1-2 times a day other than main dishes. They love to consume desserts all days long including sugar-sweetened drinks like soda pop. Besides, they do not brush their teeth regularly. These major causes lead to the tooth decay risk as well as the loss of permanent teeth used for grinding and chewing food. These kinds of problem can affect quality of life in terms of body, mind and society such as food eating, education, talking, communication and meeting with people (Sudaduang Kaerunpong, 2007) {4} The cause of tooth decay in pre-school children is rather complicated and combined by many factors, namely biological, behavioral, social and environmental factors. Since the trace of dental caries or tooth decay can be examined in young children even those whose baby teeth just have shortly arrived. To find risk factors of tooth decay then will be focused on inappropriate behavior of raising a child by bottle feeding or breastfeeding, dietary variety and food group consumption in children, behavior in cleaning oral cavity, racial, economy and social factors including social inequality that bring about gaps in being able to obtain or use different public health services. These kinds of numerous factors take part in pre-school children as well (Sudaduang Kaerunpong, 2007) {4}

One of the significant consequences is when tooth decay occurring in primary molars. Children will have pain and discomfort when chewing during their routine eating. It can affect not only body weight and growth, but also malnutrition and development of facial bone and oral cavity including the growing of jaw bones. The study revealed that children having deciduous tooth decay would have colonies of microorganisms and took high risk of permanent tooth decay or crowding and snaggletooth. There were many factors associated with deciduous tooth decay in children both from external factors beyond our control such as the structure of incomplete tooth formation in premature babies or low birth weight in newborns or mothers with infection during pregnancy. However, the origin of major problems that can be solved is the way we raise a child especially how to clean oral cavity and inappropriate eating habits. The trend of change will increase rapidly during 1-3 years of age and it can be seen that children who do not have tooth filling treatment can experience a severe pain in dental pulp and take a risk of Pulpitis eventually. As a result of this, children cannot chew and eat food less than ever and lead to malnutrition which affects the body and brain growth. One of the major variables that children have to face with these kinds of problem is parents. A major problem of dental caries or tooth decay in pre-school children is caused by a dental care treatment in children by their parents such as to let children falling asleep holding their own bottle and the milk is left to pool in their mouths, to let children regularly keeping candy in their mouths and parents themselves do not take care their dental health care (Tanatporn Booncharoen and Kalaya Arunkaew, 1992: 1-14) {3}.

From previous above studies, the researcher team is interested in studying the problem in order to be a guideline for dental caries prevention in pre-school children by sorting out contexts from neighboring areas facing a dental caries problem which is Rajabhat Maha Sarakham University Demonstration School, Kindergarten level. Judging from the information of dental service for pre-school children supplied by Rajabhat Maha Sarakham University Medical Center, the researcher team realizes that dental caries problem is a problem that we can find a solution and prevention if we have enough and appropriate knowledge and understanding to take care children from parents' supervision and self-motivation of children themselves. Therefore, this research is conducted and we really hope that we can apply all information from the research to be a database in planning to address the dental caries problem in pre-school children accordingly. Research objectives (1).To study the knowledge about dental caries prevention in pre-school children of Rajabhat Maha Sarakham University Demonstration School, Kindergarten Level. And (2).To study about self-care practices for dental caries prevention in pre-school children of Rajabhat Maha Sarakham University Demonstration School, Kindergarten Level.

## MATERIALS AND METHODS

This research was conducted in a descriptive study to seek knowledge and self-care practices about dental caries prevention in pre-school children of Rajabhat Maha Sarakham University Demonstration School, Kindergarten Level and carried out through 2 major methods which were (1). Activity of clinical oral health examination to see the number of tooth decay by receiving courtesy from dentistry personnel located in the health service area; Rajabhat Maha Sarakham University Medical Center. (2). The researcher team asked for collaboration from the sample groups and parents of the sample groups who agreed to join the activity voluntarily and explained in details how to carry out the activity in providing knowledge about dental caries prevention in pre-school children. In answering questionnaires, parents needed to answer all questions in the questionnaires as

they were the ones who took care and supervised children's daily routines and most likely closed to the sample groups and actually the sample groups were unable to write and answer questionnaires on their own.

Before questionnaires interviewing and after advising all details and collaboration request, the researcher carried out an activity to reinforce knowledge about tooth brushing and a guideline for dental caries prevention to the sample groups and parents 2 times a week, 3 consecutive months. The devices used in the activity to reinforce knowledge and understanding of tooth brushing and a guideline for dental caries prevention were as follows: 1. Tooth model with light available to feature detailed and realistic illustrations of human teeth and to describe the importance of teeth. 2. Big hand-made tooth model made of simple and easy materials that the researcher team did for encouraging attention and listening skills of pre-school children about tooth brushing. 3. Illustrated posters showing how to brush the teeth, pictures of food groups they should eat regularly and pictures of food groups they should avoid and picture fable-books illustrated with dental caries in children. Population and sample. The population was kindergarten 1 children of Rajabhat Maha Sarakham University Demonstration School, Mueang District, Maha Sarakham University. 2. The sample was 27 kindergarten 1 children of Maha Sarakham University Demonstration School and their parents.

Research Instrument the researchers carried out in making instruments and finding instrument quality according to the following method :

1. The characteristics of the research instrument : The research instrument was questionnaires answered by parents as they were the ones who take care and supervise the sample groups while the sample groups were unable to write and answer questionnaires on their own. The questionnaires were consisted of 4 parts as detailed below: Part 1: General information Part 2: Knowledge of dental caries prevention among pre-school children Part 3: Self-care practices of dental caries prevention among pre-school children Part 4: Oral health examination of kindergarten children (by dental experts)

2. Developing research instrument was detailed as follows: 2.1 Studying conceptual framework, theory and related researches about knowledge and self-care practice for dental caries prevention in pre-school children aged between 3-5 years. 2.2 Defining the scope of questions to completely cover conceptual framework, objectives and related contents and bring to design correct and appropriate questionnaires. 2.3 Submitting all questionnaires to ask for experts' advice in order to prove the correctness and ask for any suggestions for improvement.

3. Inspection of instrument quality 3.1 All improved and corrected questionnaires were submitted to experts to check the comprehensive range, correctness and content validity of questionnaire format. 3.2 Content validity was determined by obtaining the index of item-objective congruence (IOC) value for each questionnaire item. The average scores of IOC value ranged from 0.60 of each item. 3.3 All checked questionnaires were taken to try-out in the sample groups consisted of preschool children kindergarten class 1/3 of Kitiya Kindergarten, Maha Sarakham Province who possessed similar characters to the existing sample groups. All 27 interview questionnaire forms were carried out and Alpha Coefficient was used to measure the reliability of questionnaire according to Cronbach's alpha and the alpha coefficient ranged at 0.92

## RESULTS

The results could be divided according to questionnaire interviewing into 4 parts. Parents answered the questionnaires, in part 1-3

Part 1: General information of parents, the data analysis revealed that the sample groups were mostly men totally 18 66.67% and 9 women 33.33%. The age of the sample groups ranged mostly from 41-50 years, totally 17 persons estimated to 62.96%. There were 7 persons whose ages ranged from 31-40 years 25.92% and there were 3 persons whose ages ranged from 51-60 years 11.11%. There were 19 persons graduated with a bachelor's degree or equivalent estimated to 70.37%, graduated with a Diploma/High Vocational Certificate totally 4 persons estimated to 14.81%, graduated with a higher bachelor's degree totally 4 persons 14.81%, those finished with primary education totally 0 persons, those finished with high school education totally 0 persons. Regarding the marital status of parents, it was found that there were 27 persons who were married and stayed together with their couples estimated 100%, single 0 persons, widowed 0 persons, divorced/separated.

Part 2: Questionnaires concerning knowledge about dental caries prevention in pre-school children, after joining the activity. The questionnaires revealed that parents and the sample groups totally 21 persons had the highest score level of knowledge about dental caries prevention 77.78%, The score level totally 6 persons 22.22%.

Part 3: Questionnaires concerning self-care practices for dental caries prevention in pre-school children after joining the activity, the questionnaires revealed that the sample groups totally 14 persons had the highest score level of self-care practices for dental caries prevention 51.85%, The high score level totally 13 persons 48.15%.

Part 4: Clinical oral health examination in pre-school children, kindergarten level (by dentist) before and after examination.

**Table:1** the number and percentage of clinical examination of oral health in pre-school children, kindergarten level (N=27) before the activity

Variables: 1.. 2.. 3.. 4. Filling teeth. 5. Extracted teeth. 6. Cavities develop most likely on the front teeth.

Item	Number (person)	Percentage
A set of 20 Deciduous teeth	23	85.19
A complete set of 32 permanent teeth	27	100
Decayed teeth	8 (19 decayed teeth)	29.63
Filling teeth	8 (12 filling teeth)	29.63
Extracted teeth	2	7.41
Cavities develop most likely on the front teeth	7	25.93
Cavities develop most likely in the back teeth	4	14.81

(x<sup>-</sup>) = 7.64, S.D = 0.49

**Table:2** the number and percentage of clinical examination of oral health in pre-school children, kindergarten level (N=27) after the activity

Item	Number (person)	Percentage
A set of 20 Deciduous teeth	23	19.78
A complete set of 32 permanent teeth	27	32.00
Decayed teeth	8 (15 decayed teeth)	0.70
Filling teeth	8 (10 filling teeth)	0.44
Extracted teeth	0	0
Cavities develop most likely on the front teeth	7	0.26
Cavities develop most likely in the back teeth	4	0.30

(x<sup>-</sup>) = 7.64, S.D = 0.49

Before and after joining the activity, after joining the activity concerning knowledge reinforcing and motivation encouraging for dental caries prevention in the sample groups, 2 times a week, 3 consecutive months and receiving clinical oral health examination again, it was found that there was no difference in the number of those who had tooth decay but the number of decayed teeth was reduced, no symptoms of tooth decay and tooth extraction was decreased.

## CONCLUSIONS AND DISCUSSION

This research was a descriptive study. The objective of this study was to investigate knowledge and self-care practices to prevent dental caries in pre- school children of Rajabhat Maha Sarakham University Demonstration School which could be divided in 4 parts: Part 1-3 were all about interviewing sample groups through their parents who would answer interviewing questionnaires as they are the people who takes care of the sample groups who are children being unable to write and answer questions on their own. And the part 4 was the results of oral health clinical examination which answered by dentistry personnel of Rajabhat Maha Sarakham Medical Center. The details of each part are as follows: Part 1, questionnaires about general information of parents. Part 2, questionnaires concerning knowledge of dental caries prevention in pre-school children, Part 3, questionnaires concerning self-care practices for dental caries prevention in pre-school children and Part 4, the oral health clinical examination in pre- school children, kindergarten level (by dentistry personnel).

The results could be discussed according to the objectives below: 1.After the activity of knowledge reinforcing and motivation encouraging for dental caries prevention in the sample groups consisted of pre-school children, kindergarten level of Rajabhat Maha Sarakham University Demonstration School was carried out, it was found that parents and the sample groups had the highest score level of knowledge in preventing dental caries totally 21 persons 77.78 %, six persons of them had high score level 22.22 % and correlated to Parinya Jitaram and Kunlanant Makboon et al. (2014) supporting that knowledge and attitude of parents had an impact on the reduction of dental caries. It was found the advice of dental health from teachers who take care of children correlated to parent's behavior in brushing their child's teeth (statistical significance). Moreover, it was also

associated with the research of the Division of Oral Health, Department of Health, (2004) that obtaining dental health education and mother's dental self-care related to the incident of tooth decay of children under their supervision. 2. After the activity of knowledge reinforcing and motivation encouraging for dental caries prevention in the sample groups consisted of pre-school children, kindergarten level of Rajabhat Maha Sarakham University Demonstration School was carried out. It was found that the sample groups, totally 14 persons, had the highest scores level of self-care practices (51.85%) thirteen persons having high scores level 48.15% correlated to Tarapawn Buamkhuntos, Wirat Pansila and Parinya Pakanont, (2015) describing the process of behavior modification in preventing dental caries of primary school students in Sawang Sub-district, Ponthong District, Roi Et Province by applying motivation theory to raise students' awareness of severity of tooth decay. The awareness of tooth decay risk could minimize the plaque on teeth greater than before the experiment by applying health and hygiene education to shape up their experiences through activities carried out weekly to reinforce their knowledge and skill in caring the dental health appropriately, change their behavioral patterns in preventing tooth decay. In addition, a social support through engagement technology was a group discussion by discussing the problems among parent, teachers, authorities/organizations and public health personnel to get to know supporting roles and duties in dental health care treatment and encouraging the collaboration of activities to exchange knowledge in terms of emotion, evaluation of information sources and resources leading to active involvement in dental health care and effective prevention.

### REFERENCES

- [1] Dental Health Division, Department of Health. (2004). *Healthy 3-year-old children*.
- [2] Boumkuntot, T., Pansila, W. และ Phaganon, P. (2015). *The processes of behavioral changing for dental caries prevention of primary school students at Sawang Sub district, Phonthong District, Roi-Ed Province*. Mahasarakham Hospital Journal 12 (3), 1-9.
- [3] Thanachaporn Booncharoen and Kulaya Arunkaew. (1992). *Maternal factors influencing the incidence of dental caries of children at Children and Mom Hospital Chiang Mai*. Health Support Center 10 Chiang Mai. 1- 14.
- [4] Sudaduang Keranphong. (2007). Tooth decay and factors related to tooth decay the children of Thai flag and mountainous Thai Amphoe Samoeng Chiang Mai Province. *Lanna public health journal*. 9,2 (2 May – August 2013), 1-14.
- [5] Parinya Jitaram and Kunlanat Makboon. (2014). *Dental care behavior of the caregivers of children aged 3-5years*. Thai Dental Nurse Journal Vol 25 No 1 (January - June 2014)



## THE EFFICIENCY OF DOUBLE SLOPE SOLAR STILL OF HEAT ABSORBER FROM BLACK GASKET

Chawisorn Phukapak<sup>a,\*</sup>, Sorawin Phukapak<sup>b</sup>, Narathip Pawaree<sup>c</sup>, Ketsadaporn Wongsim<sup>a</sup>,  
Sanit Samutwong<sup>d</sup>, Komsuchart Buapha<sup>d</sup>

<sup>a</sup> *Department of Energy and Environmental Engineering, Faculty of Engineering,  
Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000*

<sup>b</sup> *Department of Mechanical Technology, Faculty of Technology, Udon Thani Rajabhat University,  
Udon Thani, Thailand 41000*

<sup>c</sup> *Department of Industrial Management, Faculty of Technology, Udon Thani Rajabhat University,  
Udon Thani, Thailand 41000*

<sup>d</sup> *Department of Technology Construction Management, Faculty of Engineering,  
Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000  
Correspondence e-mail : chawis\_champion@yahoo.com*

### ABSTRACT

This paper presents an effect of size the efficiency of double slope solar still of heat absorber from black gasket. Black gasket was chosen to use as heat absorber and was put on the water surface in the second layer of the solar still. The size of black gasket used in the experiment has divided 9 sizes from 10% to 90% of the surface of the water in the second layer of the solar still. The temperature, condensed water and efficiency of solar still were measured and calculated in the experiment. The result that using the size of 10% of black gasket absorber has the maximum condensed water at 1,728 ml/day and has the efficiency at 24.85%. The minimum condensed water at 1,554 ml/day and has the minimum efficiency at 21.61% where size of 90% of black gasket absorber was used. The result was also revealed that the efficiency of solar still was decreased according to the increasing of the size at black gasket absorber.

**KEYWORDS:** Solar still, Efficiency, Absorber, Black gasket

## INTRODUCTION

Condensed water is a significant product and has been used in many uses such as scientific laboratory, medical practices, industries and especially in consumption. Purity of condensed water depends on the usage. Condensed water production needs energy for instance electricity, gas, solid coal, boiling water stream, fuel, and solar energy. Water refinery by solar energy still is one way to avoid environmental pollution and let contaminated water to be reused within limited budget and simple maintenance method. Solar energy which is clean energy can be taken throughout the year. The researchers have an idea on efficiency improvement for solar energy water refinery to support the uses of alternative energy instead of expensive fuel which affects on the investment of water distill. Therefore, an alternative power: solar energy should be taken into consideration to be used in Thailand in water refinery as lower investment. However solar refiner currently hold insufficient efficiency, most researchers have redesigned and developed solar refiner. Water is one of nature's most important gifts to mankind. It is essential to life as a person's survival depends on drinking water. About 97% is salty seawater and 2% is frozen in glaciers and polar ice caps [1]. Thus, 1% of the world's water supply is a precious commodity necessary for our survival. Solar desalination is the best method for purifying the impure water in a small scale. Solar stills are widely used in solar desalination but the productivity of the solar stills is very low. To enhance the productivity of the simple solar still, several research works are being carried out. Integrated a flat plate collector with a single basin solar still [2, 3].

The effect of the water depth on the productivity for single and double basin double slope glass solar stills with different water [4]. In order to minimize the convective and radiation losses, double-basin type still is fabricated. It possesses an additional transparent sheet of material fixed in between the basin liner and the glass cover [5]. Concluded the considerable effect of energy storing and wick materials on the productivity of the solar still [6-8]. Provision of additional glass basin is another method for increasing the productivity by means of latent heat recovery [9, 10]. About the depth of water to distillate, most authors conclude that at shallower depths, the production increases and decreases up to 14%, and when the depth increases from 2 to 7 cm [11]. An optimal depth range between 2 and 6 cm has been proposed [12]. Another study concluded that, if the depth decreases from 6 cm to 0.5 cm, the production improves up 19% [13]. Indicated that, reducing the gap between basin water surface and glass cover from 13 to 8 cm resulted in an increase of 11% in the daily productivity [14]. Further experimental studies carried out also concluded that at shallower depths the production improves substantially; however, no specific value was reported [15]. The effect of the shadow area of the fins on the amount of solar radiation available for water evaporation [16]. Investigated the performance of stepped solar still using trays having different depths and widths; the results indicated that the productivity is strongly correlated to both factors [17]. The effect of single and double slope of the still cover on productivity was studied [18]. This paper compares the performance of single basin single slope solar still with and without water nanofluid. Water nanofluids of Aluminum Oxide ( $Al_2O_3$ ), Zinc Oxide ( $ZnO$ ), Iron Oxide ( $Fe_2O_3$ ) and Tin Oxide ( $SnO_2$ ) [19], asphalt [20], mild steel sheet [21], or galvanized iron [22, 23], and charcoal cloth was used as an absorber/evaporator material [24], whereas the transparent using cover, glass or plastic [25, 26]. Regarding the cover thickness, mathematical and experimental models have shown that it does not have effect on the water production [15]. In relation to thermal insulating materials, polyurethane, polystyrene [25], wood [15] and polyurethane foam [22] have been utilized and the idea of which created a refiner and examine the effect of slope layer and solar absorber by placing sheep fur letting water equally spread [27]. His result showed that using sheep fur increased more amount of refined water by 2-3 times.

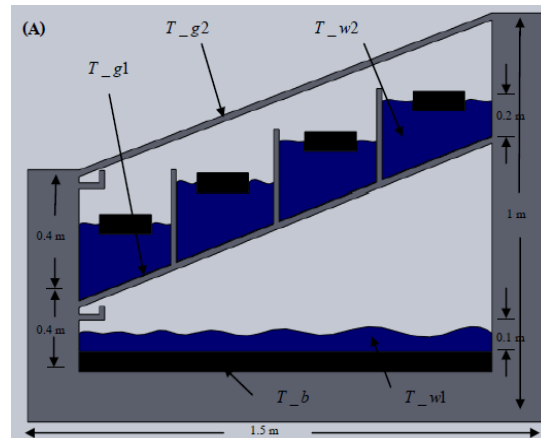
Solar energy is clean and has the efficiency in water distill. Moreover, had designed and evaluated efficiency of  $1.5 \times 1 \text{ m}^2$  double solar water refinery, each level height was 0.4 m, only one side of the glass had slope of  $14^\circ\text{C}$  but the optimal angle in Thailand and upper level had been designed into steps increasing the surface area. The researchers therefore set aims to investigate the effects of relations between the absorbers and the efficiency of solar still water distill by applying black gasket as absorber which conducts much heat on the upper level and distill longer time to accumulate heat in the daytime.

## MATERIALS AND METHODS

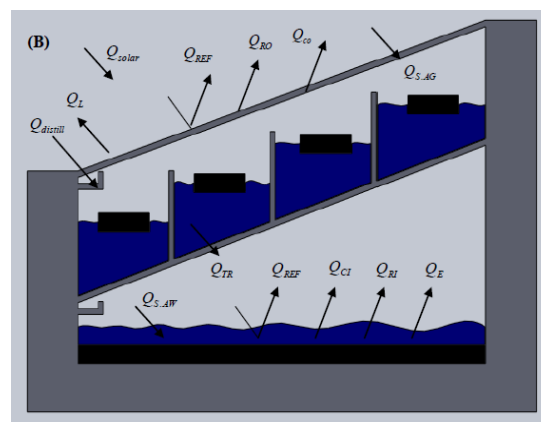
### Materials

This study is the developing of  $1.5 \times 1 \text{ m}^2$  and each level height was 0.4 m. Double slope solar still single side sloped water refiner. Each side of the refiner, there are water release cavity in each level. The bottom area of the refiner is contained with nonconductors, heat absorbers, single side  $14^\circ\text{C}$  slope glass. The upper level was designed into steps, increasing surface areas by applying more heat absorbers as black gasket to transfer heat to the water.





(A) Location temperature.



(B) Energy transferring in solar still.

**Figure 1** Model of Double slope solar still.

## Methods

This research is the study to identify the solar intensity per hour, cumulative water refinery in a day of each layer and temperature change inside the water refiner to analyze the efficiency of the refiner which had applied heat absorbers as black gasket. Black gasket plates were divided from 10% to 90% the water surface area at the upper level and the experiment as followings:

1. Apply Thermo Couple Type J at 5 locations:  $T_b$ ,  $T_{w1}$ ,  $T_{g1}$ ,  $T_{w2}$ ,  $T_{g2}$  (as shown in Figure 1 A) and connect Thermo Couple with Thermometer Digital to identify each location temperature, then apply 50 liters ( $m_w = 50$ ) of water at the lower level and 20 liters ( $m_{wf} = 20$ ) for upper level.
2. Apply heat absorber made from black gasket with had been divided into 10% to 90% of water surface areas at the top of double slope solar still towards the South direction.
3. Measure condensed water by measuring cup, measure wind speed by Flow meter, use wet and dry Thermometers to measure temperature and relative humidity.
4. Measure all values every hour starting from 1 A.M. to 0 A.M. of the next day.

## Related Theories in Calculation Water distill by Solar Energy

Working Process: Solar radiation will be transferred to translucent cover sheet at upper level which can be glass or plastic. The radiation will be absorbed by raw water and tub. As water heats and steam evaporates to cover sheet in the upper area by heat conducting. Cover sheet needs sufficient degree of the slope to let distill water flow through gutter. The length of gutter needs to comply with the size of the refiner and refined water with be collected at the container.

### The Calculation of Solar Radiation

The value of solar radiation per hour (I) can be accumulated by [28, 29] the result from accumulated of solar radiation per day (H) multiplies by the ratio of an hour of solar radiation per accumulated radiation ( $r_t$ )

$$I = Hr_t \quad (1)$$

when

$$r_t = \frac{\pi}{24} \left( a + b \cos \omega_s \frac{\cos \omega - \cos \omega_s}{\sin \omega_s - \left( \frac{2\pi s}{360} \right) \cos \omega_s} \right) \quad (2)$$

Since  $a = a_1 + a_2 \sin(\omega_s - 60)$  and  $b = b_1 + b_2 \sin(\omega_s - 60)$  when  $\omega_s$  stands for the degree of the sun (Sunset hour angle) as incidence angle between the value of radiation at the area of strike level and the values of  $a_1$ ,  $a_2$ ,  $b_1$ ,  $b_2$  are invariants at vary stations in Thailand.

### Energy Transferring in Solar Still Water Distill

Most energy transferring in water distill costs lost in the system affecting water distill ratio. When solar radiation transfers to water refiner, some radiation is able to be transferred to the refiner as the reflection of radiation at the bonnet of the water distill. The transferred radiation in the water refiner will be changed into heat energy accumulatively and some of radiation will be absorbed at the surface [30]. The accumulated heat in water distill is lost by these conditions. (as shown in Figure 1 B)

1. Solar radiation is absorbed into the bonnet ( $Q_{S,AG}$ )
2. Energy from solar radiation goes through the bonnet ( $Q_{TR}$ )
3. Energy from solar radiation goes through the bonnet and absorbed by the water ( $Q_{S,AW}$ )
4. Heat transferred from the bonnet to the atmosphere by heat radiation ( $Q_{RO}$ )
5. Heat transferred from outside surface of the bonnet to the atmosphere by convection ( $Q_{CO}$ )
6. Heat transfers from water surface to the bonnet by radiation ( $Q_{RI}$ )
7. Heat transfers from the surface to the bonnet by convection ( $Q_{CI}$ )
8. Heat lost at the side and bottom parts of water refiner ( $Q_L$ )
9. Heat ventilated from water to the bonnet along with evaporating steam ( $Q_E$ )
10. Heat lost along with the refined water outcome ( $Q_{distill}$ )

The energy at all parts of the refiner can be calculated using energy balance in solar still water refiner as following:

Heat energy balance at nonconductors

$$m_b c_{pb} \frac{dT_b}{dt} = I(t)A_b - q_{cbw} - q_{loss} \quad (3)$$

Heat energy balance in level 1 water

$$m_w c_{pw} \frac{dT_w}{dt} = I(t)A_w + q_{cbw} - q_{rwg1} - q_{cwg1} - q_{ewg1} \quad (4)$$

Heat energy balance at level 1 glass surface

$$m_g c_{pg} \frac{dT_{g1}}{dt} = I(t)A_{g1} + q_{rwg1} + q_{cwg1} + q_{ewg1} - q_{cg1wf} \quad (5)$$

Heat energy balance in level 2 water

$$m_{wf} c_{pw} \frac{dT_{wf}}{dt} = I(t)A_{wf} + q_{cg1wf} - q_{cwfg2} - q_{rwfg2} - q_{ewfg2} + q_{absorber} \quad (6)$$

Heat energy balance at level 2 glass surface

$$m_g c_{pg} \frac{dT_{g2}}{dt} = I(t)A_{g2} + q_{cwfg2} + q_{rwfg2} + q_{ewfg2} - q_{rg2,sky} - q_{cg2,a} \quad (7)$$

Accumulative condensation ratio of both levels

$$\frac{dm_c}{dt} = h_{ewg1} \frac{(T_w - T_{g1})}{h_{fg@T_w}} + h_{ewfg2} \frac{(T_{wf} - T_{g2})}{h_{fg@T_{wf}}} \quad (8)$$

Since  $T_b$ ,  $T_{w1}$ ,  $T_{g1}$ ,  $T_{w2}$ ,  $T_{g2}$  are temperatures at bottom nonconductors, bottom surface water, bottom glass surface, top water surface and top glass surface respectively. The standard room temperature is assigned at 25°C and  $m_b$ ,  $m_w$ ,  $m_g$ ,  $m_{wf}$  are the mass of bottom nonconductors, bottom water amount, glass, upper water amount respectively.

### The Calculating of Heat Absorbed by an Object

General formula to calculate energy absorbed by [31] an object is

$$q_{absorber} = \alpha(I_b \tau_{wb} + I_d \tau_{wd}) \quad (9)$$

When  $\alpha$  is the radiation absorption of the object,  $I_b$  is the value of beam solar radiation per hour on plane level.  $I_d$  is the value of diffuse solar radiation per hour on plane level,  $\tau_{wb}$  is absorption transferring of the atmosphere by steam absorption,  $\tau_{wd}$  is the transferring of solar radiation of the atmosphere as steam scattering.

### Efficiency of Solar Still Water Distill Calculation

General formula to [32] calculate for efficiency ( $\eta$ ) is

$$\eta = \frac{\sum \dot{m}_c h_{fg}}{\sum I} \quad (10)$$

When  $\dot{m}_c$  is condensation ratio,  $h_{fg}$  is latent heat and  $I$  is hourly solar radiation ( $W/m^2$ )

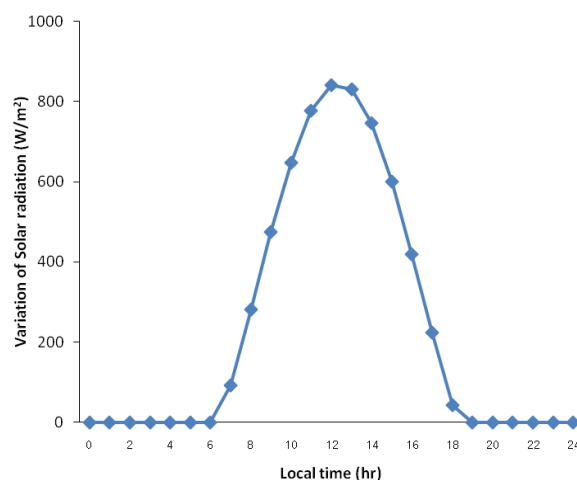
### Calculation Methods

Efficiency calculation of solar still water refiner uses EES computer based program. Fixed variables are needed to be assigned as mentioned and solar condensation can be calculated using solar function to get the temperature values of  $T_b$ ,  $T_{w1}$ ,  $T_{g1}$ ,  $T_{w2}$ ,  $T_{g2}$  as (3) - (8) equation. Then calculate for latent heat ( $h_{fg}$ ) of both levels to find the ratio of condensation ( $\dot{m}_c$ ) to be able to calculate the efficiency of solar still water refiner as (10) equation.

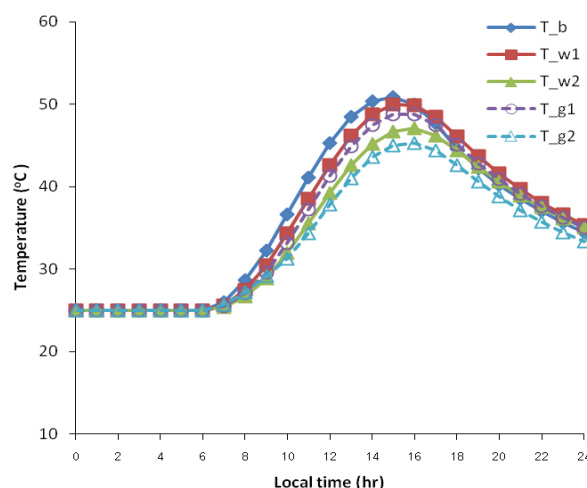
## RESULTS

### Solar Radiation

The Calculation of applying black gasket as absorbers covering 10% to 90% of two level of water surface area was tested for data of temperature variation in water refiner, amount of distill water and calculated for the efficiency of distill water. In case of using heat absorber sheet size 10% that was conducted on August 18, 2017 as shown in Figure 2 with day average solar radiation of 427.05  $W/m^2$ , 12.00 P.M. maximum of 841.14  $W/m^2$  the sunlight can be notified from 6.00 A.M. until 18.00 P.M. accumulated as 12 hours.



**Figure 2** Variation of Solar radiation.



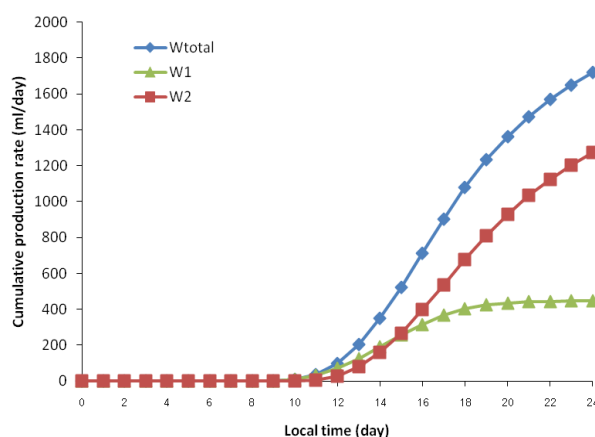
**Figure 3** Temperature variation in water refiner applied 10% black gasket plate heat absorbers.

### Temperature at Surfaces

According to Figure 3, the graphs indicate temperature calculated from locations in solar still water refiner and the results showed that the difference of temperature between the surface of glass at level 1 ( $T_{g1}$ ) and water surface level 1 ( $T_{w1}$ ) was more than the difference between glass surface level 2 ( $T_{g2}$ ) and water surface level 2 ( $T_{w2}$ ). At level 2 the difference between water and glass is more than the difference of level 1. At 3 P.M. the highest temperature moment: 50.01°C between glass surface and water surface of both levels. Both levels 2 had the differences of temperature between glass surface and water surface of 1.69°C and levels 1 had the differences of temperature between glass surface and water surface of 1.22°C indicating that level 2 had more condensation than level 1 (as shown in Figure 4) and condensation remained when there was no sunlight as the difference of temperature between glass surface and water surface still remained however the condensation without sunlight was lower.

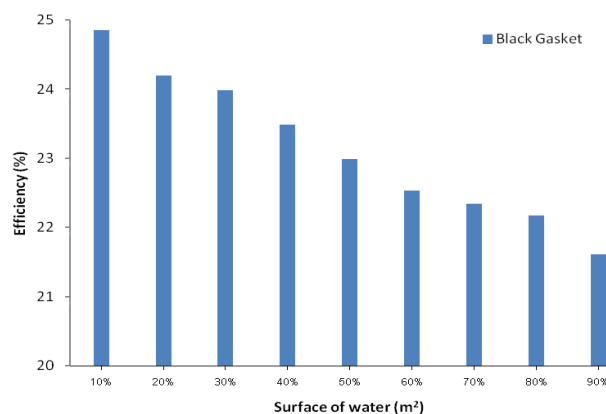
### Accumulative Water Distill Product

According to Figure 4, The graphs indicate both levels accumulative water distill product. Level 1 outcome distill water was 470 ml/day and level 2 outcome distill water was 1,258 ml/day and accumulative refined water was 1,728 ml/day. At 9.00 A.M. From 1 P.M. to 6 P.M. the refinery ratio was highest as the graphs shows most incline during the day: Between 7.00 A.M. to 9.00 A.M. there was no condensation as the refiner needed accumulative heat to reach latent heat value of evaporation. Than the heat later evaporated to glass surface and condense.



**Figure 4** Single day accumulative water distill product from the experiment of applying size 10% of black gasket as heat absorber.

According to Figure 5, Single day average accumulative of efficiency, applied with black gasket size 10% and the use of equation 10 showed that the refiner had single day average accumulative efficiency of 24.85%.



**Figure 5** Single day average accumulative efficiency, applied with black gasket heat absorber of 10%.

The experiment of water refinery then was conducted by original refiner but replaced with all sized of black gasket as heat absorbers from 10% to 90%. The results and the calculations are indicted in Table1.

**Table 1** Results of experiments on black gasket as heat absorber at sizes.

Size of Black Gasket (%)	Average Solar radiation (W/m <sup>2</sup> )	Amount of distill water (ml/day)	Efficiency (%)
10%	427.05	1,728	24.85
20%	453.24	1,720	24.20
30%	474.41	1,699	23.98
40%	425.44	1,663	23.49
50%	482.69	1,626	22.99
60%	508.37	1,605	22.53
70%	477.33	1,591	22.34
80%	436.62	1,565	22.17
90%	455.90	1,554	21.61

According to Table 1, The efficiency decreased when black gasket heat absorber's size increased. The highest efficiency of 24.85% is at size 10% and the lowest efficiency of 21.61% is at size 90% the graphs of temperature variation at different surfaces of the refiner, accumulate amount of refined water when applied heat absorber from size 20% to 90% resulted very close outcome compared to sized 10% experiment.

### CONCLUSIONS AND DISCUSSION

The results indicated that black gasket can act as heat absorbers and the size of black gasket plate affected on the efficiency of single side sloped-double solar still water refiner. The area increased reduced the efficiency of 10% size of black gasket indicated the highest distill water at 1,728 ml/day and accumulative efficiency of 24.85%. Black gasket size of 90% produced the lowest amount of distill water at 1,554 ml/day and accumulative efficiency of 21.61%. For experiments that do not heat absorber accumulative efficiently of 23.72% after heat absorber panels 10%, 20% and 30%. Therefore the efficiency of double solar still water refiner decreased the size of black gasket increased as black gasket covered the surface which solar radiation needed for heat transferring to level 1 of the refiner and The researchers therefore set aims to investigate the effects of relations between the absorbers and the efficiency of solar still water refinery by applying black gasket as absorber which conducts much heat on the upper level and distill longer time to accumulate heat in the daytime.

### ACKNOWLEDGEMENTS

The researcher would like to show great gratitude to the Department of Energy and Environmental Engineering, Faculty of Engineering, Rajabhat Maha Sarakam University and Department of Mechanical Technology, Faculty of Technology, Udon Thani Rajabhat University who provided facilities in this study. And the researcher also appreciates the assistance from Research and Development Intitute, Rajahat Maha Sarakham University who provided financial support from this research.

### REFERENCES

- [1] G.N. Tiwari, H.N. Singh, T. Rajesh. (2003). Present status of solar distillation, *Solar Energy*, 75, pp. 367-373.
- [2] A.A. Badran, A.A. Al-Hallaq, I.A. Eyal Salman, M.Z. Odat. (2005). A solar still augmented with a flat plate collector, *Desalination*, 172, pp. 227-234.
- [3] C. Tiris, M. Tiris, Y. Erdalli, Sohmen. (1998). Experimental studies on a solar still coupled with a flat-plate collector and a single basin still, *Energy Conversion and Management*, 39, pp. 853-856.
- [4] T. Elango, K. Kalidasa Murugavel. (2015). The effect of the water depth on the productivity for single and double basin double slope glass solar stills, *Desalination*, 359, pp. 82-91.
- [5] S. Abdallah, Mazen M. Abu-Khader, Omar Badran. (2009). Effect of various absorbing materials on the thermal performance of solar stills, *Desalination*, 242, pp. 128-137.
- [6] K. KalidasaMurugavel, Kn.K.S. K. Srithar, K. Chockalingam. (2008). An experimental study on single basin double slope simulation solar still with thin layer of water in the basin, *Desalination*, 220, pp. 687-693.
- [7] K. Kalidasa Murugavel, S. Sivakumar, J. Riaz Ahamed, Kn.K.S.K. Chockalingam, K. Srithar. (2010). Single basin double slope solar still with minimum basin depth and energy storing materials, *Apply Energy*, 87, pp. 514-523.

- [8] T. Rajaseenivasan, T. Elango, K. Kalidasa Murugavel. (2013). Comparative study of double basin and single basin solar stills, *Desalination*, 309, pp. 27-31.
- [9] T. Rajaseenivasan, K. Kalidasa Murugavel. (2013). Theoretical and experimental investigation on double basin double slope solar still, *Desalination*, 319, pp. 25-32.
- [10] T. Rajaseenivasan, K. Kalidasa Murugavel, T. Elango, R. Samuel Hansen. (2013). A review of different methods to enhance the productivity of the multi-effect solar still, *Renewable and Sustainable Energy Reviews*, 17, pp. 248-259.
- [10] A. Safwat Nafeya, M. Adeldkadib, A. Abdelmotalipb, A.A. Mabrouka. (2000). Parameters affecting solar still production, *Energy Conversion and Management*, 41, pp. 1797-1809.
- [11] A.A. El-Sebaili. (2000). Effect of wind speed on some designs of solar stills, *Energy Conversion and Management*, 41, pp. 523-538.
- [12] S. Toure, Pierre Meukam. (1997). A numerical model and experimental investigation for a solar still in climatic conditions in Abidjan (Cote D'Ivoire), *Renewable Energy*, 11 (3), pp. 319-330.
- [13] A. Ghoneyem. (1995). Experimental Study on the Effects of the Cover and Numerical Predication of a Solar Still Output, (M. Sc. thesis) METU, Ankara.
- [14] M. Suleiman, K. Tarawneh. (2007). Effect of water depth on the performance evaluation of solar still, *Jordan Journal of Mechanical Industrial Engineering*, 1 (1), pp. 23-29.
- [15] A.A. El-Sebaili, M.R.I. Ramadan, S. Aboul-Enein, M. El-Naggar. (2015). Effect of fin configuration parameters on single basin solar still performance, *Desalination*, 365, pp. 15-24.
- [16] A.E. Kabeel, A. Khalil, Z.M. Omara, M.M. Younes. (2012). Theoretical and experimental parametric study of modified stepped solar still, *Desalination*, 289, pp. 12-20.
- [17] H.E.S. Fath, M. El-Samanoudy, K. Fahmy, A. Hassabou. (2003). Thermal-economic analysis and comparison between pyramid-shaped and single-basin solar still configurations, *Desalination*, 159, pp. 69-79.
- [18] T. Elango, A. Kannan, K. Kalidasa Murugavel. (2015). Performance study on single basin single slope solar still with different water nanofluids, *Desalination*, 360, pp. 45-51.
- [19] A. Hilal, M.S. Al-Nassri, B.A. Jubran. (2002). Parametric investigation of a double-effect solar still in comparison with a single-effect solar still, *Desalination*, 150, pp. 75-83.
- [20] K. Vinoth Kumar, R. Kasturi Bai. (2008). Performance study on solar still with enhanced condensation, *Desalination*, 230, pp. 51-61.
- [21] W.A. Kamal. (1998). A theoretical and experimental study of the basin-type solar still under the Arabian Gulf climatic conditions, *Solar & Wind Technology*, 5 (2), pp. 147-157.
- [22] A.E. Kabeel. (2009). Performance of a solar still with a concave wick evaporation surface, *Energy*, 34, pp. 1504-1509.
- [23] J.T. Mahdi, B.E. Smith, A.O. Sharif. (2011). An experimental wick-type solar still system: design and construction, *Desalination*, 267, pp. 233-238.
- [24] E. Rubio Cerda, M.A. Porta G\_andara, J.L. Fernandez Zayas. (2002). Thermal performance of the condensing covers in a triangular solar still, *Renewable Energy*, 27, pp. 301-308.
- [25] C. Phukapak and S. Phukapak. (2015). Comparison of Aluminum and Zinc as a Heat Absorber in Double-Step Solar Still, *The Journal of Industrial Technology*, 11 (2), pp. 1-14.
- [26] H. S. Aybar, Fuat Egelioglu, U. Atikol. (2005). An experimental study on an inclined solar water distillation system, *Desalination*, 180, pp. 285-289.
- [27] J. A. Duffie, William, and Beckman. (1980). *Solar Engineering of Thermal Processes*. New York: John Wiley & Sons.
- [28] N. Pratinthong. (1996). Long Term Simulation of Concrete Solar Collector. Bangkok: King Mongkut's institute of Technology Thonburi.
- [29] Y. H. Zurigat and M. K. Abu-Arabi. (2004). Modeling and performance analysis of a regenerative solar desalination unit, *Applied Thermal Engineering*, 24, pp. 1061-1072.
- [30] H. Al-Hinai, M.S. Al-Nassri, B.A. Jubran. (2002). Effect of climatic, design and operational parameters on the yield of a simple solar still, *Energy Conversion and Management*, 43, pp. 1639-1650.
- [31] A.S. Nafey, M. Abdelkader, A. Abdelmotalip and A.A. Mabrouk. (2002). Solar still productivity enhancement, *Energy Conversion and Management*, 43, pp. 937-946.

## PARTICIPATION MODEL FOR CARING THE CHRONIC KIDNEY DISEASE PATIENT

<sup>1</sup>Dr. Ranida MonKhlung, <sup>2</sup>Mr. Wai Chueram, <sup>2</sup>PhrakruSripariyutthayanusat Wiwekram,

<sup>2</sup>Phra Thammanoon Petlert, <sup>2</sup>PhrakruSiripariyattayapirom Boonvon

<sup>1</sup>Mueang Nakornpanom Municipality, Nakornpanom Province, Thailand

<sup>2</sup>Mahachulalongkornvittayalaya, Buriram Collage, Buriram province, Thailand

Corresponding email; Ranida1122@gmail.com

### ABSTRACT

This research aimed to build the Model for caring of the chronic kidney disease patient base on community's integrative participation, it was held on the area of Nakornpanom municipality, Nakornpanom province during November 2016. The target population was 12 expertise by the Focus Group Discussion and the participatory observation, then using the content analysis, the research result were found as follows;

Participation Model for caring of the chronic kidney disease patient base on community's integrative participation were; (1) the concepts was health policy between the public health network and local government organization, join together operated in area of responsibility. (2) The Process was servicing oriented systems for excellence by 3 activities to support behavior changed (food, exercise and emotion). (3) Technique was operating according to Ministry of Health Policy in the level 1-3 by prevention and slowdown of kidney degeneration with all activities in all municipal health services. (4) The plan program/project was "the Kidney Care Companion ; Health Concerning Project" was the main project for supporting, Cooperating and integrating of the work together so that it can effectively cure chronic kidney disease patients.

**KEYWORDS** : Participation Model, Chronic Kidney Disease Patient.



## INTRODUCTION

Present in Thailand Chronic kidney disease was found in 17.6% of the population, or about 8 million, compared to about 100 people with chronic kidney disease. Among them, there were 200,000 patients with chronic kidney disease. Or 2.5% of all chronic kidney patients. Every year more than 7,800 new cases are reported each year, with up to 70,000 kidney dialysis patients and over 5,000 kidney transplant patients. Only 600 cases / year or only 1 in 10 Bureau of Non-Communicable Diseases, Department of Disease Control, Ministry of Public Health (2559) A Practical Guide to Managing Kidney Disease Chronic (CKD) in diabetic patients and hypertension. 1st edition. Bangkok: Printing Workshops. Veterans Affairs.

People only get kidney transplants. The cost of modern kidney dialysis is as high as 200,000 baht per person per year. It is estimated that in 2017, the budget for kidney replacement treatment will reach Bt4bn. At the same time, chronic kidney disease patients must be painful. And the time to bleed 4-5 times a week, which must go to the hospital to dialysis. Not less than 3-2-3 times a week. Patients and relatives have to pay a very high cost. Life is not perfect There is suffering in the body. While physicians, nurses, and specialists in the care of kidney disease are not sufficiently well-off for patients, the prevention and elimination of kidney failure is essential. Both in the community and health care. Network partners in all organizations play an important role. The mainstay of the operation. To reduce and delay chronic patients in the community. And must be parallel. Systematic transmission. Between the community and the health service. The problem with chronic kidney disease is that economic changes can be seen. The social and environmental changes that have made the city more prosperous are changing people's behavior. According to statistics from the Ministry of Public Health, the major causes of mortality among Thais are the non-communicable diseases and non-communicable diseases. Related to health, there are many projects or measures. To assist in the campaign. Reduce risk behaviors that will cause health problems among people, such as the Thai Immigrant Program, 3A Policy (Diet, Exercise and Emotional) Campaign for Quit Smoking, Alcohol Abuse and Drug Abuse. Excessive water and disease in non-communicable diseases. (Non-Communicable Diseases:NCD) It also found that. Most Thai people are unaware of chronic diseases. Or people known to be chronically ill. I can not control the symptoms and care for myself properly. The health problems mentioned above. Can be prevented. If the public is promoting good health and thorough health promotion is any action aimed at promoting. Physical and mental health. By supporting the behavior of individuals, social and environmental conditions will lead. To a healthy body, complete mental state, longevity. And quality of life. Health promotion can be integrated. In every health service. Primary care in individuals, families and secondary care communities in community hospitals and tertiary care, which focuses on patient preparation and Relative to the safety of complications. In addition, some patients with more than two or more diseases must be promoted for health and prevent the effects of the condition. Caused by common diseases It includes long-term care in chronic patients and palliative care in patients who can not cure their quality of life in a healthy and acceptable condition. The service will focus on "build, repair and build" for Thailand. Although nurses have a role under Section 4 of the Nursing and Midwifery.

Profession Act. To care and help when sick. Rehabilitation Disease prevention and health promotion. But in reality, most of the workload. It also emphasizes the care of the sick. More rehabilitation Health promotion Lack of integrated health promotion. The integration of health promotion. And chronic disease prevention (NCD) is associated and coherent. The community and the network partners, such as prevention, prevention and prevention of communicable diseases in the community. The first is community-based dengue prevention and control, focusing on the local community where the basic operations are based. Subdivision Area Sub-district, which is managed centrally and locally, is comparable to imported inputs. Target population in the community Based on the concept of responsibility for dengue management by the involvement of the World Health Organization And the community competency assessment framework. The group can be defined as 2 groups: 1) the core group is the group representing the protection activities. And control dengue fever. Represent the community with direct responsibilities. 2) community people in each household in the community, and 2) community capacity building, which refers to the process of increasing the capacity of the community to carry out the protection. And control dengue fever. The process consists of four steps: 1) Define, component, performance, and instrumentation used to evaluate. 2) community performance assessment; 3) strategy and performance appraisal; and 4) monitoring and evaluation. Community Empowerment 4 steps will spin into a continuous cycle. Action research is the process leading to the results of community empowerment. The NCD between the community and its partner organizations is similar in nature. From the statistics of Nakhon Phanom. Chronic non-communicable disease was the first problem, with the death rate from renal failure rising to one of 8 health service districts, the rates for inpatient treatment of diabetic patients and hypertension Cardiovascular disease Stroke

increases every year. In 2014, the rate of illness per 100,000 population is 1094.29, 1204.56, 221.27 and 159.5 respectively. The rate of new patients and hypertension increases every year. In 2014, the rate of diabetes. There were 295.86, 248.49 hypertensive patients, and 37.88% and 38.85% respectively of renal complications. Guidelines for the care of chronic kidney disease. It has been diagnosed at an early stage. Aims to help to slow down the kidney. Maintaining quality. Good life of the patient, the duration of chronic renal failure lasts for the longest time because of the quality of life of patients with renal disease. Chronic starts to decrease when blackening. Diseases of the kidneys. Chronic 2-3 stage (moderate CKD) and will gradually decrease when entering chronic renal failure. Renal replacement therapy is needed to reduce the economic impact. Due to patient be more responsible for the health costs. As the disease progresses, Kidney Disease: Improving Global Outcomes, KDIGO presents guidelines. To manage or prevent kidney degeneration. Includes blood pressure control. Dietary control Blood glucose control and lifestyle modification which is the activity Patients are responsible for managing self-care behaviors by themselves, as well as participating in all activities to prevent renal degeneration. And multidisciplinary team Come to work together. Community-based engagement to create a care model for chronic kidney disease. 1) Home and family or caregivers of patients with chronic kidney disease. 2) Local government organization consists of the mayor of Nakhon Phanom, the village health volunteer community and the public health center. Nakhon Phanom Municipality 3) Tha Phra Kiat Tai Muang Community Health Center 4) Nakhon Phanom Hospital The primary care unit in the area consists of a professional nurse practitioner. Physical therapist Occupational therapists, academics, nutritionists, pharmacists and dialysis specialists. 5) Chronic kidney disease patients and chronic patients include diabetes and high blood pressure which the Parties It is the mainstay of action to reduce and slow chronic kidney disease in the community and there must be parallel, consistent and systematic communication between the community and the health care in the area. From the background and significance of the above problems. Researchers are interested in establishing a participatory approach to care for patients with chronic kidney disease. This research is aimed at creating Development of quality of care model for chronic kidney disease patients. The synthesis framework consists of the concepts, the processes, the strategies and the project objectives, the goals, the characteristics of the activities to be implemented. And the execution time and the execution time. This is a condition of the development of the model. For health promotion and prevention of chronic kidney disease. And components. The information will be the basis for developing the model for health promotion. In chronic disease patients in other health care settings. Therefore, this research has objectives was to establish a model for participation in the care of chronic kidney disease patients in Nakhon Phanom Municipality, Muang District, Nakhon Phanom Province.

### RESEARCH METHODOLOGY

This research a qualitative study was conducted in the Nakhon Phanom municipality, Muang district, Nakhon Phanom province. During the period from November 2016, this study included the research process. In-depth interviews Focus group discussions with experts Patients with chronic kidney disease at public health centers. Municipality of Nakhon Phanom Use of documentary research. To create a model for participation in the care of chronic kidney disease patients. The concept of synthesis consists of concepts, processes, strategies, and project / project frameworks to achieve a model of participation in the care of patients. Chronic kidney disease by target population (Population) used in this study. There are 12 patients in this group: Chronic 2 patients, Chronic Kidney Disease 2 patients. 1 local community leader (1 community leader), 1 local administrator, 1 chronic kidney specialist from Nakhon Phanom hospital, 1 exercise expert, 1 nutrition expert One psychologist and one representative from one health unit in Nakhon Phanom Municipality, Muang District, Nakhon Phanom Province. Tools used in research. Focus Group Discussion and data collection. From November 2019

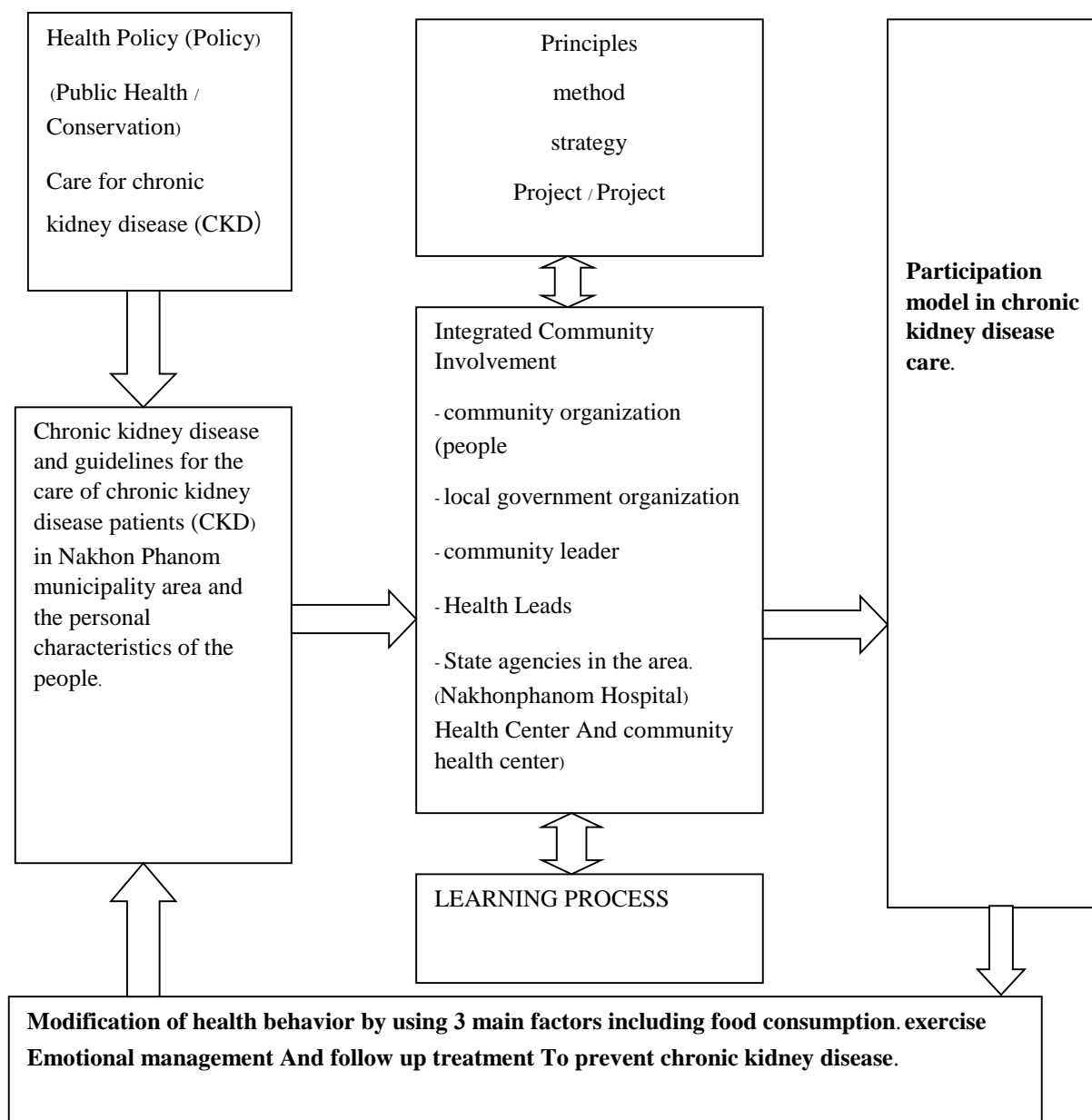
### RESEARCH RESULTS

The purpose of this research was to develop a model for participation in the care of chronic kidney disease patients in Nakhon Phanom municipality, Muang district, Nakhon Phanom province. In the care of chronic kidney disease. The Synthesis Framework consists of: 1. Concepts 2. Processes 3. Strategies 4. Project Plans (Objectives) The nature of activities to be implemented And the execution time on, Table 1  
Table 1. Participation patterns in chronic kidney disease patients with concepts, processes, and strategies.

Theme format	Principles	Process	Strategy / Technique	Project / Project
1. Health Management / Health Services	1. The agency can meet the needs of patients with chronic kidney disease thoroughly and fairly. 2. Units have outstanding quality management in accordance with good governance principles. 3. Develop internal control system. Emphasis on virtue	<pre> graph TD     A[Patients with chronic kidney disease are] --&gt; B[Chronic kidney disease Quarry Service]     A --&gt; C[Chronic kidney disease Knowledge and understanding To use the]     B --&gt; D[Chronic kidney disease G]     C --&gt; D     D --&gt; E[Slow down the kidney degeneration]     E --&gt; F[Renal function ACR SCr level EGFR level]     E --&gt; G[Other Clinical Outcomes BP FBS HbA1c level LDL levels] </pre>	1. Organize quality service units. Standard / Service Support Chronic Kidney Disease 2. System of service for excellence. There are activities to accommodate. Health behavior 3. 3. The system to send patients with chronic kidney to be effective.	<b>Health Care Center Development Project Municipality of Nakhon Phanom</b>
2. Reducing Threats to Health	The health threat of chronic kidney disease decreases.		- Development of qualified personnel. And skills in the work. - Have the right information system. Modern ready to use.	<b>Development of a network of peers to help care for chronic diseases.</b>

Theme format	Principles	Process	Strategy / Technique	Project / Project
3.Development of integrated participation and self-care of chronic kidney disease patients.	Chronic kidney disease patients have a healthy lifestyle.	<pre> graph BT     A[Chronic kidney disease patients are aware. Can change the behavior.] --&gt; C[Affiliated Health Network in a Stronger Community]     B[Healthcare Community Partners in Healthcare Management Good] --&gt; C </pre>	<ul style="list-style-type: none"> <li>- Create a participatory process and Develop a health network.</li> <li>- Promote behavioral change. Health and self-care of chronic kidney disease patients.</li> <li>- Organizing care and strengthening activities. Holistic health of the people.</li> <li>- Strengthening of the Parties Health</li> <li>- Support the club's activities. "People love kidney.</li> </ul>	<b>Kidney Care Partnerships</b>

The pattern of participation in the care of chronic kidney disease patients can be summarized as a conceptual chart. As shown in Chart 1:Diagram 1 Diagram of a chronic kidney disease model. On the basis of integrated community participation.



## DISCUSSION

The results of this study show that. Model of participation in chronic kidney disease care. The nursing model was community-based. And local government organizations. There is action between the plans. Pilot projects also contribute to health promotion. Prevention of chronic kidney disease in Nakhon Phanom Municipality. Nakhon Phanom Province It very good Chronic Kidney Disease Care Formulation. On the basis of the community participation in the building. The concept consists of (1) Concepts, (2) Processes (3) Techniques (4) Project Plans (Objectives) Activities to be performed And the execution time, there are two major principles: 1. Policy (Public Health / Conservation). CKD care. The health services of public health units can be met. Needs of chronic kidney disease patients. Thorough and thorough. And reduce the threat to the health of patients with chronic kidney disease. The second principle is the community and the linkage of culture and personal

characteristics of patients with chronic kidney disease. (Traditional), which uses strategies by organizing activities and supporting behavioral change. The health and self-care of patients with chronic kidney disease consists of eating. Exercise. Emotional management and medical treatment by culture. And personal characteristics of chronic kidney disease patients. In this study, it was found that caregiving of patients, particularly those with chronic diseases, was at the point of change. Patient-centered care and community-based support services from relevant agencies. People in the community pay close attention to the public health agencies, such as Thanasuk province, the health center, the community hospital. Local administration. Monastery and role of monks Local radio academies in the community are very involved in the development of the system. Health care and success factors include (1) empowerment By empowerment by educating people with chronic disease care experiences in communities, community leaders, and relevant network partners. (2) AIC participatory engagement by initiating collaborative thinking processes. And get benefits. The network partners joined. Continuing activities (3) Continuing commitment of team, personnel, community leaders and network partners. The process is the same. (4) Team building, personnel and networking. The result of reaching the target audience to understand. In the management of chronic disease. (5) Policy support at all levels of management. This is a powerful level of motivation. In the activity. As a result, the development model of community participation in care for chronic disease patients.

## SUGGESTIONS

### 1. Recommendations for applying research results.

1.1 is the basic information for the preparation of activities / programs / projects for the provision of health services in the care of chronic kidney disease patients efficiently

1.2. Provide guidelines for education and guidelines for public health officials. To promote health. And slow down the kidney function in patients with chronic kidney disease.

1.3. In a study on the need to modify health behaviors and the involvement of network partners in the care of other chronic diseases.

### 2. Suggestions for future research.

This study was conducted at the beginning of the study. Model of participation in chronic kidney disease care. In Nakhon Phanom Municipality Nakhon Phanom Province Should follow the results. Medical treatment to reduce the severity and prevent the occurrence of chronic renal failure in all patients in Nakhonphanom district or apply this model to the district or. Other provinces

## REFERENCES

- [1] Nutrition Division, Ministry of Health. (2006). *Health behavior and self-reliance*. Bangkok: Community Cooperative Society of Thailand.
- [2] Department of Health Service Support. Ministry of Public Health. (2013) *Behavioral Surveillance System Health to change risk behavior* (3 am 2) of normal / risk / sick. Diabetes mellitus
- [3] High blood pressure in Thailand, Nonthaburi: Ministry of Public Health. (2016). *Bureau of Non-Communicable Disease Control Department, Ministry of Public Health A Practical Guide to Managing Kidney Disease Chronic (CKD) in diabetic patients and hypertension*. 1st edition. Bangkok: Printing Workshops. Veterans Affairs.
- [4] Model of care system for risk patients. (2016). Chronic kidney disease. *Journal of Nursing Science*, Vol. 34 No. 1 (January - March 2016).
- [5] Chitip Chanmanee. (2015). Community Capacity to Prepare Communities to Resolve Dengue Haemorrhagic Stroke in Amphoe Bo Songkla Province. *Journal of Social and Community Research Mahasarakham Rajabhat University*. Year 2 Issue 4 (February - July 2015)
- [6] Sompong Chanwat, et al. (2014). "Development of Community Participation Model". In the care of chronically ill patients: case study of the Epicurean Health Service Network. Mahasarakham province". *Journal of Public Health*, Vol. 23, No. 3 (May - June 2014).
- [7] Ministry of Public Health. (2012). *Community health behavior modification*. Department of Health Health Services. Source: [http:// www. Hed.go.th](http://www.Hed.go.th). [August 20, 2012]
- [8] *Reporting System 43 HOSxP PCU Program Municipality of Nakhon Phanom Muang District*, Nakhon Phanom Province [18 March, 2016]
- [9] Creer, L.T. (2000). *Self-management of chronic illness*. Handbook of self-regulation.
- [10] California: Academic. 601-629. Green L.W and M.W. Kreuter (1991). *Envioronmental Approach 2<sup>nd</sup>* Toronto: May Field Publishing Company.

## ANTIBIOTIC SENSITIVITY OF AEROMONAS HYDROPHILA ISOLATED FROM DISEASED NILE TILAPIA (OREOCHROMIS NILOTICUS)

Chutharat Kanchan <sup>a,\*</sup>, Puttachat Imjai<sup>a</sup>, Nukoon Kanchan<sup>b</sup> and Aonanong Chaiyara<sup>c</sup>

<sup>a</sup> Aquaculture Technology Program, Faculty of Agricultural Technology, Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000

<sup>b</sup> Animal Production Technology Program, Faculty of Agro-Industrial Technology, Kalasin University, Kalasin, Thailand 46000

<sup>c</sup> Fisheries Program, Faculty of Agriculture Technology, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000. Thailand

Corresponding author. Tel.: 043-725439; fax: 043-725439 E-mail address: cmunchan@yahoo.com

### ABSTRACT

The purpose of this study is to examine the antibiotic sensitivity of *Aeromonas hydrophila* isolated from diseased Nile tilapia. The antibiotic susceptibility test of nine strains of *Aeromonas hydrophila* isolated from diseased Nile tilapia was determined by disk diffusion method. Thirteen antibiotic drugs were investigated namely amoxycillin, ampicillin, ceftiofur, chloramphenicol, ciprofloxacin, erythromycin, gentamicin, kanamycin, novobiocin, oxytetracycline, norfloxacin, sulphamethoxazole-trimethoprim and trimethoprim. All strains of *A. hydrophila* were resistant to amoxycillin, ampicillin, erythromycin, gentamicin, novobiocin and oxytetracycline, however, all bacterial strains were sensitive to ceftiofur, chloramphenicol, ciprofloxacin and norfloxacin. All strains were intermediate susceptible to kanamycin, sulphamethoxazole-trimethoprim and trimethoprim. It can be concluded that ciprofloxacin and norfloxacin were an effective drug for the treatment of Nile tilapia infected with *A. hydrophila*.

**KEYWORDS:** *Aeromonas hydrophila*, antibiotic drugs, antibiotic sensitivity, Nile tilapia



## INTRODUCTION

Nile tilapia (*Oreochromis niloticus* spp.) is an economical and important species of freshwater fish in Thailand. In the present time, industrial production is an intensive fish culture system due to the increase of human populations. Several fish species have been infected with *Aeromonas hydrophila* including in freshwater fish *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*, *Anabas testideneus*, *Channa punctatus*, *Channa marulius* [1], *Clarias gariepinus* [2], *Clarias batrachus* [1, 3], *Piaractus mesopotamicus* and *Oreochromis niloticus* [4], *Tilapia nilotica* [3], *Clarias* spp. [5], in ornamental fish such as *Carassius auratus* [6, 7]. Bacterial diseases treatments and controls were generally used antibiotic drugs, usually by bath or mixed as feed additive. The major antimicrobial drugs have been used in aquaculture for example sulphonamides, penicillins, macrolides, quinolones, phenicols and tetracyclines [8]. The problems of inappropriate use of antibiotics has caused in increasing antibiotic resistance among pathogenic bacteria due to the farm owner generally used antibiotics in all period of fish even through fish healthy or unhealthy. According to this problem, it will be meaningful to discover the effective drugs for cure the diseased fish. The present study was aimed to determine the antibiotic sensitivity against the *A. hydrophila* which isolated from diseased Nile tilapia.

## MATERIALS AND METHODS

### Sampling of diseased fish

Five fish samples were monthly collected from two local farm culture Kosumpisai District, Maha Sarakham Province during October to December 2013. A total of 30 fish were examined. Nile tilapia were average 5.22 g in body weight and 7.20 cm in body length and then transported to the laboratory of aquaculture technology program for bacterial investigations.

### Isolation and identification of bacteria

Kidneys and liver from diseased fish were aseptically collected into Tryptic Soy agar (TSA, Difco, USA) plates and incubated at 30 °C until pure cultures were obtained. Purified cultures were inoculated onto TSA plates and kept at 4°C for stock. For identification of the isolates; the basic tests namely Gram's stain, morphology, oxidase test and catalase were observed. Further identification was performed using the commercial API 20E (bioMerieux, France). Finally, nine strains of *A. hydrophila* were chosen for antibiotic sensitivity test.

### Antibiotic susceptibility testing

Thirteen antibiotic drugs including amoxycillin (AML; 10µg), ampicillin (AMP; 10µg), cefoxitin (FOX; 30 µg), chloramphenicol (C; 30µg), ciprofloxacin (CIP; 5µg), erythromycin (E; 15µg), gentamicin (CN; 10µg), kanamycin (K; 30µg), novobiocin (NV; 30µg), oxytetracycline (OT; 30µg), norfloxacin (NOR; 10µg), sulphamethoxazole-trimethoprim (SXT; 25 µg) and trimethoprim (W; 5µg) were determined against the bacteria, according to the Clinical Laboratory Standards Institute [9] (Table 1). The antibiotic susceptibility was recorded by mean of inhibition zone diameter of each drug by vernia caliper measurement.

## RESULTS

The nine strains of *A. hydrophila* were all resistant to amoxicillin, ampicillin, erythromycin, gentamicin, novobiocin and oxytetracycline. In addition, all strains showed intermediate to kanamycin, sulphamethoxazole-trimethoprim (SXT) and trimethoprim. However, all strains were susceptible to cefoxitin, chloramphenicol, ciprofloxacin and norfloxacin as shown in Table 1.

**Table 1** Antibiotic susceptibility of 13 drugs against nine strains of *A. hydrophila*

Antibiotic	Disk content of antibiotic (µg)	R	I	S	<i>A. hydrophila</i>
AML	10	<26	n/a	>27	R
AMP	10	<13	14-16	>17	R
FOX	30	<14	15-17	>18	S
C	30	<12	13-17	>18	S
CIP	5	<15	16-20	>21	S
E	15	<13	14-18	>19	R
CN	10	<12	13-14	>15	R
K	30	<13	14-17	>18	I
NV	30	<14	15-16	>17	R



Antibiotic	Disk content of antibiotic (µg)	R	I	S	<i>A. hydrophila</i>
OT	30	<15	15-18	>18	R
NOR	10	<12	13-16	>17	S
SXT	25	<10	11-15	>16	I
W	5	<10	11-15	>16	I

Remark: S, susceptible; R, resistant I, intermediate, Applied from CLSI (2008)

### CONCLUSIONS AND DISCUSSION

*Aeromonas hydrophila* has been reported to cause a bacterial disease in several fish species as mentioned by [1, 2, 3, 4, 7]. The antibiotic resistance of *A. hydrophila* has been investigated in many authors. In the current study, *A. hydrophila* isolated from Nile tilapia were resistant to amoxycillin, ampicillin, erythromycin, gentamicin, novobiocin and oxytetracycline. This result was similar to [4], except erythromycin showed susceptible and this author did not examine gentamicin and oxytetracycline. The antibiotic resistance of all strains *A. hydrophila* isolated from *Clarias* spp. showed highly resistant to amoxycillin, novobiocin and trimethoprim [5] which corresponded in the present study. However, according to the bacteria showed susceptible to gentamicin in the present study which similar as [10]. In the other hand, all bacterial strains in this study showed high sensitive to cefoxitin, chloramphenicol, ciprofloxacin and norfloxacin which corresponded with reported of chloramphenicol and norfloxacin in [4] and ciprofloxacin in [3, 11].

The effective drugs against *A. hydrophila* were ciprofloxacin and norfloxacin. Although chloramphenicol was effective against bacteria, but it was so toxic to human cells that its uses were restricted [12]. However, *A. hydrophila* isolated from *Clarias* spp. showed multi-resistance [5]. It was contrast in the present study because may be the different in fish species. In addition, the use of antibiotic drugs in aquaculture has been important due to its can induce the resistance bacteria in environments or fish [13]. Reducing the antibiotic resistance of bacterial pathogens in fish or environments has to examine for antibiotic susceptibility test before treatment in diseased fish.

In conclusion, *Aeromonas hydrophila* has been reported as bacterial pathogen in several fish species. From these results can be suggested that ciprofloxacin and norfloxacin were effective antibiotics for cure the bacterial pathogens caused by *A. hydrophila* in diseased Nile tilapia.

### ACKNOWLEDGEMENT

The authors are grateful thanks to research grant of Rajabhat Maha Sarakham University for the research support.

### REFERENCES

- [1] Samal, S. K. , Das, B. K. and Pal, B. B. (2014). Isolation, biochemical characterization, antibiotic susceptibility study of *Aeromonas hydrophila* isolated from freshwater fish, *International Journal of Current Microbiology and Applied Sciences*, 3, 259-267.
- [2] Laith, A.R. and Najiah, M. (2013). *Aeromonas hydrophila*: antimicrobial susceptibility and histopathology of isolates from diseased catfish, *Clarias gariepinus* (Burchell), *Journal of Aquaculture Research and Development*, 5, 1-7.
- [3] Ashiru, A.W., Uaboi-Egbeni, P.O., Oguntowo, J.E. and Idika, C.N. (2011). Isolation and antibiotic profile of *Aeromonas* species from tilapia fish (*Tilapia nilotica*) and catfish (*Clarias betrachus*), *Pakistan Journal of Nutrition*, 10, 982-986.
- [4] Belém-Costa, A. and Cyrino, J.E.P. (2006). Antibiotic resistance of *Aeromonas hydrophila* isolated from *Piaractus mesopotamicus* (Holberg, 1887) and *Oreochromis niloticus* (Linnaeus, 1758). *Scientia Agricola*, 63, 281-284.
- [5] Kanchan, C., Imjai, P., Kanchan, N. and Chantabut, L. (2016). Antibiotic resistance of *Aeromonas hydrophila* isolated from diseased catfish. *Proceedings 6<sup>th</sup> International Conference on Sciences and Social Sciences*, Rajabhat Maha Sarakham University, pp. 891-894.
- [6] Jongjareanjai, M., Assawawongkasem, N. and Chansue, N. (2009). In vitro Antibiotic Susceptibility of *Aeromonas hydrophila* isolated from disease ornamental Fish, *The Thai Journal of Veterinary Medicine*, 39, 225-229.
- [7] Dias, C., Mota, V., Martinez-Murcia, A. and Saavedra, M. (2012). Antimicrobial resistance patterns of *Aeromonas* spp. Isolated from ornamental fish, *Aquaculture Research and Development*, 3, 1-4.

- [8] Sapkota, A., Sapkota, A.R., Kucharski, M., Burke, J., McKenzie, S. and Walker, P. (2008). Aquaculture practices and potential human health risks: current knowledge and future priorities. *Environment International*, 34, 1215-1226.
- [9] Clinical and Laboratory Standards Institute. (2008). *Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for bacteria isolated From Animals: Approved Standard-Third Edition M31-A3*. Waune, PA, USA.
- [10] Sarder, H., Khan, T., Saha, M.L., Punom, N.J., Mandal, S.C. and Rahman, M.S. (2016). Prevalence and antibiotic susceptibility of *Aeromonas hydrophila* isolated from freshwater fishes, *Journal of Fisheries*, 4, 411-419.
- [11] Hatha, M., Vivekanandhan, A.A., Julie Joice, G. and Christol. (2005). Antibiotic resistance pattern of motile aeromonads from farm raised fresh water fish, *International Journal of Food Microbiology*, 98, 131-134.
- [12] Cowan, M.K. and Talaro, K.P. (2006). *Microbiology a system approach*. 2<sup>nd</sup> Edition. McGraw-Hill Company, Inc. New York. pp 357.
- [13] Asari, M., Rahim, E., and Raissy, M. (2011). Antibiotic susceptibility and resistance of *Aeromonas* spp. isolated from fish. *African Journal of Microbiology Research*, 5, 5772-5775.

## STUDY OF PHYSIOLOGICAL RESPONSES OF CHALOLAIS PUREBREED

Tichara pearthong, Sittisak Khampa and Uthai koatdoke

*Rajabhat Mahasarakham University, Mueang Mahasarakham, 44000, Thailand*  
*Corresponding email; sittisak\_k sittisak\_k2003@yahoo.com*

### ABSTRACT

The physiological responses to heat stress of cattle. Twelve cattle Brahman (*Bos indicus*) and Charolais (*Bos taurus*) crossbred heifers, 2-3 years was placed outdoor with partial roof. Samples were collected, ambient temperature, relative humidity and physiological responses, including rectal temperature, respiration rate were examined at 06.00 and 14.00. The responses of physiological responses of Brahman and Charolais was increased according to the increase of THI. However, the changes in rectal temperature, respiration rate each point of THI between of Brahman and Charolais were different ( $P < 0.05$ ). In conclusion, this study could confirm the different in physiological responses to control the body temperature under heat stress.

**Keywords:** Chalolais pure breed, Physiological responses, THI.

## INTRODUCTION

High temperatures raise the concern of heat stress on cattle. Hot weather and high humidity can reduce breeding efficiency, milk production, feed intake, weight gains, and sometime cause death. (Collier et al., 1982) Charolais pure breed raised in Thailand could be affected of heat stress. This study was investigated the heat stress affected on physiological responses.

## MATERIALS AND METHODS

Twelve cattle Brahman (*Bos indicus*) and Charolais (*Bos taurus*) crossbred heifers, 2-3 years. were placed outdoor with partial roof. Samples were collected. Ambient temperature, relative humidity and physiological responses, including rectal temperature, respiration rate were examined at 06.00 and 14.00.

### Statistical analysis

The rectal temperature and respiration rate were conducted as a paired t-test with two treatments. Analysis were analysed using the General Linear Model (GLM) procedures.

## RESULTS AND DISCUSSION

**Table 1** Ambient temperature (AT), Humidity (RH), temperature humidity index (THI)

		AT (°C)	RH (%)	THI
<b>Summer</b>		6.00	28.5	<b>84</b>
		14.00	38.5	<b>44</b>
<b>Rainy</b>		6.00	25.9	<b>91</b>
		14.00	30.3	<b>85</b>
<b>Winter</b>		6.00	18.8	<b>90</b>
		14.00	29.6	<b>58</b>

**Table 2** Rectal temperature (RT) Respiration rate (RR) of Brahman (BH) and Charolais (CH)

		RT (°C)	BH RR	RT (°C)	CH RR
Summer	06.00	38.2±0.1	26.5±1.3	38.5±0.2	33.9±2.1
	14.00	38.5±0.2	37.7±1.3	39.0±0.3	49.7±3.8
Rainy	06.00	38.1±0.1	24.2±0.7	38.5±0.2	32.3±1.5
	14.00	38.4±0.1	30.5±1.4	38.7±0.2	40.2±4.6
Winter	06.00	36.9±0.4	28.7±0.7	37.8±0.3	26.9±4.3
	14.00	37.5±0.4	26.2±0.7	38.5±0.3	39.2±5.7

Under heat stress situation THI >72 (Gauhan et al., 2000). This study found that the mechanism to dissipate heat from their body were different between breeds. Brahman could be adapted to heat condition, they has ability to control their body temperature than Charolais breed. Charolais breed had higher rectal temperature than Brahman, they used respiration to dissipate heat from their body. The respiration rate could be the parameter of determination and evaluation of heat stress. (Du Preez, 2000).

## CONCLUSION

Rectal temperature is indicator for heat tolerance. Brahman (*Bos indicus*) has heat tolerance than Charolais (*Bos taurus*). The Charolais use respiration to dissipate heat from their body.

### ACKNOWLEDGEMENT

This work was supported by MahaSarakhm Livestock Research Breeding center And RajabhatMahasarakham University. I would like to thank my thesis adviser Asst Prof Dr. UthaiKoatdokaAndAssoc Prof Dr. Sittisakkhampa co-advisor. The door to Asst Prof Dr. UthaiKoatdokaAndAssoc Prof Dr. Sittisakkhampa office was always open whenever I ran into a trouble spot or had a question about my research or writing. They consistently allowed this paper to be my own work, but steered me in the right the direction whenever he thought I needed it.

### REFERENCES

- [1] Collier, R. J., Beede, D. K. Thatcher, W. W. Israel, L. A. and C. J. Wilcox. 1982. Influences of environment and its modification on dairy animal health and production. *Journal of Dairy Science*. 65: 2213 – 2227.
- [2] Davis, M. S., T. L. Mader, S. M. Holt and A. M Parkhurst. 2003. Strategies to reduce feedlot cattle heat stress effect on tympanic temperature. *Journal Animal Science*. 81: 649 – 661.
- [3] Du Preez, J.H. 2000. Parameters for determination and evaluation of heat stress in dairy cattle in South Africa. *The Onderstepoort Journal of Veterinary Research*. 67 : 263 – 271.
- [4] Dutt, R. H. 1993. Critical period for early embryos motility in ewes exposed to high ambient temperature. *Journal Animal Science*. 22: 713 – 719.
- [5] Gauhan, J. B., S. M. Holt, G. L. Hahn, T. L. Mader, and R. A. Eigenberg. 2000. Respiration rate, it is good measure of heat stress in cattle. [www://nal.usda.gov/ttic/tektran/data/000011/15/0000111590.html](http://nal.usda.gov/ttic/tektran/data/000011/15/0000111590.html).
- [6] Geisert, R. D., M. T. Zary and B. G. Biggers. 1988. Effects of heat stress on conceptus and uterine secretion in the bovine. *Theriogenology*. 29 : 1075 – 1082.
- [7] Hammond, A. C., T. A. Olson, C. C. Chase, Jr., E. J. Bowers, R. D. Randel, C. N. Murphy, D. W. Vogt and [8] A Tewolde 1996. Heat tolerance in two tropical adapted *Bostaurus* breeds, Senepol and Romosinuano, compared with Brahman, Angus and Hereford cattle in Florida. *Journal of Animal Science*. 74 : 295 – 303.

**PRELIMINARY INVESTIGATION OF ANTAGONISTIC PROPERTIES OF *GLIOCLADIUM* SP.  
AGAINST CHILLI ANTHRACNOSE DISEASE CAUSED BY *COLLETOTRICHUM ACUTATUM***

Kanchalika Ratanacherdchai<sup>a\*</sup>, Taweessab Chaiyarak<sup>a</sup> and Nattachai Juntachum<sup>b</sup>

<sup>a</sup>*Faculty of Agricultural Technology, Rajabhat Maha Sarakham University,  
Maha Sarakham 44000, Thailand*

<sup>b</sup>*Program in Research and Curriculum Development, Faculty of Education,  
Rajabhat Maha Sarakham University, Maha Sarakham 44000, Thailand  
Correspondence e-mail: kanchalika.ra@rmu.ac.th*

**ABSTRACT**

*Gliocladium* sp. was proved to be antagonist to *Colletotrichum acutatum* causing chilli anthracnose disease. Fourteen isolates of *Colletotrichum* spp. were proved for pathogenicity. With this, *C. acutatum* J06 gave the highest virulence for disease incidence. *Gliocladium* sp. was isolated from rhizosphere soil from agricultural field and tested against mycelial growth and sporulation of *C. acutatum* J06 by bi-culture test showed that *Gliocladium* sp. could inhibit mycelial growth and sporulation at 60.83 and 97.21%, respectively. Crude extracts were extracted from *Gliocladium* sp. with hexane, ethyl acetate and methanol. Methanol crude extract inhibited the sporulation at the concentration of 500 µg/ml as 93.69%. It is proved that *Gliocladium* sp. become the promising antagonistic fungus as a biological agent against plant pathogenic fungus.

**KEYWORDS:** Anthracnose disease, Antagonistic fungi, Biological control

## INTRODUCTION

*Colletotrichum* spp. was reported as pathogenic fungi causing chilli anthracnose disease including *C. acutatum*, *C. capsici*, and *C. gloeosporioides* which reported to cause chilli anthracnose disease in Thailand [1,2,3,4,5]. Anthracnose disease can reduce both quality and quantity of chilli yield up to 50% [6]. This disease can be reduced by using one of, or integration of, the following: resistant cultivars, cultural practices, biological control and chemical fungicides. Although, the use of chemical fungicides such as difenoconazole is an effective way to control anthracnose disease [7]. Not only chemical way but also biological control, an additional method, can help in reducing the disease incidence to economically level. Moreover, biological control is a concomitant decrease in the use of chemicals. Because of the use of chemical fungicides has resulted in the residual toxic including risks to the environment and consumers as well as induction of chemical resistant pathogens. Currently, the researcher have been considerable efforts to find biological control agents for controlling anthracnose disease. Biological control implicates the use of natural products such as non-pathogenic microorganisms. These microorganisms are able to inhibit the growth of pathogen and reduce the disease symptom. Antagonistic fungi such as *Trichoderma* spp., *Chaetomium* spp., *Gliocladium* sp. and *Emericella* spp. are reported as effective bio-agent for growth inhibition of many plant pathogens such as *Colletotrichum*, *Phytophthora* and *Fusarium* [8,9,10,11,12,13]. This information would valuable to further study on biological control using antagonistic fungi. The aim of this research was to test antagonistic fungus, *Gliocladium* sp. to inhibit *C. acutatum* causing chilli anthracnose disease.

## MATERIALS AND METHODS

### Isolation of *Colletotrichum* species

*Colletotrichum* strains were isolated from anthracnose symptom of infected fruits of chilli (*Capsicum annum*) from agricultural field in Kalasin province, Thailand. Isolation was carried out by two methods depending on fungal sporulation on the sample. Conidia were picked directly from sporulating samples and then cultured on water agar (WA). The *Colletotrichum* isolates were then transferred to plates of potato dextrose agar (PDA). Alternatively, isolates were obtained from fruit without visible sporulation by culturing three 5 mm×5 mm pieces of tissue taken from the margin of infected tissue on WA. Before culturing on WA, the surface of infected tissues was sterilized by dipping in 1% sodium hypochlorite for 3 minutes, and rinsed three times with sterile water. The growing edge of any fungal hyphae developing from the disease tissue was then transferred aseptically to PDA [1]. The pure cultures which grown on PDA were identified under compound microscope and multiplied on PDA for further study.

### Pathogenicity testing

Preparation of inoculum – Pure cultures of each *Colletotrichum* isolate were grown on PDA for 14 days at room temperature (28 – 30°C). Plugs (5 mm diameter) were cut from actively-sporulating areas near to colony periphery by using a sterilized cork borer.

Preparation of hosts – Freshly harvested chilli fruits were obtained from the field. Chilli fruits were washed under running tap water for 60 seconds followed by surface sterilization by immersing the fruits in 70% ethanol for 3 minutes, 1% sodium hypochlorite solution for 5 minutes and then rinsed three times in sterile distilled water for 2 minutes and dried with sterile tissue paper and then air drying.

Inoculation – Surface sterilized fruits were placed in a plastic box with tissue paper then sprayed with sterilized water to maintain at least 95% relative humidity [2]. The samples were inoculated using the plug inoculation method [4] which included pin-pricking the fruits to a 1 mm depth with a sterile needle in the middle portion of fruit and then placing agar plug onto the wound. Wounded chilli fruits inoculated by placing only a PDA plug over the wound were used as a control. The inoculated samples were incubated in the containers at room temperature (28 – 30°C) for 10 days.

Lesion development on fruit were assessed by measuring the lesion diameter in centimeters on each fruit; and analyses of variance ( $P < 0.05$ ) with DMRT for multiple range tests from statistic software using completely randomized design (CRD) with four replications. Then a most pathogenic isolate was used for further study.

### Isolation of *Gliocladium* sp.

*Gliocladium* sp. strains were isolated from rhizosphere soil from agricultural field in Kalasin province, Thailand using soil plate technique. A hundred milligrams of sample were grown on PDA in the dark environment. The different morphological colonies were transferred on PDA to obtain pure culture and identified under compound microscope. Pure cultures of the *Gliocladium* sp. were multiplied on PDA for further study.



### Bi-culture antagonistic test

In this experiment, bi-culture antagonistic test was conducted to evaluate *Gliocladium* sp. against *Colletotrichum* isolate. Pathogen isolate used in this study was obtained from pathogenicity test which was the most aggressive isolate. *Gliocladium* sp. isolate used in this was isolated from rhizosphere soil from agricultural field in Kalasin province, Thailand using soil plate technique. Hyphal plugs of pathogen isolate and *Gliocladium* sp. were placed to the middle of a half of petri dishes (9 cm diameter) and incubated at room temperature (28 – 30°C). Data were collected to measure mycelial growth and sporulation of *Colletotrichum* isolate then computed as percent growth inhibition. The mycelial growth was examined by measuring the colony diameter of *Colletotrichum* isolate. While, the sporulation of *Colletotrichum* isolate was examined by counting the number of spores using hemacytometer. Percentage of growth inhibition (PGI) of pathogen was evaluated in the formula  $(cc - cd) / cc \times 100$ ; cc equals colony diameter/ number of spores of plant pathogenic fungi in control petri dish and cd equals colony diameter/ number of spores of plant pathogenic fungi in bi-culture petri dish [13]. Data were computed analyses of variance ( $P < 0.05$ ) with DMRT for multiple range tests from statistic software using completely randomized design (CRD) with four replications.

### Test for antifungal metabolites

The microbial antagonist, *Gliocladium* sp. was cultured in Potato dextrose broth (PDB) for 30 days, and then filtered and dried mycelium mats were collected for extraction with hexane, ethyl acetate and methanol using rotary vacuum evaporator. The crude extracts were tested in petri dishes which mixed to PDA at concentrations 0 and 500 µg/ml. Cultures of plant pathogenic fungus, *Colletotrichum* sp. was grown for 7 days on PDA. Each pathogen was separately transferred the agar plug (0.3 cm diameter) to the center of petri dish containing crude extracts of microbial antagonist and incubated at room temperature. After 4 days of incubation, colony diameter and sporulation were recorded and computed growth inhibition (GI) and analyses of variance using completely randomized design (CRD) with four replications [10].

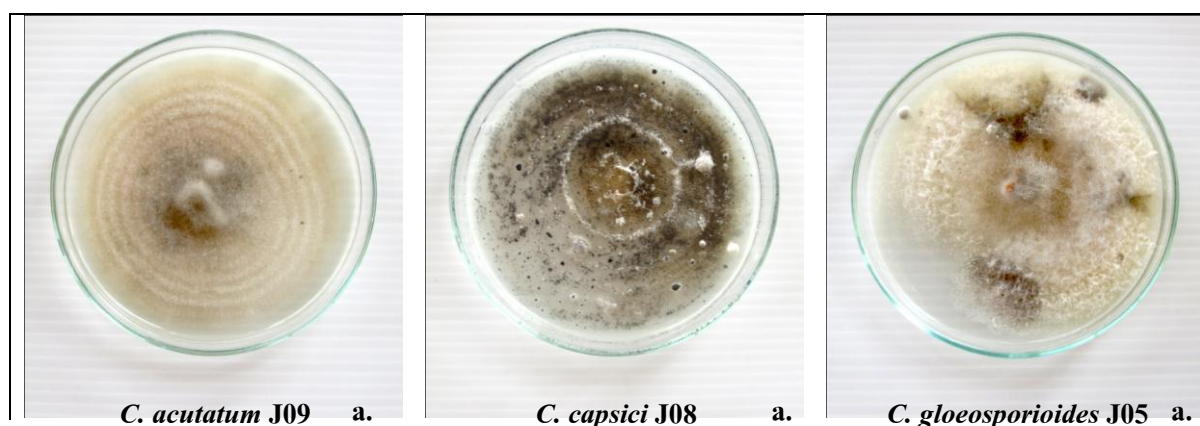
## RESULTS AND DISCUSSION

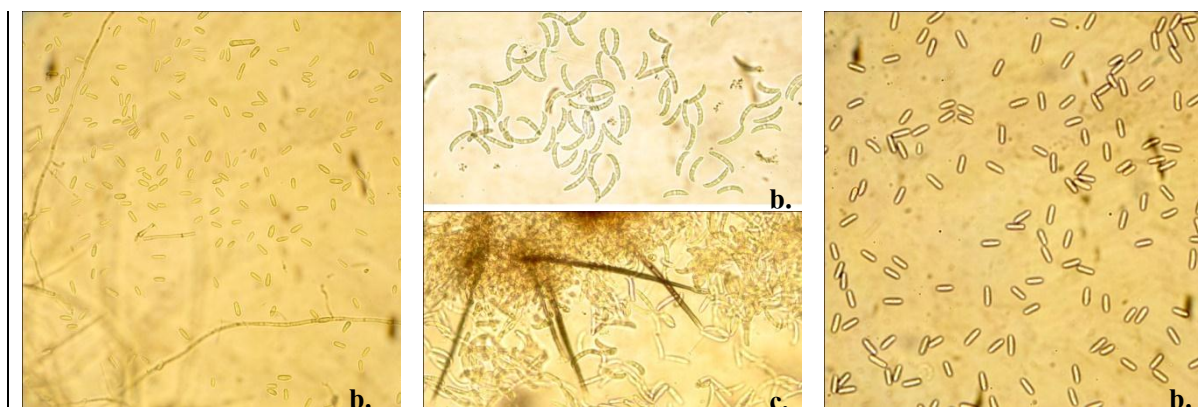
### Isolation of *Colletotrichum* species

Fourteen isolates of the anthracnose pathogen of chilli were isolated and identified as *Colletotrichum* spp. including 3 species, *C. acutatum*, *C. capsici* and *C. gloeosporioides* (Table 1 and Fig. 1). With this, these pathogens were reported causing anthracnose disease of chilli in Thailand [3,5,13].

**Table 1** Isolates of the anthracnose pathogen of chilli

Species	No. of isolate	Isolate
<i>Colletotrichum acutatum</i>	5	J01, J06, J07, J09, J14
<i>Colletotrichum capsici</i>	7	J02, J04, J08, J10, J11, J12, J13
<i>Colletotrichum gloeosporioides</i>	2	J03, J05





**Fig. 1** *Colletotrichum* isolates; a. colony on PDA at 10 days, b. conidia, c. setae

### Pathogenicity testing

All isolates of *Colletotrichum* spp. were proved to be pathogenicity to the host species. The inoculated fruits showed the anthracnose symptoms within 7 days after inoculation. Symptoms were found as small brown spots initially appeared on wound, and the spots gradually enlarged and coalesced [5]. The result showed that isolate of *C. acutatum* J06 gave the most aggressive causes to anthracnose symptom (Fig. 2).

### Bi-culture antagonistic test

Bi-culture showed that *Gliocladium* sp. could inhibit *C. acutatum* J06 in term of mycelial growth (60.83%) and sporulation (97.21%) (Fig. 3). There are several reports on the potential use of microbial antagonists for biological control of anthracnose disease caused by *Colletotrichum* spp. such as *Emericella* spp., *Eurotium* sp. and *Rhizopus* sp. [10,13]. But this result was also expressed the potential of *Gliocladium* sp. to control chilli anthracnose disease caused by *C. acutatum*.

### Test for antifungal metabolites

The inhibitory effect of antifungal metabolites from *Gliocladium* sp. on mycelial growth *C. acutatum* J06 in the medium amended with crude extract at the concentration of 500 µg/ml showed that the methanol crude extract strongly inhibited the sporulation as 93.69%. The antifungal metabolite extracted from ethyl acetate, methanol and hexane could inhibit the mycelial growth of 26.00, 22.25 and 15.75%, respectively. The ethyl acetate and hexane extracts inhibited the sporulation of *C. acutatum* J06 as 84.47 and 72.82%, respectively (Table 2 and Fig. 4). Similar results reported by Talubnak and Soyong [10] that the methanol crude extract from *Emericella nidulans* strongly inhibited the sporulation of *C. gloeosporioides* VP8 causing vanilla anthracnose disease at the concentration of 1,000 µg/ml with 95.85%.

**Table 2** Effect of crude extracts of *Gliocladium* sp. for inhibition of mycelial growth and sporulation of *Colletotrichum acutatum* J06

Treatment	Mycelial growth		Sporulation	
	Colony diameter (cm)	%MGI <sup>1/</sup>	Spore (×10 <sup>4</sup> spores/ml)	%SL <sup>2/</sup>
Control (0 µg/ml)	5.00 <sup>a</sup>	0.00	10.30 <sup>a</sup>	0.00
Hexane extract	4.21 <sup>b</sup>	15.75 <sup>b</sup>	2.80 <sup>b</sup>	72.82 <sup>c</sup>
Ethyl acetate extract	3.70 <sup>c</sup>	26.00 <sup>a</sup>	1.60 <sup>c</sup>	84.47 <sup>b</sup>
Methanol extract	3.89 <sup>c</sup>	22.25 <sup>a</sup>	0.65 <sup>c</sup>	93.69 <sup>a</sup>
F-test	**	*	**	**
CV. (%)	4.17	18.98	16.87	5.51

<sup>a,b,c</sup> Average of four replications. Means followed by the same letter in a column were not significantly different by DMRT at P = 0.05.

<sup>1/</sup> MGI = mycelial growth inhibition

<sup>2/</sup> SL = sporulation

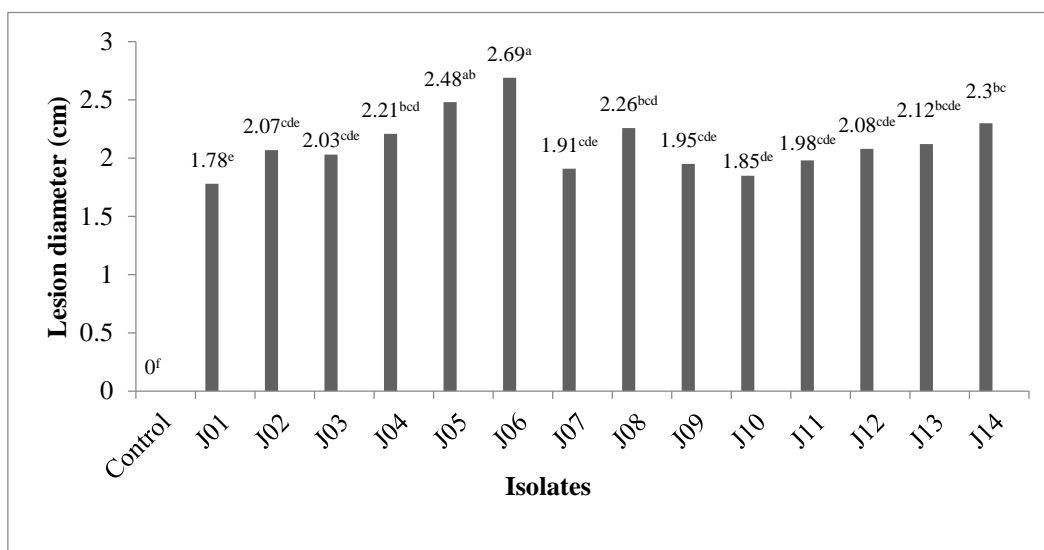


Fig. 2 Lesion diameter of chilli anthracnose disease causing by *Colletotrichum* spp. on chilli fruits

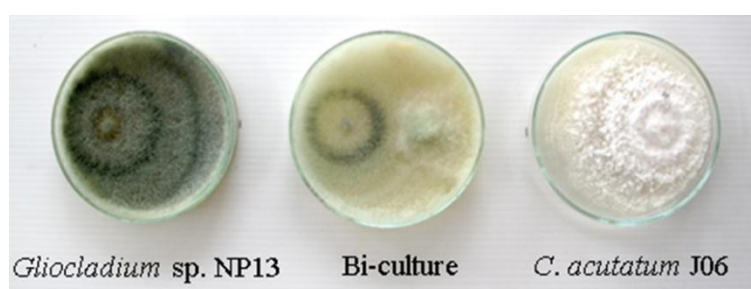
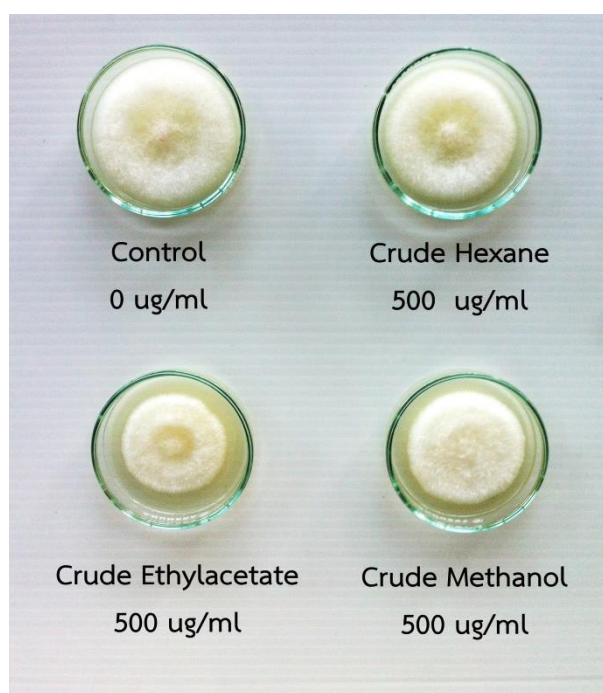


Fig 3 Bi-culture antagonistic test between *Gliocladium* sp. and *Colletotrichum acutatum* J06



**Fig. 4** Testing for crude extract from *Gliocladium* sp. to inhibit *Colletotrichum acutatum* causing chilli anthracnose disease

### CONCLUSION

It could be concluded from the results of this study that the anthracnose pathogens of chilli were identified as *Colletotrichum* spp. including 3 species; *C. acutatum*, *C. capsici* and *C. gloeosporioides*. *Gliocladium* sp., the antagonistic fungus which was isolated from rhizosphere soil showed the potential for against *Colletotrichum acutatum* causing chilli anthracnose disease. It proved that *Gliocladium* sp. become the promising antagonistic fungi as a biological agent against plant pathogenic fungi.

### ACKNOWLEDGEMENT

We would like to acknowledge to Rajabhat Maha Sarakham University for financial support. Special thanks are conveyed to Faculty of Agricultural Technology, Rajabhat Maha Sarakham University for providing instrumental support and all other facilities.

### REFERENCES

- [1] Phoulivong, S., McKenzie, E.H.C. and Hyde, K.D. (2012). Cross infection of *Colletotrichum* species; a case study with tropical fruits. *Current Research in Environmental & Applied Mycology* 2 (2), 99–111.
- [2] Than, P.P., Jeewon, R., Hyde, K.D., Pongsupasamit, S., Mongkolporn, O., Taylor, P.W.J. (2008a). Characterization and pathogenicity of *Colletotrichum* species associated with anthracnose disease on chili (*Capsicum* spp.) in Thailand. *Plant Pathology* 57, 562–572.
- [3] Than, P.P., Prihastuti, H., Phoulivong, S., Taylor, P.W.J., Hyde, K.D. (2008b). Review: Chili anthracnose disease caused by *Colletotrichum* species. *Journal Zhejiang University* 9, 764–778.
- [4] Ratanacherdchai, K., Wang, H.K., Lin, F.C. and Soyong, K. (2010). ISSR for comparison of cross-inoculation potential of *Colletotrichum capsici* causing chilli anthracnose. *African Journal of Microbiology Research* 4 (2), 76–83.
- [5] Ratanacherdchai, K., Wang, H.K., Lin, F.C., Soyong, K. (2007). RAPD analysis of *Colletotrichum* species causing chili anthracnose disease in Thailand. *Journal of Agricultural Technology* 3, 211–219.
- [6] Pakdeevaporn, P., Wasee, S., Taylor, P.W.J. and Mongkolporn, O. (2005). Inheritance of resistance to anthracnose caused by *Colletotrichum capsici* in *Capsicum*. *Plant Breeding* 124 (2), 206 – 208.

- [7] Ratanacherdchai, K. and Soyong, K. (2010). Biological fungicides for controlling of chilli anthracnose. *Prawarun Agricultural Journal* 7 (2), 225 – 234.
- [8] Vasanthakumari, M.M. and Shivanna, M.B. (2013). Biological control of anthracnose of chilli with rhizosphere and rhizoplane fungal isolates from grasses. *Archives of Phytopathology and Plant Protection* 46 (14) : 1641-1666.
- [9] Intana, W., Suwanno, C., Chamswarn, C., Issarakraisila, M., Koysomboon, S. and Chantrapromma, K. (2009). Bioactive compound of antifungal metabolite from *Trichoderma harzianum* mutant strain for the control of anthracnose of chilli (*Capsicum annuum* L.). *The Philippines Agricultural Scientist* 92 (4) : 392-397.
- [10] Talubnak, C. and Soyong, K. (2010). Biological control of vanilla anthracnose using *Emericella nidulans*. *Journal of Agricultural Technology* 6 (1), 47–55.
- [11] Sibounnavong, P., Cynthia, C.D., Kanokmedhakul, S. and Soyong, K. (2008). The new antagonistic fungus, *Emericella nidulans* strain EN against Fusarium Wilt of tomato. *Journal of Agricultural Technology* 4 (1), 89 – 99.
- [12] Živković, S., Stojanović, S., Ivanović, Ž., Gavrilović, V., Popović, T. and Balaž, J. (2010). Screening of antagonistic activity of microorganisms against *Colletotrichum acutatum* and *Colletotrichum gloeosporioides*. *Arch. Biol. Sci., Belgrade* 62 (3) : 611-623.
- [13] Ratanacherdchai, K., Seelakum, A. and Juntachum, N. (2014). Screening and potential of antagonistic fungi for biological control of chilli anthracnose. Proceedings of the 4<sup>th</sup> International Conference of Sciences and Social Sciences 2014: Integrated Creative Research for Local Development toward the ASEAN Economic Community (ICSSS 2014). September 18-19, 2014. Rajabhat Maha Sarakham University, Maha Sarakham, Thailand. p 82.



**INFOGRAPHICS DESIGN FOR PUBLIC RELATIONS  
RAJABHAT MAHASARAKHAM UNIVERSITY**

NARUMOL INTIRAK

*Rajabhat Maha Sarakham University 80 Nakornsawan Road, Talad district,  
Mueang Maha Sarakham, Maha Sarakham Province, Thailand  
Corresponding email ; tomadagi@hotmail.com*

**ABSTRACT**

The objectives of this research are 1) to study and analyze the information about Rajabhat Maha Sarakham University, (2) to pictogram design in the Infographics related to Rajabhat Maha Sarakham University, faculty, and discipline, (3) to quality evaluation of infographics design for public relations, Rajabhat Maha Sarakham University. The target group for this research is specialist five persons. The instrument in this research is (1) Infographic related to Rajabhat Maha Sarakham University. (2) The infographic quality assessment form. The results showed that (1) The summary information about Rajabhat Maha Sarakham University and academic service structure within the University (2) One hundred and thirteenth pictogram design divided into three vision images, one university logo, nine group photo, and hundred image cursors (3) To quality evaluation of infographic design for public relations Rajabhat Maha Sarakham University. It is appropriate to publish. Through quality assessment from experts five persons. It found that most suitable.

**KEYWORDS:** Infographics design, Symbol Pictogram, Visual design

## INTRODUCTION

Infographics are the information or knowledge to conclude the information in the manner of information graphics to communicate a message quickly and reduce the complexity of data presentation in bulk. Easy to understand, can make the viewers quickly and clearly. [1] The graphical presentation of data. Whether the symbols, drawings, graphs, charts, diagrams, maps, etc. The design features a still image or animation used in the presentation without a presenter to help expand their understanding further. [2] At present, infographics have infiltrated every media such as print media including digital media such as, and Website Blog Social Media's flow and extremely popular. Reported searching "Infographics in Google to 14.5 million data at the 15 m. 2555 increase to 80% within only two years only 90% of data into the human brain is data that is a picture. Because various graphic images and icons were stimulating better. People remember the story from the read-only 20% 40% of consumers and to respond to the information as images over data. [3] And the influence of infographics is not only popular in social Media only, but also to the wider influence whether a business and marketing, Politics and education. Commonly used infographic presentation in complex information easy to understand in quick time. At present, both public and private institutions trying to communicate useful information and promote knowledge to youth and individuals through social media using in presentation to have a distinctive and interesting. Rajabhat Mahasarakham University and a university in the government media still lack the benefit of the University. Or media knowledge in various subjects in the form of an infographic, which is becoming popular today. Knowing the pace of media and technology is an important one. Due to the spread of information through the internet and social media has grown and expanded rapidly through popular consumer information has become a part of life. If we have information that is useful to media agencies and corporations. You can use the channels of social media to disseminate information and news quickly.

Therefore pay attention to infographics design advice for the University. By presenting information through infographics to create media interest. Students and general people can access information via the Internet and can choose to watch the convenience. Also can be forwarded to a group of friends or other individuals. It is also the media to introduce or public relations Rajabhat Mahasarakham University.

## MATERIALS AND METHODS

### 1. Infographics Design for Public Relations Rajabhat Mahasarakham University

Researchers have designed using principles for creating infographic 6 steps. [4] As follows:

- 1.1 Understand the purpose of making
- 1.2 Define headings: Infographics Design for Public Relations Rajabhat Mahasarakham University
- 1.3 Study information: University graduates from guidebooks and website [rmu.ac.th](http://rmu.ac.th).
- 1.4 Define the concept of content: content and the idea of the work by organizing your data in presentations before and after. Start by defining the mission, vision, philosophy, followed by the information of each Department, respectively, and to define the concept of a task by using the regular color and pastel tones, resulting in a visually pleasing to watch.
- 1.5 Design and sketch: sketch design based on the concept that, when placed images. Then, to design a computer program using design to achieve beauty.
- 1.6 Check: The researcher has reviewed the information provided in Infographics in both the Graduate Handbook and website to verify that the information is correct. And check on the design, the design based on the storyboard placed.

### 2. Production of Infographics for Rajabhat Mahasarakham University

Researchers have Production of Infographics 3 steps. [5] As follows:

- 2.1. Pre-Production
  - 2.1.1 Write a Script
  - 2.1.2 Write a storyboard



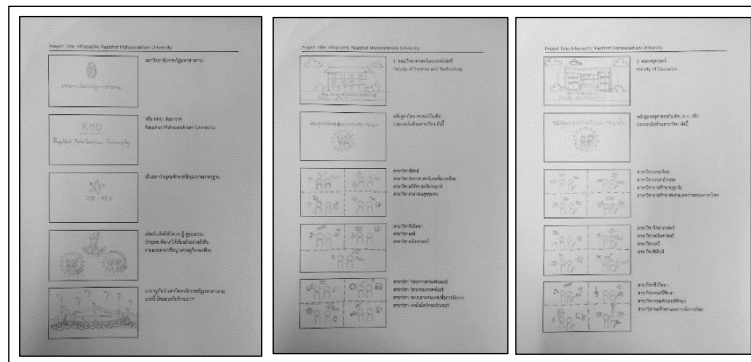


Figure 1. Storyboard

#### 2.1.2 Visual design the Pictogram 5 steps. As follows:

- Step 1 Objective checklist.
- Step 2 Understanding of content.
- Step 3 Sketch.

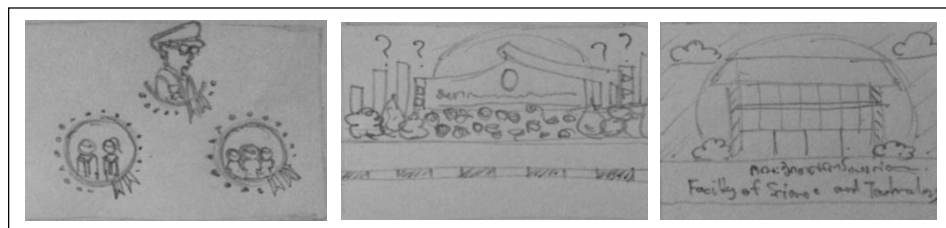


Figure 2. Sketch

#### Step 4 Drawing and editing.

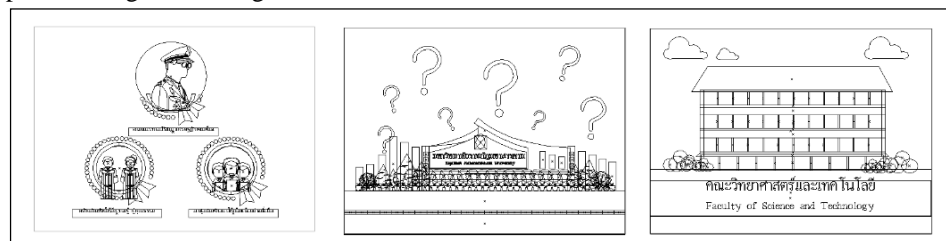


Figure 3. Drawing and editing

#### Step 5 Design in Adobe Illustrator.

Researchers have taken the Pictogram sketch designed using the program Adobe Illustrator and designed the scene according to the Storyboard layout of the plotter designed by the following example



Figure 4. Design in Adobe Illustrator

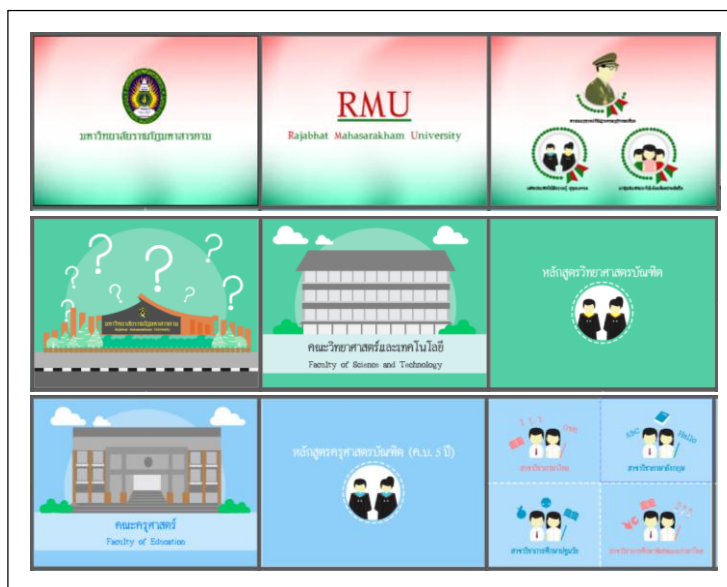


Figure 5. Design according to Storyboard Layout in Adobe Illustrator

#### 2.1.4 prepare for voice

Researchers have prepared sound by recording the content in the storyboard use the voice recorder program to be used in the process Post-Production

#### 2.2. Production

Researcher has produced infographics using all the pictogram design an animated video production from Storyboard and Compositing in Adobe After effect by the following example

##### 2.2.1 Animate in Adobe After effect



Figure 6. Animate in Adobe After effect

##### 2.2.3 Compositing in Adobe After effect

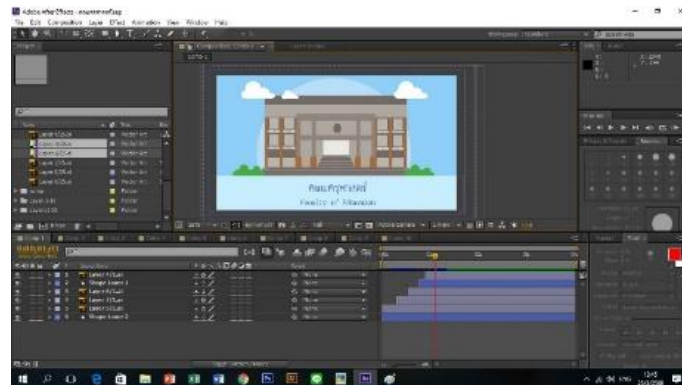


Figure 7. Compositing in Adobe After effect

### 2.3. Post-Production

Researchers must check and verify that the media came out as scheduled or not. Then we prepare voice files that are pre-installed by using Adobe premiere pro to make sure the full graphic can then be processed as output in AVI file.

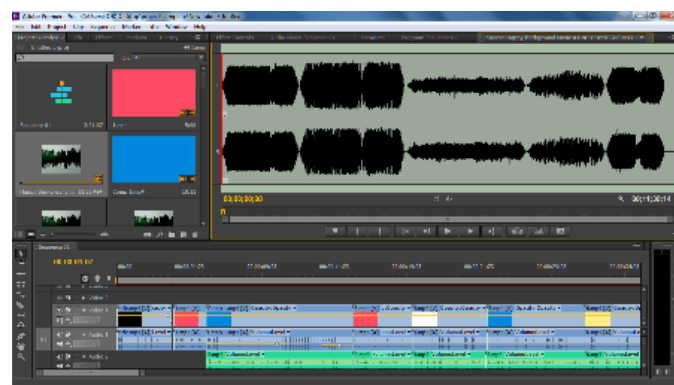


Figure 8. Processed as output in AVI file

## 3. Methods of data collection

3.1 Quality assessment Infographics Design for Public Relations Rajabhat Maharakham University to expert assessment

3.2. Data were analyzed by statistical methods is Arithmetic Mean and Standard Deviation

3.3 Research result

## RESULTS

### 1. The study and analysis of information about Rajabhat Maharakham University

Researchers to study and analyze the data that will be written as subtitles in infographics design for Public Relations Rajabhat Maharakham University. By studying data from Rajabhat Maharakham University Handbook and data analysis by comparison with the data on the website, [rmu.ac.th](http://rmu.ac.th) has information that is then distributed according to as follow

1.1 Information about History of the University

1.2 Information about vision

1.3 Information on symbols and colors

1.4 Information on the structure of academic services within the university. It is divided into nine faculties.

## 2. Infographics related to Rajabhat Mahasarakham University of Pictogram design

Researchers have made visual design the symbol Pictogram 5 steps appear iconic images as shown in the following example.



Figure 8. Pictogram

## 3. Infographics Design for Public Relations Rajabhat Mahasarakham University

Researchers used the 3P method to create infographics and media production through the design process as follows.



Figure 9. Infographics Design

#### 4. Quality assessment results Infographics Design for Public Relations Rajabhat Mahasarakham University

The result of specialist quality with the Infographics Design for Public Relations Rajabhat Mahasarakham University Follow the table below.

Table1: Quality assessment results

Descriptions	$\bar{X}$	S.D.	Satisfaction Level
1. The appropriateness of data	4.80	0.41	Very good
2. The appropriateness of pictogram	4.85	0.33	Very good
3. The appropriateness of colors	4.48	0.61	Very good
4. The appropriateness of the narrative	4.40	0.51	good
<b>Total</b>	<b>4.74</b>	<b>0.41</b>	<b>Very good</b>

From the table 1: Quality assessment results ( $\bar{X} = 4.74$ , S.D. = 0.41) that is very good in quality.

#### CONCLUSIONS AND DISCUSSION

Infographics Design for Public Relations Rajabhat Mahasarakham University. The researcher's analyzed summarized data an information design infographics get the information that can be used to disseminate information about the history, vision, symbol, and color, and various disciplines and faculty to publish in the university and the information was designed to represent the relevant symbols to produce infographics based on the Pre-Production, Production, Post-Production. Infographics are then produced for quality assessment by a specialist the result of the evaluation is that Infographics is of the highest quality.

#### ACKNOWLEDGEMENTS

The authors are grateful to Department of Computer Engineering, Faculty of Engineering, Rajabhat Maha Sarakham University and Research and Development Intitute, Rajabhat Maha Sarakham University for financial support of this research.

#### REFERENCES

- [1] Rouse, M. (2016 November 10). *Infographics* [Internet]. Retrieved from <http://whatis.techtarget.com/definition/infographics>
- [2] Jongrak Tesana. (2016 November 11). *What is Infographics* [Internet]. Retrieved from [http://www.krujongrak.com/infographics/infographic\\_project.html](http://www.krujongrak.com/infographics/infographic_project.html)
- [3] Zidan.Rider. (2016 November 11). *Whai is Infographics and How to use it?* [Internet]. Retrieved from <http://oknation.nationtv.tv/blog/digitalmarketing/2013/01/01/entry-2>
- [4] Sakurada, J. (2015). *Basic infographic*. Nonthaburi : IDC
- [5] Thammapapon leeamnuaychok. (2007). *Intro to Animation*. Bangkok :Tanbook

## **DESIGN AND DEVELOP SMART STREET LIGHTING SYSTEM BASED ON WIRELESS SENSOR NETWORK**

Nopporn Maikami, Chatchawan Sanrak, Sumet Sriwantha, Pak Satanasawapak\*

*Department of Computer Engineering, Faculty of Engineering, Rajabhat Maha Sarakham University  
Correspondence, e-mail : pak.satanasaowapak@gmail.com*

### **ABSTRACT**

This research presents the design and the development of a smart street lighting system based on a wireless sensor network which aimed to 1) develop smart street lighting system on the street, 2) develop software for managing the system, and 3) evaluate the system. The system showing the current environment in the area where the smart street lighting device is installed, such as temperature, light intensity, and power consumption were designed in this study. The system can control the street lighting, and the users can also press the emergency button in case of an emergency. The results showed that the system could display accurate temperature and light intensity and it can also display the power consumption at that time. The smart street lighting device is controlled by the Arduino Mega, and the data are stored on the SD card. In addition, the system can transmit data via a wireless sensor network using API frame data. The data is sent by the most energy-saving system. Moreover, the software developed by the researcher on the windows is used to control the power on the device. The remote shutdown time and the display of the location when the emergency button is pressed were also set. In the future, this system will be developed for more efficiency.

**KEYWORDS :** Sensor, Street lighting, Smart street lighting, Wireless sensor network



## INTRODUCTION

At present, street lighting is designed to provide light on the streets for pedestrians and drivers. Street lighting may be electrically powered, or it was power by the solar cell. Some street lighting can be turned on or off according to the light detected to use energy efficiently. The development of street lighting for the most beneficial use is an interesting issue. Each of street lighting is not installed far apart and is usually mounted outdoors, so the network handed for communicating between each street lighting to provide useful information can be designed. Renewable energy is considered to save energy in the future. According to the research studies, there are a number of ways that have been developed to improve the efficiency of street lighting, including the enhancement of street lighting by using wireless communication and LED technology to reduce energy consumption: [1] using GPS technology, mobile phone and software application to provided lighting and facilitate pedestrians, which street lighting will illuminate only in the areas where there are pedestrians; [2] controlling street lighting by using the microcontroller and LDR sensor during day and night; [3] creating smart street lighting using GSM; [4],[5] developing the street lighting system for energy saving by using wireless sensor network; [6] developing the street lighting system and the measurement of energy saving by VANET; [7] developing street lighting capabilities using various sensors such as PIR sensor, light sensor and hall sensor based on the wireless sensor network;[8]. The network of street lighting with the introduction of the sensor used in the data processing to make the system more intelligent was also created.

The research aimed to 1) to create the prototype devices for the development of smart street light, 2) to test the system and 3) to develop the software for control and monitoring which can make street lighting more energy efficient as well as to facilitate the pedestrians. The staff can control and monitor the status of street lighting from distance. In addition, the system can display environmental values detected by the sensor at the installation site and also show the power consumption.

## MATERIALS AND METHODS

The operation of this research was divided into two parts: software and hardware, which can be described as follows.

### 1. SSL software management

1.1) Smart Street Lighting (SSLv1.0) is the software that controls all system functions. It can receive and transmit data through wireless sensor network, which displays the data collected from the sensor, such as temperature, light intensity, and power consumption. It can also turn off the lamp automatically, and the manual mode is also available. Also, if the user presses the SSL device in case of an emergency, the data will be sent from the SSL device to the SSLv1.0 program, and the program emits the sound and shows the device's location. Figure 1 shows the user interface of the SSLv1.0 program.

### 2. SSL hardware component

The hardware of this system is called Smart Street Light device (SSL device) as shown in Figure 2. It consisted of 5 parts as follows.

2.1) Wireless Communication: In this part, the communication based on IEEE 802.15.4 between the XBee Pro device connected via USB to the computer running SSLv1.0 with XBee Pro installed in SSL device is used.

2.2) Controller: Arduino Mega is used as a microcontroller for controlling street lighting, LCD screen of SSL device, emergency button, receiving data from sensors and data transmission via wireless sensor network.

2.3) Interface: SSL device displays the data from the sensor via LCD screen and emergency button as well as LED multicolor used for lighting or as a warning light.

2.4) Sensor: In SSL device, temperature sensor, light sensor, and current sensor are installed. The values from these sensors will be sent to a microcontroller and stored on SD card before being forwarded to SSLv1.0 via wireless sensor network.

2.5) Data Storage: Its function is to back up the data to SD card in case there are problems in the network.



The overview of the software and the hardware is shown in Figure 3.

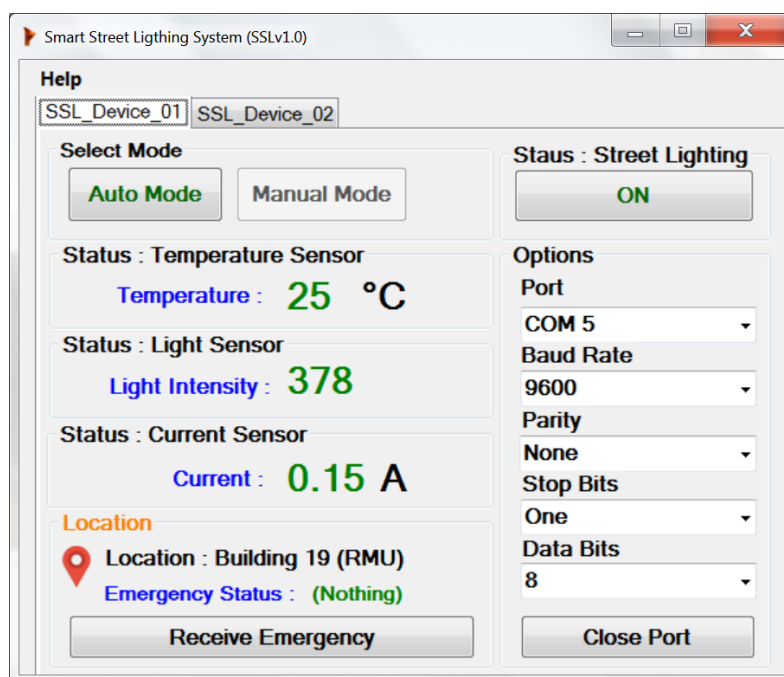


Figure 1. Software: Smart Street Lighting (SSLv1.0)

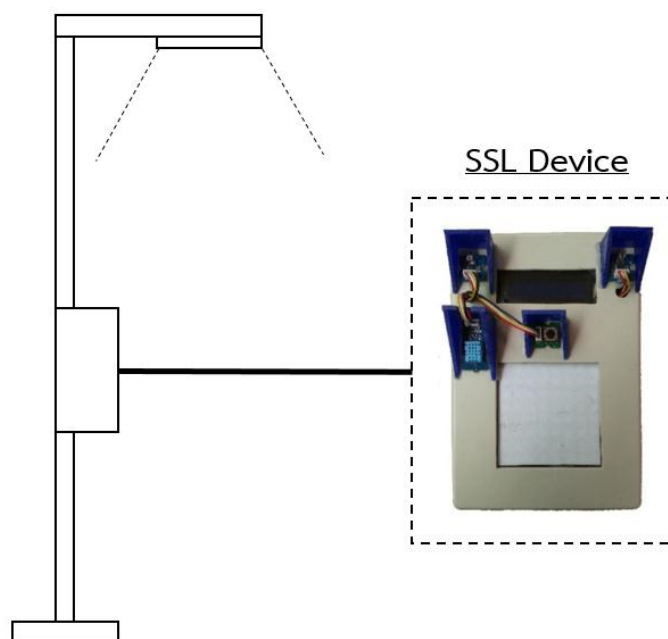


Figure 2. Smart Street Lighting device (SSL Device)

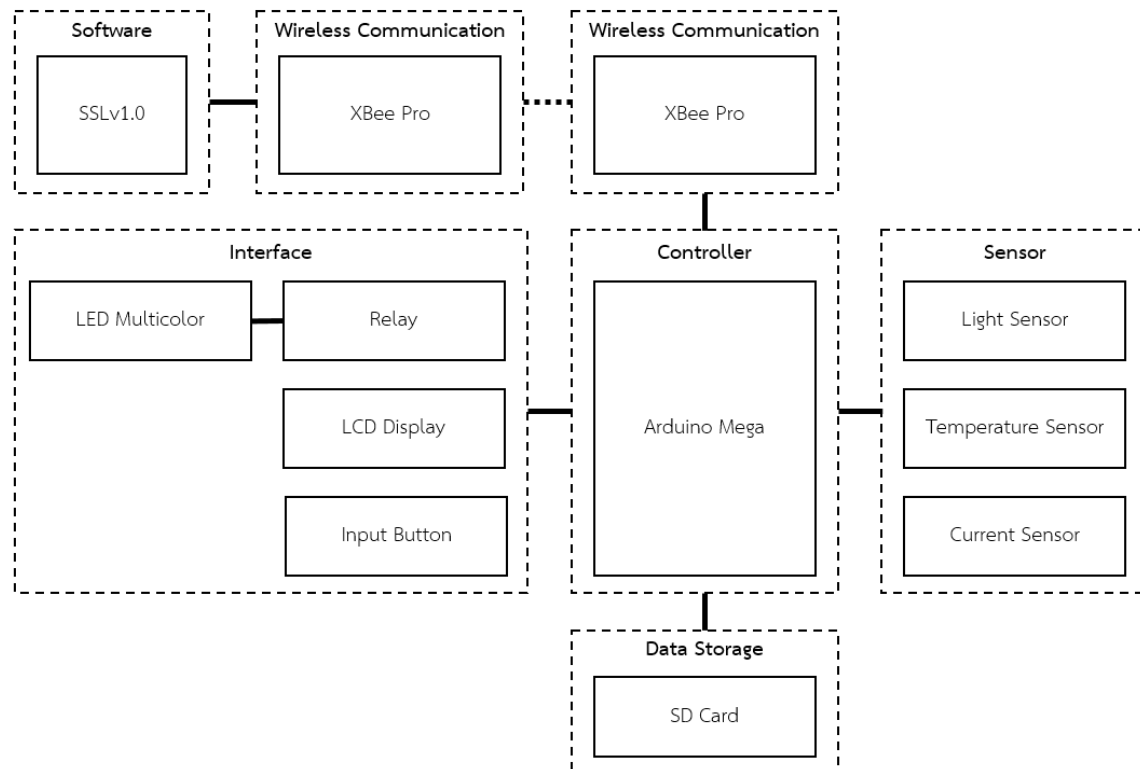


Figure 3. System overview of Smart Street Lighting System

The sensor transmits the data to SSLv1.0 Software. The criteria for transmitting the data are as follows.

- 1) The light sensor transmits the data when light intensity changes from bright to normal/dark or from normal to bright/dark. The light intensity is set from the sensor. For example, if the analog value is greater than 600, it is presented as bright. If the analog value is greater than 300, it is presented as dark. If the analog value is less than or equal to 300, it is presented as normal. These values are used in automatic mode. This mode determines that if the value is dark, the system will automatically turn on street lighting.
- 2) The temperature sensor transmits data only when the measured temperature is different from the original value  $\pm 1$  Celsius.
- 3) The current sensor transmits data only when the measured value is different from the original value  $\pm 0.1$  A. The data are stored on the SD card before transmitting it over wireless sensor network. There are also other data stored on the SD card, such as the data of street lighting status and emergency button presses.

The data transmission in the wireless sensor network of this system is based on the IEEE802.15.4 API Frame. Each situation has different transmission patterns, such as one way (only transmitting data) or two ways (transmitting and receiving data) as shown in Figure 4. When the user chooses Auto mode, SSLv1.0 program transmits API frame of this instruction set to Arduino microcontroller to make the config system as the auto mode, and transmits the API frame back to SSLv1.0 to confirm mode change. In this section, SSL device checks the light intensity every 1 minute to determine if the value is in the specified range. If the light intensity is Dark (analog value  $\leq 300$ ), the LED multicolor will be turned on by the system. If the light sensor detects that the light intensity is normal (analog value  $> 300$ ) or bright (analog value  $> 600$ ), the system will instruct street lighting to turn off. If the user selects the manual mode, API frame is sent back and forth in the system to confirm mode change. Then the user can control the street lighting switch via SSLv1.0 program. When the user presses the emergency button, SSL device will cause multicolor LED to change color as flashing lights and in SSLv1.0 program, the location of SSL device is displayed along with the alarm sound through the program. When the admin presses receive emergency, SSLv1.0 program will stop the notification and transmit data to the SSL device to turn off the alert. The user will know that the admin is aware of the emergency. In addition, the sensor is one-way data transmission. The data are sent from SSL device to SSLv1.0 program. When the program receives the data from the sensor, it will be displayed on the screen immediately.

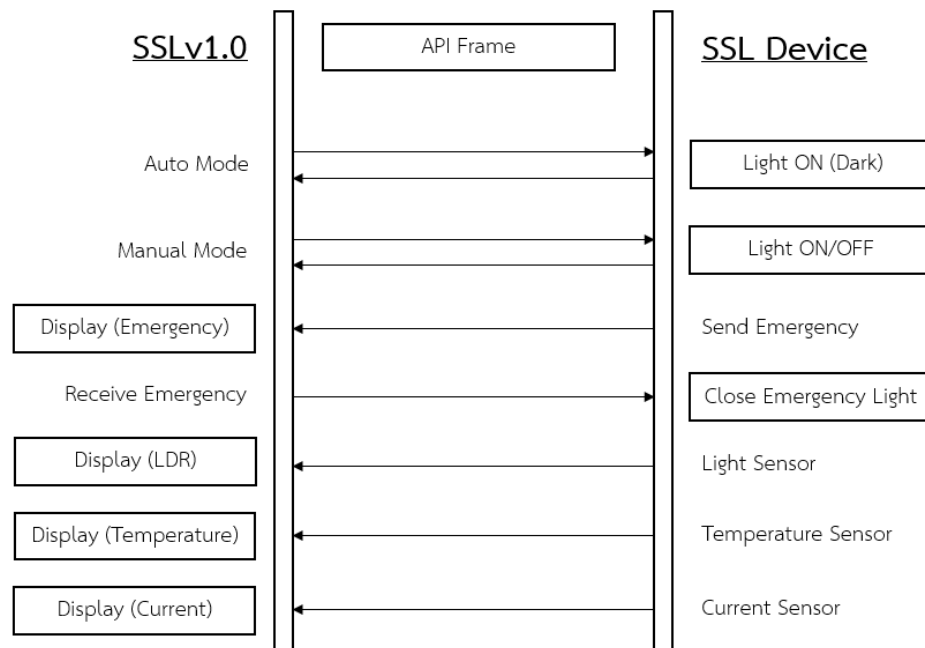


Figure 4. Sending API Frame packet of this system

## RESULTS

The researcher tested the data transmission for a week. The results showed that SSLv1.0 software could receive and transmit data on wireless sensor network from SSL device correctly and the display on the LCD screen is equivalent to SSLv1.0. When the emergency button is pressed, the location of the device and the alertness can be displayed correctly. The data can also be stored on the SD card. In addition, both auto mode and manual mode can be controlled. In auto mode, when light intensity decreases to the specified level (analog value  $<300$ ), the device will automatically turn on street lighting. The data will be transmitted from the sensor only when the conditions change, so the system can save more power when it is installed. The results of the data collection from the sensor of SSL device are shown in Figure 5. It is the example of the change in temperature from 10.00 AM to 11.00 AM, with the temperature change of  $\pm 1$  Celsius. For the light sensor, the data collection was administered from 12.00 AM to 07.00 PM, showing all ranges of analog value changes  $\pm 100$  units. The system was running at an average of 0.15 A.

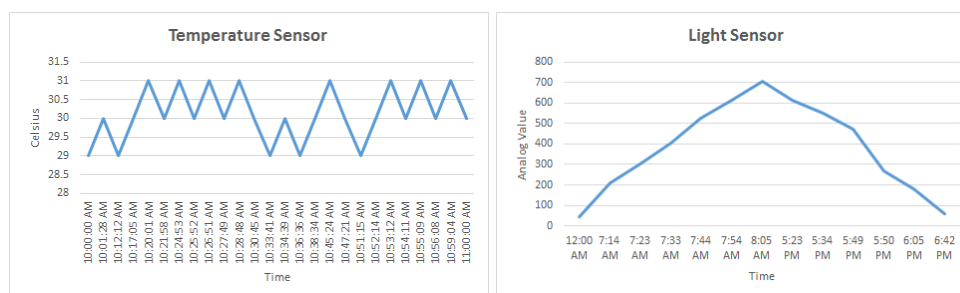


Figure 5. Example result of temperature sensor and light sensor

## CONCLUSIONS AND DISCUSSION

The results showed that the developed smart street lighting system could efficiently transmit data between SSLv1.0 program and SSL device. The data in the system are transmitted through wireless sensor network with the conditions supporting the energy saving. In addition to being able to display the state of the environment of SSL device, the button on SSL device can also be used when there is an emergency as it will notify the SSLv1.0 program. The system also has a backup section on the SD card in the case when there are problems in wireless data transmission. This research was the first phase of device development and testing. The researcher, therefore, recognized the need for improvement and development in the future work, such as the use of a variety of sensors, the improvement of the system to be able to store data on Cloud without the need to store on the SD card, updating the system to alert and control street light through the LINE application and allowing users to access the current environment of SSL device by using the application on the smart phone.

## ACKNOWLEDGEMENTS

The authors are grateful to Department of Computer Engineering, Faculty of Engineering, Rajabhat Maha Sarakham University and Research and Development Institute, Rajabhat Maha Sarakham University for financial support of this research.

## REFERENCES

- [1] Pilar Elejoste, Ignacio Angulo, Asier Perallos, Aitor Chertudi, Ignacio Julio García Zuazola, Asier Moreno, Leire Azpilicueta, José Javier Astrain, Francisco Falcone, Jesús Villadangos. (2013). *An Easy to Deploy Street Light Control System Based on Wireless Communication and LED Technology*. Sensors (Basel) 2013 May; 13 (5) : 6492–6523.
- [2] Reinhard Müllner, Andreas Riener, (2011) "An energy efficient pedestrian aware Smart Street Lighting system," *International Journal of Pervasive Computing and Communications*, Vol. 7 Issue: 2, pp.147-161.
- [3] Sakshee Srivastava. (2013). *Automatic Street Lights*. *Advance in Electronic and Electric Engineering* (2013). 3 (5). pp. 539-542.
- [4] Natu, Omkar; Chavan, S. A. (2013). GSM Based Smart Street Light Monitoring and Control System. *International Journal on Computer Science & Engineering* (2013). 5 (3). pp. 187-189.
- [5] Prof. K.Y.Rajput, Gargeyee Khatav, Monica Pujari, Priyanka Yadav. (2013). Intelligent Street Lighting System Using GSM. *International Journal of Engineering Science Invention* (2013). 2 (3). pp.60-69.
- [6] Yusaku Fujii, Noriaki Yoshiura, Akihiro Takita, Naoya Ohta, Smart street light system with energy saving function based on the sensor network, *Proceedings of the fourth international conference on Future energy systems*, May 21-24, 2013, Berkeley, California, USA. pp.271-272.
- [7] Samir A. Elsayagheer Mohamed. Smart Street Lighting Control and Monitoring System for Electrical Power Saving by Using VANET. *International Journal Communications, Network and System Sciences* (2013). 6. pp.351-360.
- [8] Chetna Badgaiyan, Palak Sehgal. Smart Street Lighting System. *International Journal of Science and Research* (2013). 4 (7). pp. 271-274.

## INTESTINAL PARASITIC INFECTION ON VEGETABLE MARKET IN NAKHON RATCHASIMA MUNICIPALITY, THAILAND

Piyathida Kusolrat<sup>1\*</sup>, Prapada Momklang<sup>1</sup>, Arisara Feekrathok<sup>1</sup> and Prayuth Kusolrat<sup>2</sup>

<sup>1</sup>*Biology Program, Faculty of Science and Technology, Nakhon Ratchasima Rajabhat University,  
Nakhon Ratchasima 30000, Thailand*

<sup>2</sup>*Veterinary Technology Program, Faculty of Science and Technology,  
Nakhon Ratchasima Rajabhat University, Nakhon Ratchasima 30000, Thailand*

*(Author for correspondence: Piyathida Kusolrat, e-mail: piyathida.k@nrru.ac.th, Fax +66-272939)*

### ABSTRACT

Intestinal parasitic infections remain prevalent and constitute a public health problem in certain rural areas of Thailand. Consumption of contaminated fresh vegetables is commonly responsible for food-borne transmitted parasitosis. This research was aimed to evaluate the presence of intestinal protozoa and helminthes in fresh vegetables. A total of 120 samples, including white lettuce, lettuce, morning glory, coriander, celery and peppermint were collected from open aired market in Nakhon Ratchasima municipality, Nakhon Ratchasima province. The samples were processed by a sedimentation technique with detergent method and evaluated by light microscopy for parasitological examination. The percentage of overall contamination was 31% (37/120), with two groups of medical intestinal parasites, protozoan and helminthes. The vegetable samples of celery gave the highest intestinal parasite contaminated rate of 100% while those of lettuce, peppermint, coriander, white lettuce and morning glory were 45, 15, 15, 5 and 5%, respectively. The predominance medical parasites in human are *Ascaris lumbricoides* eggs (5.83%), cysts of *Entamoeba histolytica* (3.33%), *E. coli* (1.17%), and *Giardia lamblia* (1.17%). The results clearly indicate that fresh vegetables from open-aired market consumed by people without properly washing are quite often contaminated with parasites. This data may serve as a baseline for the prevention and surveillance of parasitic diseases.

**KEY WORDS:** Vegetables, Parasites, Contamination, Nakhon Ratchasima

## INTRODUCTION

Parasitic infection is one of the public health problems in many tropical and subtropical countries. The World Health Organization estimates that approximately 1.5 billion people are infected with at least one species of soil-transmitted helminths (STH) [1]. Moreover, parasitic infections lead to about 300 million severely illnesses with approximately 200,000 deaths occurring in developing countries [2]. In Thailand, intestinal parasites infection remains a significant health problem in rural communities of some regions. The report from a national survey in 2009 found the prevalence of parasitosis in the Thai population was 18.1%, with persistent high prevalence of helminthes infection in the northeastern and southern regions of Thailand. The infections with medically important parasites are closely associated with various factor such as poor personal hygiene, climatic conditions, lack of sanitation and hygiene, poverty and unsafe drinking water [3-6]. Fresh vegetables are a great source of various nutrients; vitamins, minerals and fibers. In many countries and also in Thailand, there are a variety cuisine that eaten with fresh vegetables such as **salad**, shrimp-paste sauce and fried mackarel with shrimp-paste sauce and others. The consumption of fresh vegetables without properly washing is an important route in the transmission of parasitic diseases. For the past decade, outbreaks of human infections due to the consumption of raw fruits and vegetables have occurred with increased frequency and these diseases are a major cause of morbidity. Recently, it has been reported that there is an increasing number of cases of food-borne illness mainly linked to eating fresh vegetables [7]. Several studies indicated that the vegetables can be a major source for transmitting protozoan trophozoite/cysts (*Balantidium coli*, *Entamoeba histolytica*, *E. coli*, *Giardia intestinalis*), oocysts (*Isospora belli*, *Cryptosporidium* spp.) and helminthes larvae and eggs (*Strongyloides stercoralis*, *Trichuris trichiura*, hookworm, *Enterobius vermicularis*, *Fasciola* spp., *Ascaris lumbricoides*, *Toxocara* spp., *Hymenolepis nana*, *H. diminuta* and *Taenia* spp.) [8-10].

In developing countries, parasitic infection is an important factor affecting the individual health of people and country development. Not surprisingly, many studies had been conducted to evaluate the role of raw vegetables in the transmission of intestinal parasites, for example, in Egypt, Ethiopia, Sudan, Kenya, Bangladesh, Saudi Arabia, Iraq, Iran, Philippines and Thailand. The research data strongly indicated the high prevalence of parasitic contamination of raw vegetables are still available. In Thailand, Satjapala et al., (2014) have been reported the parasitic contamination of 91% (n = 100) in fresh vegetables from Bangkok. Subsequently, Jongkolnee and Songthamwa (2015) detected parasites contamination 44.8% in vegetables by sedimentation technique [11-12]. While Nakhon Ratchasima province is the largest province in the Northeast of Thailand, there are many open aired markets that are traded vegetable and fruits, especially in Nakhon Ratchasima municipality area. However, there is no published document about the prevalence of parasitological contamination of vegetables in Nakhon Ratchasima province. Therefore, this study aimed to evaluate the parasitic contamination in some common fresh vegetables used for raw consumption in Nakhon Ratchasima province. The findings of this study may be help strengthen the information currently available about parasitic infections and to provides important information to stake holders on the potential contamination of vegetables.

## MATERIALS AND METHOD

### Sample collection and preparation

A survey study was conducted in Nakhon Ratchasima province during September to November 2017. Fresh vegetable samples were collected randomly from open-aired markets; Mae Kim Heng market in Nakhon Ratchasima municipality. The study included 120 vegetable samples, comprised of six types of fresh vegetables; white lettuce (20), lettuce (20), morning glory (20), coriander (20), celery (20) and peppermint (20). The vegetable samples were transported in plastic bags to the Applied Parasitology laboratory at Science Center, Faculty of Sciences and Technology, Rajabhat Nakhon Ratchasima University to parasitic examination. Each vegetable was immersed immediately in tap water inside a sink and left approximately 5–6 min for sedimentation of mud and dust. Two hundred grams were being prepared from the edible part of each vegetable sample separately according to the household practice to obtain qualitative estimation of parasitic contamination. Each sample was placed in a separate plastic bag and labeled with a unique number and its date of collection.

### Detection of parasitic contamination

The parasitological analyses were modified from Jongkolnee and Songthamwat (2015) [12]. Briefly, approximately 200 grams of each vegetable were cut vegetables into small pieces, and then immersed in a 0.85% NaCl solution with detergent (0.1% sodium dodecyl sulphate), followed by vigorous shaking with the aid of a mechanical shaker (240 time/min) for 1 hour. The resulting liquid was filtered through gauze and collected

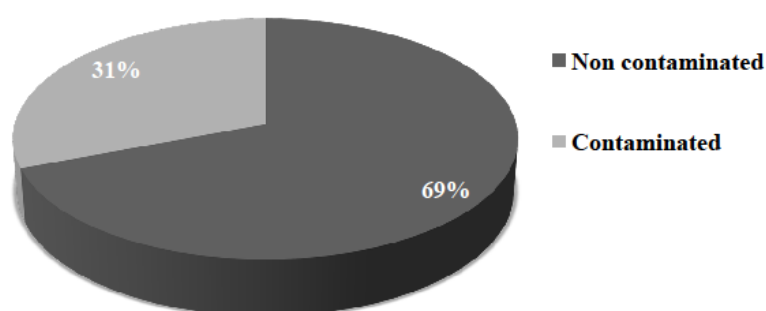
in a sedimentation cylinder. The tray used was also washed with 50 mL of the detergent solution and the resulting liquid was transferred to the same glass, which was covered with a Petri plate and left to settle for 24 hours at room temperature. After that, the top liquid was discarded and the sediment with approximately 50 mL of the remaining washing water was centrifuged at 3000 rpm for 10 minutes. The supernatant was carefully removed and a drop of the residue was transferred to a clean glass slide and mixed with a 20  $\mu$ L of Lugol's Iodine solution. The preparation was examined systematically in triplicate under light microscopy for detection of parasitic structures using 10x, 40x and 100x objectives. An iodine stained smear was prepared by adding a small drop of Lugol's iodine solution prior to the placing of a cover slip to a slide similarly prepared for the unstained smear. The eggs/cysts of parasites were identified based on morphological details as described by WHO, 1994 [13].

### Statistical Analysis

Statistical analyses were performed by one way ANOVA test via the software SPSS 17 for Windows in order to compare the rate of parasitological contamination among different vegetables. The differences were considered significant at  $P$ -value  $< 0.05$ .

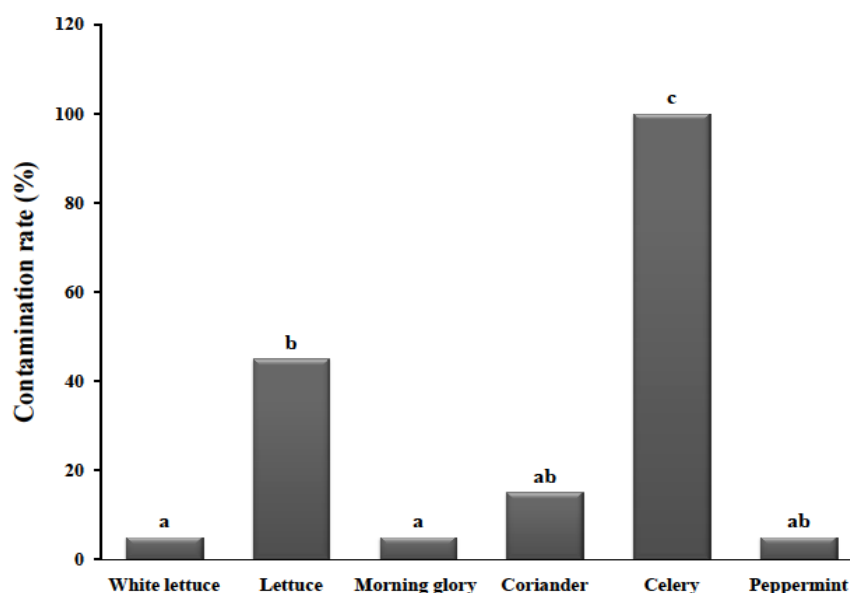
## RESULTS

The total of 120 fresh vegetable samples collected from Mae Kim Heng market were examined for the presence of intestinal parasite contamination. The overall contamination rate evaluated from all parasitic infection included human or non human parasitosis was 31% (37/120) (Figure 1). Figure 2 summarizes the percentage of contamination in each vegetable sample group was infected: 5% white lettuce (1/20), 45% of lettuce (9/20), 5% of morning glory (1/20), 15% of coriander (3/20), 100% of celery (20/20) and 5% of peppermint (1/20), respectively. The parasitic contamination rate of the different vegetables was significantly different ( $P < 0.05$ ). Remarkably, high level of contamination in fresh vegetable samples was found in celery, lettuce and coriander, respectively.



**Figure 1:** Percentage of the overall parasitic contamination rate of fresh vegetables in Nakhon Ratchasima municipality, Thailand (N = 120).





**Figure 2:** The percentage values of contaminated samples in each type of fresh vegetable in Nakhon Ratchasima municipality, Thailand (n = 120). Different letters above total values represent significant differences ( $P < 0.05$ ).

In this study, unidentified free living nematode larvae were detected in 9.17% of vegetable samples (Table 1), with lettuce samples being most contaminated (35%). It is worth mentioning that among all examined fresh vegetable samples, white lettuce, morning glory and coriander had single parasitic contamination (animal nematode eggs, *E. coli* and *B. coli*, respectively). Contamination with multiple contamination was found in lettuce (*E. coli*, animal nematode eggs, free living nematodes larvae), celery (*E. histolytica*, *E. coli*, *G. lamblia*, *A. lumbricoides*, *H. diminuta*, animal nematode eggs and free living nematodes larvae) and peppermint (*E. histolytica*, *A. lumbricoides*, animal nematode eggs).

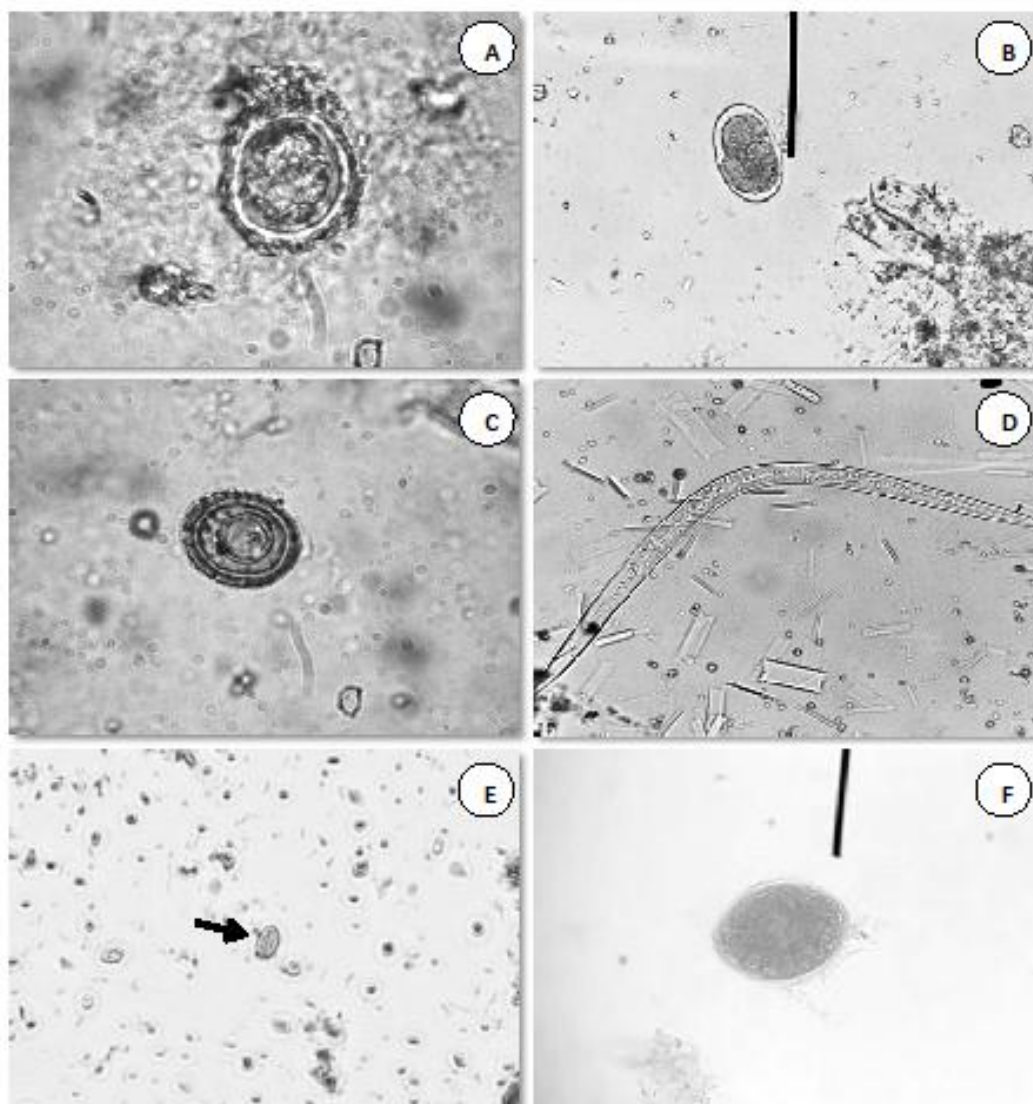
**Table 1:** Distribution of human intestinal parasitic contamination in different fresh vegetables from Nakhon Ratchasima Municipality, 2017.

Vegetable	No. of examined	No. of detected parasite (%)							
		Eh	Ec	Gl	Bc	Al	Hd	AN. e.	FFN. l.
White lettuce	20	-	-	-	-	-	-	1 (5)	-
Lettuce	20	-	1 (5)	-	-	-	-	1 (5)	7 (35)
Morning glory	20	-	-	-	1 (5)	-	-	-	-
Coriander	20	-	-	-	-	-	-	3 (15)	-
Celery	20	3 (15)	1 (5)	2 (10)	-	6 (30)	1 (5)	3 (15)	4 (20)
Peppermint	20	1 (5)	-	-	-	1 (5)	-	1 (5)	-
<b>Total</b>	<b>120</b>	<b>4 (3.33)</b>	<b>2 (1.17)</b>	<b>2 (1.17)</b>	<b>1 (0.83)</b>	<b>7 (5.83)</b>	<b>1 (0.83)</b>	<b>9 (7.50)</b>	<b>1 (9.17)</b>

Note: Eh: *Entamoeba histolytica*; Ec: *E. coli*; Gl: *Giardia lamblia*; Bc: *Balantidium coli*; Al: *Ascaris lumbricoides*; Hd: *Hymenolepis diminuta*; AN. E: Animal nematode eggs; FLN. l.: Free living nematodes larvae.

Table 1 shows the identified intestinal parasites included cyst of protozoa and ova/larvae of helminthes. The data represent of *Ascaris lumbricoides* (5.83%), *Hymenolepis diminuta* 0.83 (%) and cysts of *Balantidium coli* (0.83%), *Giardia lamblia* (1.17%), *Entamoeba histolytica* (3.33%) and *E. coli* (1.77%). The most

predominant important medical parasite encountered was *A. lumbricoides* whereas both *B. coli* and *H. diminuta* were the least detected parasites.



**Figure 3:** Microscopic detection of parasitic stages contaminating fresh vegetables: (A) *Ascaris lumbricoides* eggs (40x), (B) *Strongylid* spp. eggs (40x), (C) *Hymenolepis diminuta* eggs (40x), (D) Free living nematodes larvae (40x), (E) *Giardia lamblia* cyst (100x) and (F) *Balantidium coli* trophozoite (40x).

### CONCLUSIONS AND DISCUSSION

Nakhon Ratchasima is a large city, it is considered the second largest population after Bangkok. In addition, there are many wholesale vegetables market that the people used to trade in this area and nearby. Because of the open aired market, is a high risk of parasite contamination in vegetables. Therefore, the present study has attempted to assess the contamination of intestinal parasites from vegetables sold in open aired market of Nakhon Ratchasima municipality. The six types of fresh vegetables including white lettuce, lettuce, morning glory, coriander, celery and peppermint which are eaten raw and have high consumption by the local population were examined.

Our study showed a considerably high level of overall contamination of raw vegetables with intestinal parasites in Nakhon Ratchasima municipality (37%), which is similar with Jongkolnee and Songthamwat (2015), that reported 44.8% of parasite detected in vegetables from Phra Nakhon Si Ayutthaya district, Phra Nakhon Si Ayutthaya province [12]. However, it is lower when compared with the findings of some studies [14]. Celery and lettuce samples were contaminated significantly more often than those of vegetable samples. These results were in agreement with many studies which evaluated the overall parasitic contamination of the vegetables. Parasitic contamination of the vegetables in another studies in Ethiopia was also 57.8% [15]. In addition, Damen et al., (2007) detected contamination in 40% of lettuce samples, and 24% in green leafy vegetable in Nigeria. In contrast, another study in Iran reported that the highest contamination was in leek (51.8%) [16]. In this work, the highest rate of contamination was detected in celery (100%), followed by lettuce samples (45%). This could be due to the fact that the degree of contamination varies according to the shape and surface of vegetables. Green leafy vegetables as white lettuce, lettuce and celery have uneven surfaces and makes parasitic cysts, oocysts and eggs attached to the surface of the vegetable more easily, either in the farm or when washed with contaminated water. On the other hand, vegetables with smooth surface as leek and green onion had the least prevalence because its smooth surface reduces the rate of parasitic attachment [9]. These results were in agreement with that of a study done in Bangkok and circumference in 2014 which could be detected parasitic contamination in 91% (91/100) of vegetable samples. [14].

On the other hand, cysts of *E. coli*, *E. histolytica*, *G. lamblia* and trophozoite of *B. coli* were also detected by the present investigation. This elevated contamination corroborated the study conducted by various research on vegetables marketed in Thailand and abroad, and is probably the result of the high viability of amebic cysts in the environment [17-18]. These findings represent a public health problem due to the fact that cysts are also eliminated with feces. Regarding the different commercial establishments evaluated, parasitic structures were detected in all of them, but previous report indicated that the samples from the open aired market were significantly more contaminated [16-17]. The open aired markets are characterized by the sale of agricultural products grown in rural areas close to major centers, where farmers exhibit their products in tents and consumers move between [19]. The remarkable presence of helminth rather than protozoan structures detected in present study is probably related to the practice of washing vegetables in the field and, subsequently, at the point of sale prior to commercialization [20, 21]. These washing steps may be more efficient in the removal of protozoa, since the structure and size of helminths may hinder their removal from the surface of vegetables. In current investigation, sellers from the majority of the establishments reported the adoption of such practices [21].

According to previous literature reviews suggest that the rate of parasitic contamination in vegetables are higher in warm seasons than cold seasons [11]. It has been determined that the excretion of parasite's eggs to environment by human or animals is high in warm seasons comparing to cold seasons. Also, the frequent use of untreated wastewater for irrigation of vegetable fields during spring and summer could be a reason for higher rate of parasitic contamination in these seasons. Another reason might be the difference in weather as oocysts thrive in tropical countries. They are even found to increase in summer season [9]. Several factors may contribute to such differences. These may include, geographical location, type and number of samples examined, methods used for detection of the intestinal parasites, type of water used for irrigation, and post-harvesting handling. So long as these factors differ, consequently the discrepancy of the results would be expected [18-19].

Our results clearly show that raw vegetables consumed by people are quite often contaminated with parasites. These types of vegetables should be considered as a potential source of parasitic contamination in Nakhon Ratchasima province. These contamination of intestinal parasites emphasize the public health implication of consumers of these vegetables being at high risk of infection with amoebiasis, giardiasis, ascariasis, hymenolepiasis and likely others. These parasites may be acquired through the consumption of these vegetables, especially when not hygienically grown and adequately prepared before consumption. Inhabitants of this region should be inform the detection of parasites and how to properly disinfect these vegetables before consuming. Previous report indicate that the wash-methods soaking in vinegar solution and saline solution could reduce the parasite numbers 6-14 and 3-13 times when compared to unwashed vegetable respectively. Risk management to this matter would be The Good Agricultural Practices at growing areas and washing vegetable thoroughly before consuming which would leave too few parasites to cause illness [12]. These findings may have important implications for global food safety and emphasize the importance of raw vegetables in threatening public health by transmission of intestinal parasites to humans in Thailand.

## ACKNOWLEDGEMENTS

We are sincerely thanks to Science Center Rajabhat Nakhon Ratchasima, Rajabhat Nakhon Ratchasima University for supporting facilities instrumental carry out this work.

## REFERENCES

- [1] Steinbaum, L., Kwong, L. H., Ercumen, A., Negash, M. S., Lovely, A. J., Njenga, S. M., et al. (2017). Detecting and enumerating soil-transmitted helminth eggs in soil: New method development and results from field testing in Kenya and Bangladesh, *PLOS Neglected Tropical Diseases*, 11 (4) : e0005522. <https://doi.org/10.1371/journal.pntd.0005522>.
- [2] WHO. (2017). Soil-transmitted helminth infections. Fact sheet no. 366. <http://www.who.int/mediacentre/factsheets/fs366/en/>.
- [3] Boonjaraspinyo, S., Boonmars, T., Kaewsamut, B., Ekobol, N., Laummaunwai, P., Aukkanimart, R., et al. (2013), A cross-sectional study on intestinal parasitic infections in rural communities, northeast Thailand, *Korean Journal Parasitology*, 51: 727-734.
- [4] Jiraanankul, V., Aphijirawat, W., Mungthin, M., Khositnithikul, R., Rangsin, R., Traub, R. J., et al. (2011) Incidence and risk factors of hookworm infection in a rural community of central Thailand, *American Journal of Tropical Medicine and Hygiene*, 84: 594-598.
- [5] Kitvatanachai, S., Boonslip, S. and Watanasatitarpa, S. (2008), Intestinal parasitic infections in Srimum suburban area of Nakhon Ratchasima Province, Thailand, *Tropical Biomedicine*, 25: 237-242.
- [6] Wongsaroj, T., Nithikathkul, C., Rojkitikul, W., Nakaia, W., Royal, L., Rammasut, P. (2014). National survey of helminthiasis in Thailand, *Asian Biomedicine*, 8: 779-783.
- [7] Van Duyn, M. A. and Pivonka, E. (2000). Overview of the health benefits of fruit and vegetable consumption for the dietetics professional: selected literature, *The Journal of the American Dietetic*, 100 (12) : 1511-1521.
- [8] Bekele, F., Tefera, T., Biresaw, G. and Yohann, T. (2017). Parasitic contamination of raw vegetables and fruits collected from selected local markets in Arba Minch town, Southern Ethiopia. *Infectious Diseases of Poverty*, 6:19 doi:10.1186/s40249-016-0226-6.
- [9] Said, D. E. (2012). Detection of parasites in commonly consumed raw vegetables, *Alexandria Journal of Medicine*, 48: 345-352.
- [10] Mohamed, M. A., Siddig, E. E., Elaagip, A. H., Mohammed Edris, A. M. and Nasr, A. A. (2016). Parasitic contamination of fresh vegetables sold at central markets in Khartoumstate, Sudan, *Annals of Clinical Microbiology and Antimicrobials*, doi: 10.1186/s12941-016-0133-5.
- [11] Eraky, M. A., Rashed, S. M., Nasr, M. S., Salah El-Hamshary, A. M. and El-Ghannam, A. S. (2014). Parasitic contamination of commonly consumed fresh leafy vegetables in Benha, Egypt, *Journal of Parasitology Research*, doi:10.1155/2014/613960.
- [12] Satjapala T., Toonsakool K. and Pednog K. (2014). Contamination and reducing of parasite in fresh vegetables by washing. *Journal of Department of Medical Sciences*, 56 (4) : 205-212.
- [13] WHO. Bench aids for the diagnosis of intestinal parasites. 1994.
- [14] Jongkolnee, N. and Songthamwat, D. (2015). Detection of parasitic contamination in vegetables from Phra Nakhon Si Ayutthaya District, Phra Nakhon Si Ayutthaya Province, *Journal of the Medical Associate Thailand*, 43 (1).
- [15] Tomass, Z. K. D. (2012). Parasitological contamination of wastewater irrigated and raw manure fertilized vegetables in Mekelle city and its suburb, Tigray, Ethiopia. *Momona Ethiopian, Journal of Science*, 4 (1) : 77-89.
- [16] Damen, J. G., Banwat, E. B., Egah, D. Z. and Allanana J. A. (2007). Parasitic contamination of vegetables in Jos Nigeria, *Annals of African Medicine*, 6: 115-118.
- [17] Gerais, B. (2017). Contamination by intestinal parasites in vegetables marketed in an area of Jequitinhonha Valley, Minas. *Brazilian Journal of Nutrition*, 30 (1) : 127-136.
- [18] Omowaye, O. S. and Audu, P. A. (2012). Parasites contamination and distribution on fruits and vegetables in Kogi, Nigeria. *Cibtech Journal of Bio-Protocols*, 1 (1) : 44-47.
- [19] Idahosa, O. T. (2011). Parasitic contamination of fresh vegetables sold in Jos Markets, *Global Journal of Medical Research*, 11 (1), 20-25.
- [20] LUZ, João Gabriel Guimarães et al. (2017). Contamination by intestinal parasites in vegetables marketed in an area of Jequitinhonha Valley, Minas Gerais, *Brazilian Journal of Nutrition*, 30 (1) : 127-136.
- [21] Falavigna, L. M., Freitas, C. B. R., Melo, G. C., Nishi, L., Araújo, S. M. and Falavigna-Guilherme, A. L. (2005). Quality of green vegetables marketed in the northwest of Paraná, Brazil, *Parasitol Latinoam*, 60 (3-4) : 144-149.

**THE POLITICAL PARTICIPATION OF WOMEN IN NONG MUANG SUB-DISTRICT  
ADMINISTRATIVE ORGANIZATION, BORABUE DISTRICT, MAHASARAKHAM PROVINCE**

Wanlapa Kotavinon <sup>1</sup> and Piyalak Bhodhiwan<sup>2</sup>

<sup>1</sup> Master of Political Science, Political Science, Mahasarakham Rajabhat University

<sup>2</sup> Assistant Professor (Ror.Dor. : Political Science) Lecturer, Faculty of Political Science and Public  
Administration, Mahasarakham Rajabhat University

*Author Corresponding email : Piyalak Bhodhiwan, [piyaluk.po@rmu.ac.th](mailto:piyaluk.po@rmu.ac.th)*

**ABSTRACT**

The purpose of this study was to 1) study the role of women in political participation in Nong Muang Sub-district administrative organization, 2) to compare the roles of women in political participation in the Nong Muang sub-district administrative organization, 3) to provide advice on the development of the role of women in political participation in the Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province. The samples were female. There were 355 people aged 18 years and over in the Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province. The samples were 355 randomly selected by stratified random sampling and random sampling. Questionnaires were employed to collect the data. The classification value is between 0.71-0.92 with confidence at 0.98. The research results were found as follows:

1. The role of women in political participation in the Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province. The overall level is moderate. If classified by features of study, the level was high in election, moderate in membership of political parties and low in contact with government agencies and role in the community, respectively.

2. The results of the comparative study on the roles of women in political participation in the Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province, by age of education and occupation, were statistically and significantly different at 0.05 level.

**Keywords :** Political participation, Role of women.



## INTRODUCTION

Democratic system is widely accepted in principle as the desired administrative system because the administrative system is based on the concept that people is the owner of the absolute power to govern the country which has valued and respected humanity, equality and freedom. While the value of humanity is based on the fact that each individual is able to use his judgment and to determine its own path of life without order or force of any group of individuals or persons with dictatorship power. In sum, the democratic system has put focus on essence and value of human being more than other things.

Local administration is the administrative unit essential to the national development because the administrative system is closed to people and has provided an opportunity for public participation through decentralization of authority to local people for self-administration. Parts of authority are transferred to local agencies with authority to make a decision such as public service arrangement which is independent of the central authority. At present, local administration in Thailand is divided into 6 systems, that is, municipality, sub-municipality, provincial administrative organization, sub-district administrative organization, Bangkok Metropolitan Administration and Pattaya metropolitan Administration, each of which is different in structure and administration (Ekachai Karnwattanee. 2000).

The national development at the local levels of sub-district and villages in Thailand is focused on sub-district administrative organization or Or Bor Tor, a unit in accordance with the Act on Plan and Procedure of Decentralization to local administrative organizations, B.E. 2542 since the sub-district administrative organization is the local administrative organization in accordance with the Sub-district Council and Sub-district administrative organization Act, B.E. 2537. That is decentralization of authority to local area in the grass root level since the authority is decentralized to the levels of sub-districts and villages where most people in the area have been involved with farming work nationwide. The local administrative organizations have authority and independence to manage and govern themselves under the laws efficiently and effectively. They are able to determine the plans, projects and activities to solve the problems in the sub-districts and villages in accordance with the actual problems and the public needs. (Damrongrajanuparb Institute and Department of Provincial Administration. 1997)

Even though the provision on equality of individual participation in several constitutions has been provided, the international political participation is still different greatly. There are numerous restrictions in Thailand which are not legal restriction but the social, traditional and cultural restrictions, beliefs and other restrictions. According to the statistics on political participation, it is found that there are a few female ministers. That is clearly in accordance with the data in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province where most of the leaders are male. For example, there is only one elected female village headman among 14 villages in Nong Muang sub-district. That is in accordance with the election information of the sub-district administrative organization on 20 October 2013. The total number of voters is 6,022 person but only 4,417 persons had shown up to vote, consisting of 3,089 male voters or 69.94 percent and 1,326 female voters or 30.06 percent. The other problem is that in the community meeting on 7 March 2016, there were 495 male attendants or 89.19 percent and 60 female attendants or 10.81 percent among 495 attendants.

Such problems have shown that the political participation of women in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province has a tendency to decline. That is the problem on strengthening the democratic system because public participation is the key to the opportunity provided for public opinion and decision on politics and administration of the country and for examination on the authority used and supervision on the work of the legislative sector, administrative sector and the government officers. The high or low level of democratic system in any country is decided from the public participation. The society with low political participation is classified to be low in democratic system but the society with high political participation has presented the high development in democratic system. Also it indicates the political beliefs and attitudes of the people in the country similar to the statement made by the Civil Service Institute (Chantana Banpasirichot 2546: 20) which has stated that participation in the society or community will train the people to express their opinion, to stimulate creativity, to listen to opinions of the other persons and to admit and rely on members of the community. Therefore, people are the critical element for building the sustainable democratic system and promotion of good governance. Greater public participation requires more participation in the lower levels through participation on comments provided, decision made and follow-up of the examination to ensure effectiveness of the public participation. (Thawilwadee Bureekul 2551).

Public participation is the critical process in every system, whether participation in planning, participation in action, participation in allocation of benefits and participation in assessment. The sub-district administrative organization is required to enhance the public participation and involvement in every related sector in the policy

to ensure diversity of the policy. It is the innovation on new policy which will lead the sub-district administrative organization to accomplishment in sub-district administrative organization goals of the organization (Somsak Promdua. 2016). The driving factor towards achievement of the intent of the constitution is the effort of every sector to move forward together. The community which has participated in comments, planning, monitoring, examining and working in an integrated manner will be strong and sustainable. Thus this study has put its emphasis on roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province which will lead to development of political participation of women.

### **Objectives of the research**

1. To study roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province.
2. To compare roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province, classified by age, education and occupation.
3. To recommend ways to develop roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province.

### **Research Hypothesis**

Female citizens eligible to cast a vote in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province, are different in age, education and occupation and have provided different political participation.

## **RESEARCH METHODOLOGY**

In this study, the researcher has prepared the questionnaires to collect data in the following manners.

### **1. Construction of tools**

- 1.1 To study concept, theory, documents and research papers related to roles of women in political participation.
- 1.2 To determine scope of the questions covering conceptual framework and objectives to learn of roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province as information for construction of the questionnaires.
- 1.3 To study the questionnaires of related research to provide a guideline on construction of the questionnaires.
- 1.4 To construct the questionnaires with advice from advisors and specialists for proper improvement and accuracy of the questionnaires.

### **2. Determination of quality of the questionnaires and tools**

- 2.1 The adjusted questionnaires are presented to 3 specialists to check the accuracy of the content in accordance with the academic concept and to ensure completeness of the questionnaires based on Index of Item – Objective Congruence Method (IOC method) and select the question with IOC at 0.67 or more.
- 2.2 Quality of questionnaire is tried out with fortywomen who are eligible to vote with age of 18 years or more but not the sample group. They are women eligible to cat a vote wit age of 18 years or more in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province. The classification value is determined through Item Total Correlation and Reliability in Questionnaire is determined through Alpha Coefficient in accordance with Cronbach Method.
- 2.3 The questionnaires which had been checked by the specialists were presented to the research advisor again.

### **Population and Samples**

1. **Population** employed in the research is women who are eligible to vote with age of 18 years or more in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province for 3,146 persons, data as of 8 December 2016.
2. **Samples** are women who are eligible to vote with age of 18 years or more in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province for 355 persons determined through sample size computation method to represent the population.
3. **Random sampling** is made through stratified random sampling method before the simple random sampling method to choose the samples from the population classified by villages.



### **Research Tools**

Data collection is made through the questionnaires.

### **Data collection**

1. To prepare the number of questionnaires equal to the number of samples.
2. To ask for the letter of certification and introduction from the Faculty of Political Science and Public Administration, Mahasarakham Rajabhat University to ask for cooperation from the local offices in Mahasarakham Province and Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province to examine the population statistics and to collect data.
3. To discuss with research assistant on data collection method to ensure proper understanding in the data collection method.
4. Data collection undertaken by the researcher and the research assistant in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province.
5. Data is completely collected

### **Data analysis**

Data are analyzed in accordance with the following procedures.

1. All returned questionnaires were checked to ensure completeness and accuracy.
2. Data in complete questionnaires are recorded in the Coding Form.
3. Each question in the coded questionnaires was scored within 5 levels in accordance with Likert Method and processes and analyzed with the computer program to determine the arithmetic mean for further interpretation on the arithmetic mean.
4. Comparison on roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province classified by age, education and occupation. The statistical method employed was F-test and one way ANOVA. If there is difference in comparison on opinion in the test, make the comparison on the difference of each pair of the arithmetic mean with LSD method.

## **RESEALTS**

**1. Study on roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province** It is found that the roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province were moderate overall. If classified by features of study, the level was high in election, moderate in membership of political parties and low in contact with government agencies and role in the community, respectively.

**2. Study on roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province with different age, education and occupation**

2.1 Comparison on roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province by age between 18– 25 years, 26 – 35 years, 36 – 45 years and 46 years or more. In overall, it is found that roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province were different. If classified by features of study, it was statistically different with significance at 0.05 for 4 aspects, that is, election, political membership, community leader and contact with government agency.

When each pair was compared, it was found that the pair with roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province was statistically different with significance at 0.05 for 3 pairs, that is, age of 18 – 25 years and 26 – 35 years, those with age of 18 – 25 years were found to take roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province more than those with age of 26 – 35 years; age of 36 – 45 years and 46 years or more, those with age of 36 – 45 years were found to take roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province more than those with age of 46 years or more; age of 36 – 45 years and 26 – 35 years, those with age of 36 – 45 years were found to take roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province more than those with age of 26 – 35 years.

2.2 Comparison on roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province by education, that is, primary education, high school education/professional certificate/higher professional certificate and bachelor degree or more. In overall, it was

found that roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province were different. If classified by features of study, it was statistically different with significance at 0.05 for 2 aspects, that is, community leader and contact with government agency. If each pair was compared, it was found that the pair with roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province was statistically different with significance at 0.05 for one pair, that is, primary education and high school education/professional certificate/higher professional certificate, those with education of high school education/professional certificate/higher professional certificate were found to take roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province more than those with primary education.

2.3 Comparison on roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province by occupation, that is, farmers/contractors for general work, employees of private shop/company, trading/personal business, government/state enterprise officers, students and housewives. In overall, it was found that roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province were different. If classified by features of study, it was statistically different with significance at 0.05 for 4 aspects, that is, election, political membership, community leader and contact with government agency with significance at 0.05 for 5 pairs, that is, between students and farmers/contractors for general work, employees of private shop/company, trading/personal business, government/state enterprise officers and housewives, the students were found to take roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province more than farmers/contractors for general work, employees of private shop/company, trading/personal business, government/state enterprise officers and

3. Recommendations on roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province could be concluded as follows.

3.1 Election People should be provided with more opportunities to elect their representatives in various areas and the public relations work on application for public representative should be clearly arranged.

3.2 Political membership People should be provided with more information to ensure understanding in the political party system and the members of the political party should be informed of the activities of the political party consistently.

3.3 Community leader The work of sub-district administrative organization should be examined more than that with the current process and people should have opportunities to comment on the activities of the sub-district administrative organization. Problems on management should be learned from the public and various occupation groups should be more encouraged.

3.4 Contact with government agency Understanding in contact with government agency should be clearly encouraged. Channels to obtain complaints, claims and information should be arranged more than the current ones. People should be more encouraged to participate in the activities undertaken by sub-district administrative organization

## DISCUSSIONS

1. The overall level of roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province is moderate. If classified by features of study, the level was high in election, moderate in membership of political parties and low in contact with government agencies and role in the community, respectively.

The process to promote roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province requires coordination from numerous sectors from the government to the local administrative organization. It is evident that the administrative system of the country in each period has differently promoted roles of women with connection and order of command in the bureaucratic system. Nong Muang sub-district administrative organization, a government agency, has encouraged the process to enhance political participation of the public whether male or female, in various forms such as training to ensure understanding in participation and information on political participation available through the mass media. However, the study found that roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province were mostly assumed with understanding and participation in voting process because the media and the government agencies have only made the public relations work through the media on exercise of voting right. Thus people understand that the process of political participation is only voting in the election and participation in the political activities. Regarding participation in

the political activities, it was found that people have applied to be a member of the political party but they did not understand that the member have to participate in any activity so roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province turned out to be moderate.

For roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province on contact with government agency and community leader, it is required to ensure understanding in roles of people to learn and to participate in such matter. Due to various factors, people could not take the roles in the community and contact with government agency so roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province were moderate. The outcomes of the research are in compatible with the research of Somsak Promdua (2008: Abstract) on public participation on preparation of the development plan of sub-district administrative organizations in Na Dune District, Mahasarakham Province classified by gender, occupation and education. It was found that the public participation in preparation of the development plan of sub-district administrative organizations in Na Dune District, Mahasarakham Province was moderate. Besides, the outcomes of the research are in compatible with the research of Rattiphan Saenmukda (2014) on interaction between age and education affecting political participation in Phra Thart sub-district administrative organization, Na Dune District, Mahasarakham Province. The study found that the level of political participation in Phra Thart sub-district administrative organization, Na Dune District, Mahasarakham Province was moderate overall.

2. Roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province with age between 18 -25 years, 26 -35 years, 36 -45 years and 46 years or more were different. When classified by features of study, the difference was found in 4 areas, that is, election, political member, community leader and contact with government agency. When each pair was compared, it was found that the pairs with roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province were different with significance at 0,05 for 3 pairs, that is, age between 18 -25 years and 26 -35 years, those with age between 18 -25 years had roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province more than those with age between 26 -35 years, age between 36 -45 years and 46 years or more, those with age between 36 -45 years had roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province more than those with age 46 years or more, age between 36 -45 years and 26 -35 years, those with age 36 -45 years had roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province more than those with age between 26 -35 years. It was evident that roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province had clearly developed, that is, participation in voting, participation in local political activities, community leader and regular contact with government agency. The study found that those with age between 18 -25 years tended to take roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province more than the other groups. Probably those in such ages were the new group taking part in roles of women so they could express their idea as they had just exercised their voting right so they were enthusiastic to undertake the political participation. Therefore, the study found that those with age between 18 -25 years were taking part in roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province more than the other groups.

The outcomes of the research are in compatible with the research of Sopha Wongyai on factors influencing political participation, case study on Mae Korn Sub-district, Muang District, Chiangrai Province. It was found that different age had influenced different political participation. People with age between 26 – 35 years had expressed political participation most. Probably it was that such period was the time that they had just completed their education and had political experience so they were aware of social roles, duties and responsibilities (Sopha Wongyai.2009).

The outcomes of the research are in compatible with the research of Pramuansilp Pokhasawad on relationship between individual factor, economic and social factors and political participation of the samples in Constituency 1, Mookdaharn Province. The study found that the individual factor, age, had influenced public participation in the election with understanding and interest in political activities, behavior on political participation in the process and behavior in political participation after the election (Pramuansilp Pokhasawad.2009).

The outcomes of the research are in compatible with the research of Prayoon Phuttachart on factors influencing participation of Kamnan and village headman to undertake the project on development of living

quality of people in the villages in southern provinces, mai Kaen District, Pattani Province. The study found that age influencing participation to undertake the project on development of living quality of people in the villages in southern provinces (Prayoon Phuttachart.2009).

3. Roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province classified by education, that is, primary education, high school education/professional certificate/higher professional certificate and bachelor degree were different. When classified by features of study, the difference was found in 2 areas, that is, community leader and contact with government agency and no difference without statistical significance at 0.05 for 2 areas, that is election and political membership. That is in compliance with the hypothesis that roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province with community leader and contact with government agency were still the indicator on participation of women in local administrative system with significant difference. The study on roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province found that the education in high school education/professional certificate/higher professional certificate had influenced roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province more than primary education and bachelor degree or more. It was noticeable that those with education in high school level would take roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province as most of them were the working people in the area and were required to interact and take part in the activities with Nong Muang sub-district administrative organization continuously while those with education in the primary level were the elderly who would not take much part in political participation and those with bachelor degree or more had not time to be in the area of Nong Muang sub-district administrative organization as they had to work. Therefore, roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province of those with education in the primary level and bachelor degree or more were less than those with education in high school. education/professional certificate/higher professional certificate. The outcomes of the research are in compatible with the conceptual idea of Inkeles that higher education is essential to greater roles of people and political participation (Sompit Klaiwong 2000).

The outcomes of the research are in compatible with the research of Theerayuth Sudsamujai on factors influencing public participation in management of Baan Tuek sub-district administrative organization, Sri Satchanalai District, Sukhothai Province which has found that the level of education has influenced the public participation in management of Baan Tuek sub-district administrative organization (Theerayuth Sudsamujai. 2007).

The outcomes of the research are in compatible with the research of Chutima Tunarang on factors influencing public participation in garbage management in the community in Samut Prakarn Municipality. The study found that the samples with high education would participate in garbage management in the community more than those with lower education because education enhanced the public understanding and awareness in environmental conservation Chutima Tunarang. 2010).

The outcomes of the research are in compatible with the research of Pisitsak Huayhongthong (2010:) on factors influencing participation of students in Nakorn Pathom. It was found that different educational institute has different political participation since the educational institutes in the election area were convenient to take part in the activities more than the other educational institutes (Pisitsak Huayhongthong. 2010).

4. Roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province classified by occupation, that is, farmers/contractors for general work, employees of private shop/company, trading/personal business, government/state enterprise officers, students and housewives. It was found that roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province were different in 4 areas, that is, election, political membership, community leader and contact with government agency. The difference was found in 5 pairs, that is, between occupation of students and farmers/contractors for general work, employees of private shop/company, trading/personal business, government/state enterprise officers and housewives, the students took more roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province than farmers/contractors for general work, employees of private shop/company, trading/personal business, government/state enterprise officers and housewives. The study found that the students were the youth who took part in political participation to apply for services of the sub-district administrative organization, roles of children council, contact with government agency, exercise of voting right and applying for political membership as they were energetic. It was also found that Nong Muang sub-district administrative



organization had arranged the child and youth council and project on youth against drugs, youth sport contest every year. That was the process to build participation from the students. Therefore, the students had taken roles of women in political participation in Nong Muang sub-district administrative organization, Borabue District, Mahasarakham Province more farmers/contractors for general work, employees of private shop/company, trading/personal business, government/state enterprise officers and housewives.

The outcomes of the research are in compatible with the research of Sin Mungdee on women and local political participation in Sarapee District, Chiangmai Province. It was found that women in Sarapee District had low local political participation as education, income, occupation, experience leadership, group member and training were the factors encouraging women to take part in local political participation (Sin Mungdee. 2002).

The outcomes of the research are in compatible with the research of Kalaya Noosai on factors influencing political participation in Phra Thong sub-district administrative organization, Cha Aud District, Nakorn Sri Thammarat Province. It was found that occupation was related to political participation in Phra Thong sub-district administrative organization (Kalaya Noosai.2007).

The outcomes of the research are in compatible with the research of Ratchadaporn Thongthanom on opinion towards local political participation in Pan Thong District, Chonburi. It was found that occupation was related to local political participation. People with different occupation have different local political participation (Ratchadaporn Thongthanom. 2008).

### **SUGGESTIONS**

1. Nong Muang sub-district administrative organization should encourage more roles of women on leadership in activities of sub-district administrative organizations.
2. Nong Muang sub-district administrative organization should provide more channels of communication with people such as hotlines, website, e-mails, comment box and other channels
3. Nong Muang sub-district administrative organization should provide the public or community leaders with opportunity to comment and examine the government agency.
4. Nong Muang sub-district administrative organization should enhance roles of women in political participation, political system through information distribution for greater participation from every group of age, education and occupation equally such as activities on promotion of roles of women.
5. Nong Muang sub-district administrative organization should arrange the plan and procedures of the work to ensure clear understanding in contact with the government agency.

### **REFERENCES**

- Kalaya Noosai : (2007) Factors related to political participation of people in Khao Phra Thong sub-district administrative organization, Cha-aud District, Nokorn Sri Thammarat Province, Thesis, Master of Public Administration (M.P.A.) : Local Administrative College, Khonkaen University.
- Chantana Banpasirichot. (2003) Public participation in economic and social development under the constitution: Research Coordination Project for social development, Sor Kor Vor.
- Chutima Tunarang. (2010) Factors influencing public participation in garbage management in Samut Prakarn Municipality. Environment Management.
- Damrongra januparb, (1997) Institute and Department of Provincial Administration. Minutes of the Ad Hoc Committee on Coordination and Enhancement of Strength of Sub-district Administrative Organization No. 1/2540, Bangkok: Technical and Planning Division, Department of Provincial Administration.
- Thawilwadee Bureekul. (2008) Participation: Concept, Theory and Process. Supporting documents of the work study of the committee on political development and public participation and senators, Bangkok: King Prajadhipok's Institute).
- Theerayuth Sudsamujai, (2007) Factors influencing public participation in administrative work of Baan Tuek sub-district administrative organization, Sri Satchanalai District, Sukhothai Province, Thesis, Master of Public Administration (M.P.A.) : Utraratit Rajabhat University.
- Pramuansilp Pokhasawad. (2010) Public participation in election of the member of the House of Representatives, District 1, Mukdaharn Province, Master of Liberal Arts, Ubon Ratchathani Rajabhat University.
- Prayoon Phuttachart. (2009) Factors influencing participation of Kamnans, Headmen and action in accordance with development project on quality of life in village level, Sothernmost provinces, Mai Kaem District, Pattani Province, Thesis, Master of Political Science (M.P.C.) Sukhothai Thammathirat Open University.

- Pisitsak Huayhongthong. (2010) Factors influencing behavior in political participation of the students in Nakorn Pathom, Development Study, Silapakorn University.
- Ratchadaporn Thongthanom. (2008) Comments on political participation in local level of people in Phanthong District, Chonburi Province, Thesis, Master of Public Administration (M.P.A.) : Burapa University.
- Rattiphan Saenmukda, (2014) Interaction between age and education affecting political participation of people in Phra Thart sub-district administrative organization, Na Dune District, Mahasarakham Province, Thesis, Master of Public Administration (M.P.A.) : Mahasarakham, Mahasarakham Rajabhat University.
- Sompit Klaiwong. (2000) Factors influencing political participation of those eligible to vote with age between 18-20 years, Thesis, Master of Economics (M.Econ.), Ramkamhaeng University.
- Somsak Promdua, (2008) Public participation in development plan of sub-district administrative organizations in Na Dune District, Mahasarakham Province, Thesis, Master of Public Administration (M.P.A.) : Mahasarakham, Mahasarakham Rajabhat University.
- Somsak Promdua, (2016) Innovation policy of public service of sub-district administrative organizations in central northeastern region, Journal of Social Academic, Year : 9, Issue : 2 (May- August 2016) Page No. 9-24, Year : 2016.
- Sin Mungdee. (2002) Women and local public participation in Sarapee District, Chiangmai Province, Independent Study, Master of Political Science, Politics and Administration, Graduate School, Chiangmai University.
- Sopha Wongyai. (2008) Factors influencing political participation and nature of political participation of people, Case study, Mae Korn Sub-district, Muang District, Chiangrai Province, Thesis, Master of Political Science (M.P.C.) : Sukhothai Thammathirat Open University.
- Ekachai Karnwattanee. (2000) Work and effectiveness of policy and plan on development of infrastructure and fundamental service system, Sri Ayudhaya Municipality, Thesis, Master of Economics (M.Econ.) Bangkok, Ramkamhaeng University.

**THE ROLE OF HOUSEHOLDS IN START-UP OF RURAL LABOR  
IN NGHE AN PROVINCE, VIETNAM**

Name: Ho Thi Dieu Anh, Ho My Hanh, Dang Quang Tai

*Affiliation: Faculty of Economics - Vinh University*

*Address: No 182 Le Duan street, Vinh city, Country: Vietnam*

*Corresponding Email: [hdakinhte@gmail.com](mailto:hdakinhte@gmail.com); [anhhtd@vinhuni.edu.vn](mailto:anhhtd@vinhuni.edu.vn); [homyhanhkt@gmail.com](mailto:homyhanhkt@gmail.com)*

**ABSTRACT**

The research was conducted to determine the factors of households affecting the rural labor's ability to start up their businesses in Nghe An province. Research data was collected from 675 rural workers in Nghe An Province (4 districts were selected for the study area). The information collected is verified with Binary Logistic model. The analysis results show that the factors of households affecting rural labor's ability to start up their businesses in Nghe An Province include: (1) Neighborhood support, (2) Using loans from relatives, (3) Loans from friends of the commune, (4) Households with land, (5) Households with factories, and (6) Friends' influence.

The research would like to contribute positively to changing the perception of the families to the start-up capability of rural workers; (1) Households are family members have common property and jointly contribute labor to general economic activities in agriculture, forestry and fishing industries or other sectors prescribed by law are the subjects involved in civil relations in these fields. (2) A startup is early stage in the life cycle of an enterprise. And (3) Rural labor is someone who lives and works in rural areas in the age prescribed by law and has working capacity.

**KEYWORD:** HOUSEHOLDS, START- UP, RURAL LABOR



## INTRODUCTION

Over the years, entrepreneurship has been gaining a lot of attention from researchers around the world, especially the study of factors affecting each individual's entrepreneurial intention. Lee & et al. (2006) argue that entrepreneur spirit is focused in many countries and is seen as a way to promote economic growth and job creation. Sobel & King (2008) state that start-up is the key to economic growth, so promoting young entrepreneurs is one of the top priorities of policy-makers. Intention to start-up can be defined as the intent of an individual to start a business (Souitaris et al., 2007); is a process that directs the planning and implementation of a business creation plan (Gupta & Bhawe, 2007). An individual's entrepreneurial intention is that they recognize opportunities, utilize available resources and support of the environment to create their own businesses (Kuckertz & Wagner, 2010).

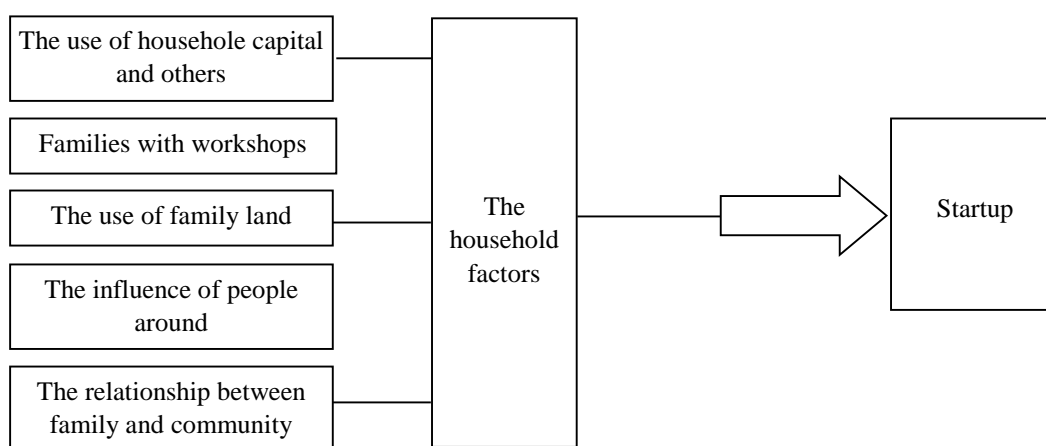
## MATERIALS AND METHODS

### 1. Theoretical basis and research model

Ajzen's (1991) theory of planned behavior suggests that the intention to perform an act is influenced by three factors: personal attitude, subjective norm, and perceived behavioral control, in which subjective norm is related to how other people (family, friends, etc.) feel about performing the behaviors. According to Dewit (1993), family background is important in deciding between the start-up and being employed. Many researchers emphasize the impact of parents' occupation and education on the tendency to start-up. Studies show the significant influence of the fathers' career on the career choice of the children. One is more likely to create jobs if one's father created jobs himself. Dewit added that a person is more likely to take risks in order to get more benefits if their spouses work and have a stable income.

The study of Pablo-Lerchundi et al. on the influence of parents' occupation on the career choices of the children concludes that self-employed parents are a good example of entrepreneurship and motivation. Parents working for the public sector is not a good example for starting a business and hindering the entrepreneurial intention. Based on a theoretical analysis and a review of the study, the author proposes an analytical framework as shown in Figure 1.

**Figure 1: Framework for analyzing household roles for rural entrepreneurship**



*Source: Author's proposal*

### 2. Observation method

This study used data from the primary survey in Nghe An Province. The author carried on a rural labor survey in the province, the survey was conducted in April 2017. Questionnaires were distributed to rural workers in households and then collected. Quantitative information was collected through surveys with pre-designed questionnaires. The study conducted a rural labor survey in localities in April 2017.

Survey of rural workers from households: Survey sample, in Nghe An Province, 4 districts selected include: Yen Thanh, Quynh Luu, Thanh Chuong, and Que Phong, representing 4 geographic areas (delta, coastal area, lowland, highland). In each district, 2 communes were surveyed (the respondents were householders). The survey unit was identified as a "rural workers" in the households. There are two types of research subjects

identified in the sample including rural workers who do not start their businesses, rural workers who start their businesses. The goal is to collect data that is large enough for the results to be statistically significant. Geography of district-level administrative units in Nghe An Province is divided into 4 areas, each of which selects one district and each district chooses 2 communes. The surveyed communes are typical representatives of the study area.

**Table 1:** Distribution of Survey Sample on Rural Labor

No.	District	Number of communes/ samples	Communes	Expected rural labor survey		Collected samples	
				With start-up	Without start-up	With start-up	Without start-up
1	Yen Thanh	2 communes/ 200	Cong Thanh	50	50	30	50
			Do Thanh	50	50	32	50
2	Quynh Luu	2 communes/ 200	Quynh Lam	50	50	28	50
			Quynh Van	50	50	34	50
3	Thanh Chuong	2 communes/ 200	Dong Van	50	50	32	55
			Hanh Lam	50	50	32	55
4	Que Phong	2 communes/ 200	Tien Phong	50	50	35	54
			Tri Le	50	50	35	53
				400	400	258	417
Total samples				800		675	

Source: Author's Survey, April 2017.

Due to the relatively large difficulties of geographic distance, time and size of the survey samples, the author can not directly interview and survey rural labor but based on the support of some officials in the communes. After being trained on the content of the questionnaires, local staffs guide rural workers to fill in the answers in the questionnaire. This method of collecting data encountered some difficulties during the investigation, so the number of distributed samples were 800, but collected samples were 675.

**Table 2:** Distribution (%) of respondents by some basic characteristics

Characteristics		Total number of respondents: 675			
1. Age group	19-35	36-50	>= 51		
Percentage (%)	21.6	54.7	23.7		
2. Gender	Male	Female			
Percentage (%)	64.9	23.7			
3. Marital status	Married	Widowed	Divorced	Single	
Percentage (%)	93.5	2.1	0.4	4.0	
4. Education	Primary school	Secondary school	High school	Higher Education	
Percentage (%)	12	36.6	46.8	4.6	
5. Qualification	Untrained	Elementary vocational school	Intermediate vocational school	Vocational colleges	Universities
Percentage (%)	41.3	41.2	10.2	4.6	2.7

Source: Author's Survey, April 2017.

## RESULTS

The research uses regression model to evaluate the effect of independent variables on dependent variable (start-up). The author uses multivariate analysis techniques, in particular binary regression analysis technique (*binary*) to measure the influence of factors on the start-up of rural labor. According to the model, the dependent variable is "startup". The dependent variable has two values (Without startup: 0; With Startup: 1). Thus, the author uses the *binary logistics* regression using binary dependent variables to estimate the probability that an event will occur with the information of the independent variable we obtain. From this binary dependent variable, a procedure is used to predict the probability of an event occurring according to the rule if the predicted probability is greater than 0.5 then the expected result is given as "Start-up". On the contrary, the predicted results will be no.

**Table 3:** Independent variables in binary regression analysis (*Binary Logistic*). The factors that affect the ability of households to start a business

No.	Independent variables	Variable code	Scale
1	Influence of relatives in other places	Ahhhnoikhac	Level
2	Influence of neighbors	Ahhx	Level
3	Influence of relatives in the commune	Ahhohangtrongxa	Level
4	Influence of friends outside the commune	Ahbanbengoaixa	Level
5	Influence of friends in the commune	Ahbanbetrongxa	Level
6	The family has a workshop	Conhaxuong	Level
7	Use of land of the family	Sudungddgd	Level
8	Capital of relatives	Vonhohang	Identification
9	Capital of friends in the commune	Vonbanbetrongxa	Identification

Source: Author's Survey

The author performs multivariate analysis using binary *logistic* regression model using SPSS software to try to clarify the correlation and to assess the impact of the factors on the start-up of rural labor. Use SPSS binary logistic regression analysis *Forward LR* ( *Analyze - Regression - Binarylogistic - Method (Forward LR)* ).

In the binary *logistic* regression model, the dependent variable is the start-up, independent variables are all variables that affect the start-up. About independent variables, the binary *logistic* regression software SPSS allows the use of all types of variables: continuous, identifier or binary. Use SPSS binary logistic regression analysis *Forward LR* ( *Analyze - Regression - Binarylogistic - Method (Forward LR)* ). This procedure will test the variables in the model.

**Table 4:** Binary logistic regression analysis (N = 675)

No.	Independent variable	Variable code	B	Sig	Exp (B)
1	The family has a workshop	Conhaxuong	2.827	0.000	16.898
2	Use of land of the family	Sudungddgd	1.808	0.000	6.100
3	Influence of neighbors	Ahhx	0.341	0.029	1.406
4	Influence of friends outside the commune	Ahbbnx	0.460	0.01	1.584
5	Capital of relatives	Vonhohang	0.755	0.004	2.127
6	Capital of friends in the commune	Vonbanbetrongxa	1.538	0.000	4.656
<b>Block factor</b>			-3.952		-3.952

Source: Binary Logistic Regression Analysis - Dependent variable: Startup

Through the probability calculations in the typical cases, the probability of startup of rural labor in Nghe An Province in Vietnam varies depending on the variation of the above factor of the regression function with the effect of 6 basic variables. Based on the regression analysis, some conclusions were drawn:

1. When rural workers highly assess the magnitude of their neighbors, the likelihood of starting a business of rural workers is higher. Neighbors have a great impact on the ability of rural workers to start their businesses.

2. Rural workers have the support of friends outside the commune (the importance of friends outside the commune is appreciated), the ability to start up business is higher. The role of friends outside the commune has a positive impact on the ability of rural workers to start their businesses.

3. Rural workers have a 16.898-fold increase in start-up possibility. The role of the household is very important, perhaps when the family has a workshop where workers are accumulating experiences so the probability of starting a business increases.

4. Rural workers using household land are 6.100 times more likely to start a home-based business than those who do not. Family land is an important factor for starting a business.

5. For rural workers who rely only on their own capital; their ability to start a business is only 0.494 of that of rural workers who do not just on their own capital. So personal capital is not the basic factor to start a business but they also have to use other sources of capital, the ability of rural workers to start their businesses can increase.

6. Rural workers can borrow capital from their relatives; the probability of starting a business is 2.127 times higher than that of those who cannot borrow capital from relatives. This shows that the role of relatives,

family linkages in rural areas has a great impact on the ability to start a business.

7. Rural workers who can obtain loans from friends in the commune have the ability to start up 4.656 times more than rural workers who cannot borrow from friends in the commune. We recognize that the support of friends in the commune is the motivation for rural labor to start up.

Based on the analysis, it is possible to deduce the influence of household factors on the ability of rural workers to start their business in Nghe An Province, Vietnam.

### CONCLUSION AND DISCUSSION

This study investigated the role of households in the ability of rural workers to start their business in Nghe An Province, Vietnam. With the use of (675) samples in four districts of Nghe An Province, Vietnam and the use of appropriate logistic regression (Binary logistic) model found some basic issues affecting the start-up of rural labor. The impact of the neighborhood has a major impact on the start-up of rural labor. Families with factories and land will be the basis to help rural workers improve their ability to start a business. The support of friends outside the commune is the basis to increase the probability to start a business of rural labor. The role of the family is promoted to help rural workers have the opportunity to start a business.

*Mobilizing start-up motivation from the household:* The start-up process of rural labor is supported by their families. Families play a very important role in supporting employment orientation for rural workers. But the fact that the rural families in Nghe An, Vietnam still are heavily sticking to tradition, dare not let children to settle. Thinking of getting rich is also a lot of barriers from the families: lack of capital, fear of failure, fear of instability, fear of procedures... It is difficult to convince the families to give up comfort in the familiar environment to engage in business. If the family does not support it, rural labor can face real challenges. Not appreciating opportunities for start-ups, the preference for stability and the desire to protect children of parents and the community to work in rural areas is one of the first hurdles for them. Therefore, it is necessary to change awareness through synchronous communication programs, especially to promote the role of vocational orientation for rural labor in the households. As the mothers, the sisters in the families, always support the youth in all circumstances, the perception of members in the households will have a strong and direct impact on the behavior and choice of the occupation of rural labor

Therefore, in order to promote the start-up of rural labor, some changes in the thinking of the families are needed. (1) Families need to build trust for rural workers when they start working. In order to persuade family support, it takes time for them to understand the business and develop a coherent plan. (2) Families should be proactive in accessing local or other entrepreneurial start-up models, seeking information that will guide their children in the process of self-employment. With the ways of thinking, the views of experienced family members in the families will be valuable lessons in the start-up of rural labor. The householders of families of rural labor have a major impact on the start-up.

*Strengthening family financial support, promoting capital from relatives and friends:* The analysis shows that if rural workers rely on their own capital, their ability to create non-farm jobs is reduced many times in rural workers who are not based on their own capital. So capital itself is not the basic factor to start a business but also have to use other sources of capital, the ability to start a new business can increase. At the same time, the conclusions from the regression model show that rural workers can borrow capital from their relatives, borrow money from friends in the commune, the ability to start a business increases many times compared to those who do not have such funds. This illustrates the role of relatives, family connections, and friendships in the countryside. Under these conditions, in order to survive and develop, rural workers have come back to find a place in kinsman relationships to overcome the difficulties of early self-development: labor, capital, technology... Most families in difficulty have to rely on relatives, especially inbreeding relationships. In the context of the current market economy, the business of the locality as mentioned has a strong combination of kinships and villages, which are most evident in hiring workers; priority is given to relatives and villagers. Although the above expressions are not the optimal solution, they confirm the role of the family in the current condition. The role of the family and relatives with the values and characteristics of life is not lost, but it adapts, changes, creates new values and is able to live with the life in villages, communes in rural areas today. The family tradition of start-up, experience and support of start-up family members also play an important role in the choice of start-ups and mastering their production, especially financial power based on regular income outside the work of the household is a strong support for rural self-employment. The development of household economics has created breakthroughs in improving the material and spiritual life of the family, but it itself contains many limits. It is a form of labor organization attached to rural areas; the development of family economy contributes to the socio-economic development. At the same time, the family economy is also a strong peddle for rural labor in the process of self-

employment. Under modern social conditions, the family economy needs to go beyond the narrow framework of a family, engaging in a new division of labor, promoting the process of start-up of the rural labor is a very necessary solution.

*Building relationships with relatives, friends and neighbors:* Families with social relationships, relationships in the community are a solid source of support for rural workers in the start-up process. Due to the specific functions of the family, the family plays an important role in maintaining the existence of social life and economic development. Family is also an important link in the relationship between people and people, people and villages, people and the community, the country. Building a healthy family relationship with the community is essential to helping rural workers build the necessary relationships in the start-up process.

The analysis shows that for rural workers, the impact of neighbors is important to the start-up process. Rural workers have the support of friends outside the commune (the importance of friends outside the commune is appreciated), the ability to start up business increased. Based on the above conclusions, rural workers with good relationships with their neighbors, friends and relatives have many advantages in the process of starting a business. It is necessary to enhance the status of family members in order to increase the value of the individuals, promote the role of rural labor in the start-up process. During the start-up, rural workers face many difficulties and challenges; they need support from the family, especially from the surrounding community. In fact, the entrepreneurial process of rural labor itself is not enough. They need the support of their people around, families and neighbors.

At the same time, the process of building good relationships with neighbors, friends, and clans will help rural workers forms the skills needed in the start-up process. These skills are the knowledge necessary to enable rural workers to implement plans and transactions during the start-up process.

## REFERENCES

- [1] Ajzen (1991), "*The Theory of Planned Behavior*", Organizational Behavior and Human Decision Processes, Vol. 50, page 197-211.
- [2] DeWit (1993) "*Model of self-employment in a competitive market*". Journal of Economic Surveys, page 67-397.
- [3] Lee, S. M., Lim, S. B., Pathak, R. D., Chang, D., & Li, W. (2006). Influences on students attitudes toward entrepreneurship: A multi-country study. *International Entrepreneurship and Management Journal*, 2 (3), 351-366. doi:10.1007/s11365-006-0003-2
- [4] Gupta, V. K., & Bhawe, N. M. (2007). The Influence of Proactive Personality and Stereotype Threat on Women's Entrepreneurial Intentions. *Journal of Leadership & Organizational Studies*, 13 (4), 73-85. doi: 10.1177/10717919070130040901
- [5] James Fetzer (1998), World Bank working paper "*Who is likely to become self-employed in Vietnam?*", page 19, <<http://ssrn.com/abstract=1161152>>.
- [6] Kuckertz, A., & Wagner, M. (2010). The influence of sustainability orientation on entrepreneurial intentions - Investigating the role of business experience. *Journal of Business Venturing*, 25 (5), 524-539. doi:10.1016/j.jbusvent.2009.09.001
- [7] Sobel, R. S., & King, K. a. (2008). Does school choice increase the rate of youth entrepreneurship? *Economics of Education Review*, 27 (4), 429-438. doi:10.1016/j.econedurev.2007.01.005
- [8] Souitaris, V., Zerbini, S., & Al-Laham, A. (2007). Do entrepreneurship programs raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources. *Journal of Business Venturing*, 22 (4), 566-591. doi:10.1016/j.jbusvent.2006.05.002
- [9] Kuckertz, A., & Wagner, M. (2010). The influence of sustainability orientation on entrepreneurial intentions - Investigating the role of business experience. *Journal of Business Venturing*, 25 (5), 524-539. doi:10.1016/j.jbusvent.2009.09.001

## POLITICAL BEHAVIOR OF PEOPLE IN YASOTHON PROVINCE

Snook Singmart and Pikul Meemana

*Lecturer of Yasotho buddist Collage, Mahamakut Buddhist University, Thailand*  
*Corresponding author, e-mail: [rock800000@hotmail.com](mailto:rock800000@hotmail.com) and [chokooon@gmail.com](mailto:chokooon@gmail.com)*

### ABSTRACT

This research serves the purpose of. 1) To study the level of political behavior of the people in Yasothon province. 2) To study factors affecting the political behavior of the people in Yasothon province and 3) To verify the equation form with the political relationship structure of the people in Yasothon province. The research yielded the following results: The level of political behavior of the people in Yasothon province was high when considering each aspect. It was found that there were two levels of significance. It follows that political observation and political participation are high and the political partnership is moderate. When sorting, the sides were average to very low as it follows political observation and partnership.

**Keywords:** political behavior; factors affecting the political behavior



## INTRODUCTION

The phenomenon of the past decade in Thailand, is that many Thai people are more active in politics because of the 1997 constitutional law that recognized for the constitution of the people it is important to be involved in politics in a more democratic way, rather than as a representative democracy. [1] For the people who have been living in Yasothon it is the same. The political behavior as well as the way of life is no different than other areas of the northeast. For the above reasons, the researcher is interested in studying the political behavior of the people. Especially in the Yasothon province. **The Research Objectives of this research were** (1) to study the level of political behavior of the people in Yasothon province. (2) To study factors affecting the political behavior of the people in Yasothon Province. And (3) to examine the model of structural equation, cause, political behavior of the people in Yasothon province.

## RESEARCH METHODOLOGY

### The Variables studied

1. Independent variables or predictors. The term “variable” is used by the researcher to describe the term “factor”: 1) psychological factors, 2) political factors and 3) political attraction. The Sub-factors are.: 1) Political interests, 2) Good attitude towards politics, 3) Democratic political ideology, 4) Political culture, 5) Political instability, 6) Government promotion, 7) Promotion from civil society, 8) Faith in politicians, 9) Faith in political parties and 10) Political concerns.

2. The predicted variable was political behavior, consisting of 3 sub-variables.: 1) Political observation, 2) Political participation and 3) Political affiliation.

### Population and sample

The population used in this research is anyone aged 18 and over who is eligible to vote which consists of 409,304 people. And the sample is 400 people. [2]

### Research Instrument

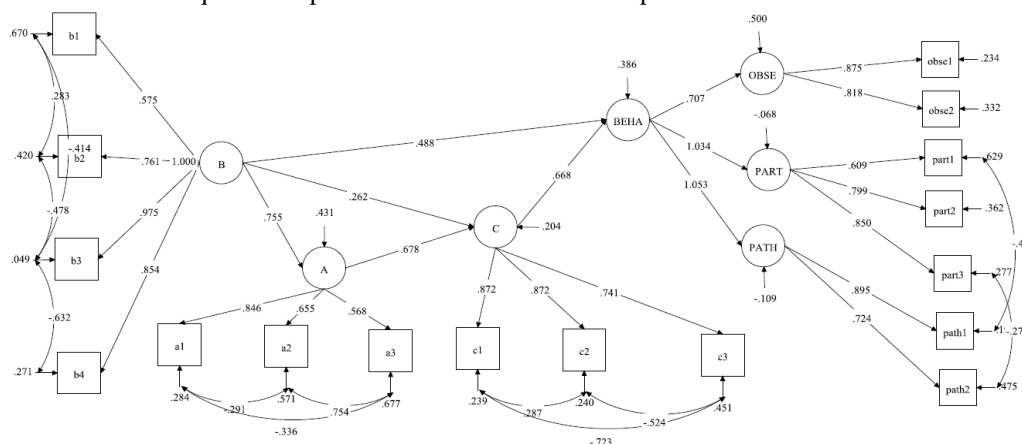
The instrument used for data collection was a questionnaire developed by the researcher and was adapted to fit the context of this research under the close supervision and guidance of instructors. The questionnaire was used as a 5-level rating scale questionnaire. There is criteria for measuring the level of feedback / behavior based on the Likert scale. (Likert Scale) [3]

## RUSULTS

1. Political behavior of people in Yasothon province overall and individual that: The level of political behavior of people in Yasothon Province, as overall level was moderate ( $\bar{X} = 3.15$  S.D. = 1.05).

2. The linear correlation between independent variables and F-test (ANOVA) : Seven independent variables were democratic political ideology, political culture, political socialization, promotion from government, promotion from civil society, faith to politicians, faith in political parties.

3. The structural equation of political behavior in Yasothon province that:





4. The results of the structural equation of political behavior in Yasothon province that: It shows that the value of the analysis is within the set criteria, which shows that there is a harmony between the political behavioral structural equation of the people in Yasothon province and the corresponding data.

#### REFERENCE

- [1] Prathaworapunya, S. (2014). Political Participation Model of Employees of Thanachart Capital Limited. Chonburi: (dissertation) Graduate School: Thammasat University. Burapha University.
- [2] Yamane, T. (1973). Statistics: An Introductory Analysis. Third edition. New York : Harper and Row Publication.
- [3] Wongrattana, C. (2010). Statistical techniques for research. Bangkok: Thailand Negotiates Inter Progress.

**A STUDY POTENTIAL OF COMMUNITY FOR EARNING A LIVING IN AGRIBUSINESS IN  
LARDPATTANA SUB-DISTRICT, MUANG DISTRICT, MAHASARAKHAM PROVINCE**

KetjitKhamkula\* and Chadaporn Sangsilang

*Department of Bachelor of Science Program in Agribusiness, Faculty of Agricultural Technology  
Rajabhat MahaSarakham University, Maha Sarakham, Thailand 44000*

*Tel : 087-8642939, 043-725439 fax: 043-725439*

*Corresponding E-mail address: ketjit-39@hotmail.com*

**ABSTRACT**

The purposes of this study were (1) to study Potential of community in Lardpattana Subdistrict, Muang District, Maha Sarakham Province and (2) Analyze the potential of community for earning a living in agribusiness by using SWOT. The questionnaires were used as a tool for collecting data. The sample consisted of 25 people in Lardpattana subdistrict by Simple random sampling and The data were analyzed by descriptive statistics and show the result by Percentage (%), Mean ( $\bar{X}$ ) and standard deviation (S.D). The results found that (1) The potential of Lardpattana Subdistrict was at the highest level. It consisted of two important aspects : The first one, it had good topography, climate, community- Leaders. The secondary aspect had good area, transportation, territory, population, economy and cultural traditions. The general characteristics of Lardpattana Subdistrict had 24,280 rais, 19 villages, 1,835 households and 7,599 persons. Nearly all of the people were farmers, lived in the Floodplains. It had a big river, called 'Chi River' that flowed through this area. It was appropriate for paddy cultivation. (In season rice-off season rice).Lardpattana Subdistrict had 3 seasons such as Winter, Summer and Rainy Season. Average rainfall of 4 months. The people in Lardpattana Subdistrict gave precedence to Education, Business, Religion and Health. So that it was appropriate for building the organizations strongly and corporate leaders. (2) The SWOT of Lardpattana Subdistrict found that the strengths of this community had alot of the water resources,because of Topography and Climate for Earning a living in farmer, the weakness was shortage of labor and agricultural products were not variety, Some rainy sea had alot of water excessively, but could not keep them for plantation in dry season. The opportunity was the budget from government for operating activities, and the last one was the thread that had some problems of the flood and shortage of agricultural workers.

**KEYWORDS :** Potential, Earning a living, Agribusiness

## INTRODUCTION

Agribusiness Group Considered a key role in the development of the national economy. Since Thailand is a production of agricultural products, the export of agricultural products and food on the top of the world and also has the potential to produce suitable products and agricultural products. Which is needed in an increasingly global market respectively. By the start of the privatization of local businesses and expend to the business community is the key to increasing household incomes for farmers and raise the income of the community. (Statistical Office of Maha Sarakham, 2016).

Self-sufficiency community is the key to local development. By developing the ability of farmers to comply with a community context. The economic community is a family production units. Labor member of the family is the most important factor. A factor important to the survival of the family self-sufficiency and the ability to self-reliance. Economy Based Community. Community's own. Dynamic and able to survive on their own. Developed alongside the development of capitalism. (Academic service, Sukhothai Thammathirat Open University, 2013).

Lardpattana subdistrict as one of the 13 subdistrict of Muang Maha Sarakham. Away from muang maha sarakham to the north, about 13 kms divided Koeng subdistrict. Now Lardpattana has a total area 24,280 rai with a population total 7,599 people, mainly area in the lowlands and often flooded annually as main occupation is farming. Career is Wicker mats, Animals husbandry, Cropping in dry season (Thai Tambon.com, 2016). As Lardpattana subdistrict were the economic community nature and communities have the ability to self-reliance in agricultural business as a key factor in the development of the community.

Thus the study of A Study Potential of Community for Earning a Living in Agribusiness in Lardpattana Subdistrict, Muang District, Maha Sarakham Province. To study Potential of community in Lardpattana Subdistrict and to analyze the strengths, weaknesses, opportunities and Thread of Lardpattana Subdistrict, Muang District, Maha Sarakham Province in agribusiness careers. So that those involved in definition and promotion for the development of sustainable communities.

## MATERIALS AND METHODS

### 1. Materials.

The study used a questionnaire as a tool for studying and collecting information. The researcher checks. Improve and solve before the inquiry to collect data. The elements of the instruments were used as following.

#### 1.1 The questionnaire on community context including 4 parts

- (1) Part 1 general information of the community.
- (2) Part 2 potential information community.

#### 1.2 The questionnaire on agricultural entrepreneurs including 3 parts

- (1) Part 1 general information of agricultural entrepreneurs
- (2) Part 2 occupation in agriculture.
- (3) Part 3 context community information towards the earning a living in agribusiness.

### 2. Methods

Methods of study on Potential of Community for Earning a Living in Agribusiness in Lardpattana Subdistrict, Muang District, Maha Sarakham Province has the study as follows.

#### 2.1 Topics study by study problems and the importance.

2.2 Scope the population and sample. The samples were used as farmers of Lardpattana Subdistrict, Muang District, Maha Sarakham Province

#### 2.3 Made a questionnaire for data collection

#### 2.4 Research using statistical tools in the questionnaire and survey by query from the sample.

#### 2.5 Gather information.

#### 2.6 Analyze and conclusion.

Study Potential of Community for Earning a Living in Agribusiness was analyzed by using the descriptive statistics that including percentage, mean and standard deviation and used SPSS program for analysis the data and presented by description.

## RESEARCH RESULTS

### 1. The potential of community context in Lardpattana subdistrict area.

1.1 Territory: The study found that the territory has a total area of about 24,280 rai. Mainly lowland areas are often flooded annually. The North of Lardpattana subdistrict adjacent to Kantarawichi district. The South, adjacent to Khwao subdistrict. The East adjacent to Tha Tum subdistrict and West adjacent to koeng subdistrict.

1.2 Topography: The study topography found that the mainly lowland areas. Chi River flows through. The canal system from Department of irrigation for water distribution by area which is suitable for the cultivation of rice. They can be farming 2 per year.

1.3 Climate: The study found that Climate of Lardpattana subdistrict has a tropical monsoon. Thus divisible 3 season include (1) summer season is in the middle of February to in the middle of May (2) rainy season in the middle of May to in the middle of October (3) winter in the middle of October to in the middle of February. Lardpattana subdistrict of average rainfall 4 months per year is June to September every year. Winter can be very cold. Summers are hot and dry.

1.4 Population: The study found that the population of Lardpattana subdistrict total of 19 villages and 1,835 households and a population total 7,599 people, divided into male 3,876 people and female 3,723 people.

1.5 Transportations: The study found that Lardpattana subdistrict is land transportation primarily from Muang Maha Sarakham can use the road the Office of Accelerated Rural Development number Mahasarakham 12010 and highway number 3267.

1.6 Water supply: The study found that Lardpattana subdistrict covering area to water distribution services from Provincial Waterworks Authority and other include Mueang Maha Sarakhammunicipal, Wang Nang subdistrict municipal, Kaeng Subdistrict Administrative Organization, Kang Lurng Chan Subdistrict Administrative Organization, Khwao Subdistrict Administrative Organization, Thasongcorn Subdistrict Administrative Organization, Wang Nang Subdistrict Administrative Organization, Nong Gung Subdistrict Administrative Organization, Nongno Subdistrict Administrative Organization, Nongpling Subdistrict Administrative Organization and Huai ang Subdistrict Administrative Organization.

1.7 Electricity: The number of households with electricity in the area total 1,835 household on 100%

1.8 Economy: The Study on Economic found that most population earn a living on agriculture and has community market always. The product from people inside outside the community.

1.9 Social, Groups organizations and Leaders: The study on Social, Groups organizations and leaders found that Lardpattana subdistrict focus on Education, business, religious and health. Thus causing organizations and leaders in the community. It includes: (1) Academies includes 7 Primary schools, 1 secondary school and 1 Center for Community Learning (2) Business unit includes 5 Gas stations and 15 Rice mill. (3) Religion includes 11 Temples and (4) Health services units. includes 2 Community hospitals

1.10 Traditional and Rituals: Study on traditional and rituals found that district has the traditions and rituals cover of 12 months, including (1) Boon Khou Kome on December (2) Boon Koon Lan on January (3) Boon khaw Gii on February (4) Boon Praves on March (5) Boon Songnam or Songkran Festival on April (6) Boon Bungfai and Boon Visakha Puja on May (7) Boon Chamha and Phee Ta Hag ceremony on June (8) Buddhist Lent on July (9) Boon Khaw Pradub Din on August (10) Boon Khaw Sark on September (11) End of Buddhist Lent on October (12) Boon Krathin on November

1.11 Local Wisdom: Study on Local Wisdom found that 2 people of Local Wisdom including (1) Mr. Thongin Phangmuangcook which has knowledge of the traditions, rituals and recipes on village and (2) Mr. Som Ruangsombat which has knowledge of the herbs.

1.12 Overview of Potential community context : Study on Overview of Potential community context found that high and most Potential level is The Terrain, Weather and leaders. For The Area, Transportation, Territory, Population at a high level in the economy at a low level. And cultural traditions in the least, respectively.

### 2. Information on Agriculture careers.

2.1 Agricultural occupations : The study found that the occupation of agricultural in Lardpattana subdistrict. Most farmers are self-employed farmer on 83% and The miller on 17%

2.2 Participation in the integration of farmers : The study found that the occupation of agricultural in Lardpattana subdistrict. Most farmers do not join the group on 96% and joined the group on 4%

2.3 Sales of Agriculture products : The study found that the employed in agriculture. Sales of Product own self on 100%

2.4 The products of agriculture : The study found that most places of employment in agriculture. Products sold to the mill on 100%

2.5 The areas in agricultural careers: The study found that most areas in the agricultural occupations is an area of their own on 100%

2.6 The debt : The study found that the agricultural occupations 68% there are liabilities and without liability on 32% and source of liabilities consist is Bank for Agriculture and Agricultural Cooperatives, village funds and Siam commercial banks/Government saving Bank.

### 3. The community context for agricultural careers.

3.1 Area: The study found that influential of Area to agricultural careers. In Lard pattana subdistrict on most level, there is the average 3.91 includes The area suitable for agriculture. Average is 4.88, Suitable for sufficient. Average 4.04, Just enough to resources are available and the size of the area to be appropriate average 3.36. (Table 1)

3.2 Transportation : The study found that influential of the transportation for the agricultural career of Lardpattana subdistrict were a middle level because there are has a transit route for transport the agricultural products average is 3.12 (Table 1)

3.3 The territory of community : The study found that influential of the territory in Lardpattana subdistrict to agricultural career in the middle level is an average of 2.52 includes border next to with the supplier directly average is 2.88 and the main road route the average is 2.16. (Table 1)

3.4 Population : The study found that influential of the population to agricultural career in the middle level is an average 2.64 includes of people are employed in agricultural career on average is 3.24 followed by the movement of agricultural labor. Average 2.36 and enough on the agricultural labor average 2.32 (Table 1)

3.5 Topography: The study found that influential of the topography to agricultural career on highest level is the best of topography and location for agriculture careers on average is 4.8 (Table 1)

3.6 Climate : The study found that influential of Climate to agricultural career on the highest level is a weather suited to a agriculture career on average is 4.8 (Table 1)

3.7 Economic : The study found that influential of the economics to agricultural career on a low level average is 2.25 consisting of a purchase on a regular basis and are engaged in the agricultural community average is 3.12, followed by a right vendor average to 3.04 with the money circulating in the community dealing in agricultural products regularly average is 2.96 with the industry average is 1.24 with the integration of production and distribution average is 1.16 and a variety of agricultural products. The average is 1.12, respectively. (Table 1)

3.8 Cultural and Traditions : The study found that influential of the cultural and traditions to agricultural career on the least is an average 1.12 (Table 1)

3.9 Leaders of Community : The study found that influential of Leaders of Community to agricultural career on the most level is leadership management and professional support for agricultural machinery as well. Leadership and talent The average is 4.52 (Table 1)

3.10 The overall community context of a agriculture. career : The study found that potential of the overall community context of a agriculture. career on the highest level is the Topography, Weather all the average is 4.8, The community leaders on average is 4.52, Followed is the potential level such as the area with the average at 3.91 potent medium include transportation average is 3.12, the territorial average is 2.52, the population average is 2.64 potential minimum level. economic average of 2.25 and a minimum potential of culture and tradition. Is an average of 1.12. (Table 1)

**Table 1** : The community context for agricultural careers.

Community Context Information	$\bar{X}$	S.D.
<b>Area</b>		<b>3.91</b>
The area suitable for agriculture	12.5	4.88
The area suitable for sufficient	8.33	4.04
Just enough to resources	8.33	3.36
The size of area to be appropriate	6.25	3.36
<b>Transportation</b>		<b>3.12</b>
Transit route for transport the agricultural products	8.33	3.12

<b>Territory</b>		<b>2.52</b>
The main road route	8.33	2.16
Border next to with the supplier directly	8.33	2.88
<b>Population</b>		<b>2.64</b>
The movement of agriculture labor	6.25	2.36
enough on the agricultural labor	6.25	2.32
People are employed in agricultural career	8.33	3.24
<b>Topography</b>		<b>4.8</b>
The topography suitable for agriculture	12.5	4.8
The location suitable for agriculture career	12.5	4.8
<b>Climate</b>		<b>4.8</b>
The climate suitable for agriculture career	12.5	4.8
<b>Economic</b>		<b>2.25</b>
In the community with an industrial	8.33	1.24
Variety of agricultural products	12.5	1.12
Integration of production and distribution	8.33	1.16
A right vendor	6.25	3.04
consisting of a purchase on regular basis	6.25	3.12
The money circulating in the community dealing in agricultural products regularly	6.25	2.96
The engaged in the agricultural community	8.33	3.12
<b>Cultural and Traditions</b>		<b>1.12</b>
Influential of the cultural and traditions to agricultural career on the least	12.5	1.12
<b>Leaders of Community</b>		<b>4.52</b>
Leadership management and professional support for agricultural machinery	6.25	4.52
Leadership are talent	6.25	4.52

4. The SWOT of this community consisted of Strengths, Weaknesses, Opportunities and Obstacles in agribusiness careers following :

**Strengths :** The study found that Lardpattana subdistrict community has strengths is (1) The area suitable. (2) water quantity and water have enough in the farming industry (3) Topography and Weather is suitable to cropping especially the Farmer career (in season rice and out season rice). There are rice planting 2 time per year.

**Weakness :** The study found that Lardpattana subdistrict community has weaknesses is (1) Labor are not enough (2) no variety of agricultural products (3) In rainy season on floods occurred (4) The farmer without join a group. Because of lack of raw materials and lack of support.

**Opportunity :** The study found that Lardpattana subdistrict community has opportunities is (1) administration budget management and community development (2) Government policy promote and support community development and extension of agricultural professionals regularly.

**Thread :** The study found that Lardpattana subdistrict community has obstacles is in the area Experiencing flooding problems because the topography on lowland therefore making flood frequently.

## CONCLUSIONS AND DISCUSSION

### Conclusions

#### 1. Potential community context in Lardpattana subdistrict area.

Lardpattana subdistrict has a total area of about 24,280 rais. Mainly lowland areas are often flooded annually. And has Chi River flows through. The canal system from Department of irrigation for water distribution and Water supply from Provincial Waterworks Authority. Lardpattana subdistrict has a tropical monsoon. Thus divisible 3 season include Summer, Rainy and Winter. For Lardpattana subdistrict total of 19



villages and 1,835 households and a population total 7,599 people, divided into male 3,876 people and female 3,723 people. For transportation primarily from Muang Maha Sarakham can use the road the Office of Accelerated Rural Development number Maha Sarakham 12010 and highway number 3267.

For Economic found that most population earn a living on agriculture and has community market always. The product from people inside outside the community.

For Social, Groups organizations and leaders found that Lardpattana subdistrict focus on Education, business, religious and health. Thus causing organizations and leaders in the community. It includes: (1) 9 Academies (2) 20 Business unit (3) 11 Religion (4) 2 Health services units.

The traditional and rituals in subdistrict area cover of 12 months and This community has Local Wisdom on 2 peoples

For Overview of Potential community context found that high and most Potential level is The Terrain, Weather and leaders. For The Area, Transportation, Territory, Population at a high level in the economy at a low level. And cultural traditions in the least.

## 2. Information on Agriculture careers.

Occupation of agricultural in Lardpattana subdistrict. Most farmers are self-employed farmer on 83% and The miller on 17%. Most farmers do not join the group on 96% and joined the group on 4%. The farmer in communication can sales of Product own self on 100% and places sold rice is mill on 100%

For debt found that the agricultural occupations 68% there are liabilities and without liability on 32% and source of liabilities consist is Bank for Agriculture and Agricultural Cooperatives, village funds and Siam commercial banks/Government saving Bank.

3. The community context for agricultural careers.

**Area** found that influential of Area to agricultural careers on most level (3.91). **Transportation** found that influential of the transportation for the agricultural career were a middle level (3.12) **Territory** found that influential of the territory to agricultural career on middle level (2.52) **Population** found that influential of the population to agricultural career in the middle level (2.64) **Topography** found that influential of the topography to agricultural career on highest level (4.8) **Climate** found that influential of Climate to agricultural career on the highest level (4.8) **Economic** found that influential of the economics to agricultural career on a low level (2.25) **Cultural and Traditions** found that influential of the cultural and traditions to agricultural career on the least (1.12) **Leaders of Community** found that influential of Leaders of Community to agricultural career on the most level (4.52) **The overall community context of a agriculture. career** found that potential of the overall community context of a agriculture. career on the highest level is the Topography, Climate, Community leaders Followed is the potential level is Area. The medium level include Transportation, Territorial, Population and minimum level. include Economic, Culture and Tradition.

4. Strengths, Weaknesses, Opportunities and Thread in agribusiness career.

**Strengths** is (1) The area suitable. (2) water quantity and water have enough in the farming industry (3) Topography and Weather is suitable to cropping especially the Farmer career **Weakness** is (1) Labor are not enough (2) no variety of agricultural products (3) In rainy season on floods occurred (4) The farmer without join a group. **Opportunity** is (1) Subdistrict Administrative Organization has budget for management and community development (2) Government policy promote and support community development and extension of agricultural professionals regularly. Thread is in the area experiencing flooding problems because the topography on lowland therefore making flood frequently.

## Discussion

(1) The community has a career in agriculture was mainly a farmer. Due to the nature of the terrain, climate and community with the appropriate amount of water to grow crops all year round. To make this community a popular rice farming is the main occupation over another.

(2) The area is lowlands during the rainy season, rainfall and river species. There are many causes of flooding in the area. It is not suitable for growing vegetables in the rainy season.

(3) Agribusiness career just a management should have a career in agriculture to a system of continuous and comprehensive for sustainability of revenue

(4) Community has a good resource. Suitable for planting rice But not suitable for other crops



## ACKNOWLEDGEMENTS

1. Be aware of community context of Lardpattana subdistrict Muang district Maha Sarakham Province.
2. Be aware of the Potential Strengths, Weaknesses, Opportunities and obstacles of Lardpattana subdistrict Muang district Maha Sarakham Province.
3. For use as a potential development community in agribusiness career on reasonable of Lardpattana subdistrict Muang district Maha Sarakham Province.

## REFERENCES

- [1] Academic service, Sukhothai Thammathirat Open University. (2013). *Self-reliance by economic community*. [http://www.ird.stou.ac.th/assets/5-2014\\_2.pdf](http://www.ird.stou.ac.th/assets/5-2014_2.pdf).
- [2] Statistical Office of Maha Sarakham. (2016). *Agribusinessgroup*. <http://www.Mahasarakham.nso.go.th>.
- [3] ThaiTambon.com. (2016). *Information of Tambon Lardpattana Maung District Maha Sarakham Province*. <http://www.thaitambon.com>

**THE IMPROVEMENT OF ENGLISH VOCABULARY LEARNING ABILITY BY USING GAMES  
FOR PRATHOMSUEKSA 4 (GRADE 4) STUDENTS OF CHUMCHON CHIANGMAI PATTANA  
SCHOOL, PROCHAI DISTRICT, ROI-ET PROVINCE, THE OFFICE OF THE ROI-ET PRIMARY  
EDUCATION SERVICE AREA 3**

Apornsiri Phonraksa<sup>1</sup>, Mayureesirin Siriwan<sup>2</sup> and Sooksil Prasongsook<sup>3</sup>

*Student in Humanities and Social Sciences of RajabhatMahaSarakhm University<sup>1</sup>, Dr. in Humanities and  
Social Sciences of RajabhatMahaSarakhm University<sup>2</sup> and Assistant Professor in Humanities and Social  
Sciences of RajabhatMahaSarakhm University<sup>3</sup>*

*Corresponding authors, E-mail: apornsiri.phon@gmail.com*

*<sup>1</sup>,maggiesiriwan@gmail.com<sup>2</sup>andsooksilp@gmail.com<sup>3</sup>*

**ABSTRACT**

The purposes of this study were: (1) to examine English vocabulary learning ability of Pratomsuksa 4 (Grade 4) students by using games (2) to compare students' pre-test and post-test result and (3) to investigate the students' English vocabulary retention. The sample in this study were cluster random sampling of the 21 Pratomsuksa 4 (Grade 4) students of ChomchonChiangmaiPattana School, Prochai District, Roi-Et Province, The Office of the Roi-Et Primary Educational Service Area 3. The research instruments were eight lesson plans, thirty items of the pre-test and post-test and thirty items of vocabulary learning retention test. The statistics used in this study were percentage, mean score, standard deviation and t-test (Dependent Sample). It was found that: (1) The effectiveness Index of lesson plans was 0.8428 which showed that after using lesson plans in teaching, students' vocabulary learning ability was higher at 84.28. (2) The score of post-test was significantly higher than the score of post-test at.05. And (3) after 14 days of experiment The students had indifferences in English vocabulary retention which showed that the students' English vocabulary retention was significant at.05

**Keywords:** Vocabulary Learning, Using Games in Teaching, Vocabulary Retention

## INTRODUCTION

Since, Thailand has become an ASEAN Community, English language is used as a communication language by the members of the ASEAN community. For this reason, learning English is important and essential, especially in communicating with foreigners for better understanding. On the economic side, English is essential for negotiation in trading and investment. Moreover, learning English is helpful in communicating, making good relationships among the other countries and exchanging culture. (Ministry of Education. 2009: 1) [1]

The Basic Education Core Curriculum A.D. 2008 has been implemented in terms of the educational curriculum. The Ministry of Education announced the implementation of the Basic Education Curriculum 2001, which served as the core curriculum for national education at the basic level. The curriculum prescribed goals and learning standards. It contributes to learners' development by enabling learners to better understand themselves and others. The learners are thus able to learn and understand differences of languages and cultures, customs and traditions, ideas, society, economy, politics and administration. They will be able to use foreign languages for communication as well as to easier and wider access to bodies of knowledge and will have vision in leading their lives (Ministry of Education Commission, 2008: 1). Teaching and learning languages will emphasize development of learners in all situations not only grammatical structures but also listening, speaking, reading and writing skills. Effective language learning will enable learners to use it to communicate effectively. Among many language skills, knowing vocabulary is an also important element. (Wallace, 1984 and Harmer, 1991) [2]. Knowledge of vocabulary will allow students to communicate well with other people. Vocabulary can be considered as a very important element in learning English. Without vocabulary knowledge, people will not understand and communicate with each other. Teaching vocabulary can improve learners in communicating. If learners can remember the words they can use it immediately, properly and correctly. In teaching vocabulary, teachers should use vocabulary correctly whether in grammatical context and in appropriate situations. (Vimolrat Soontornroj. 2011: 4) [3]. There are many ways to learn and teach vocabulary. However, it is not easy to learn and be successful in vocabulary learning because vocabulary learning and teaching has lately received little attention from language teaching methodologists. Many teachers still use the simple and old- methods in teaching which are not interesting for learners. The nature of foreign languages themselves is also the reason that obstructs vocabulary learning. Learners always find it hard to memorize the meanings of the new words.

There are many ways to teach student vocabulary such as teaching by using role play, learning vocabulary through songs, reading or finding words from stories. Among many ways, using games in teaching is one of many helpful ways that help learners in learning. Games can also change their attitude in learning. Game activities can improve English communication skills. Games can develop pronunciation and using words in the sentences. They will encourage students to learn. Teachers need to create contexts that make the language more meaningful and engage students in learning. They should also and create a fun atmosphere for students to learn English. Game activities can be used in practicing oral language. This can reduce anxiety in learning. Moreover, using games in teaching can also be used to correct grammatical or pronunciation errors. Group games also allow learners to cooperate with members. Students will be able to understand one another. Using games in teaching will enhance harmony and encourage them to express themselves. This can lead to students' progress in language learning. (Narisara Kanraya. 2009: 2-3) [4].

Chomchon Chiangmai Pattana School is facing problems in teaching English for Pratomsuksa 4. Students had a lower score in the national achievement test. There are many reasons for this problem, the most important reason is students cannot remember English vocabularies. The school focuses too much on theoretical teaching in the instructional plan. Students have very little chance to practice. They cannot pronounce vocabularies correctly and do not understand the meaning of the words. (Report on academic achievement. English PrathomSuksa 4 Academic Year 2558: Chomchon Chiangmai.2)

In investigating the language learning problems of Pratomsukda 4 (Grade 4) students in Chomchon Chaimai School, the researchers found that students' knowledge of vocabularies is the main problem. We decided to use games in teaching. The main purpose of this study is to improve vocabulary learning ability of Pratomsukda 4 (Grade 4) students in Chomchon Chaimai School.

## RESEARCH OBJECTIVES

1. Examine English vocabulary learning ability of Pratomsuksa 4 (Grade 4) students by using games
2. Compare the score from pre-test and the score from post-test for the students' English vocabulary learning.
3. Investigate the students' English vocabulary retention.

## RESEARCH HYPOTHESIS

The students' English vocabulary learning ability after studying by using games is higher than before studying through games.

## SCOPE OF STUDY

The participants of the study consisted of 21 students of Pratomsuksa 4 (Grade 4) in Chomchon ChiangmaiPattana School, selected from 63 students by using cluster random sampling. The experiment took place in the second semester of the 2016 academic year.

## METHODOLOGY AND METERIAL

### Population and Sample

The population in this research included 63 students of Pratomsuksa 4 who were studying in the second semester of the 2016 academic year in Chomchon Chiangmai Pattana School. The sample of this study was 21 students selected through cluster sampling

### The Research Instruments

1. Instructional plans including games in the teaching process
2. Pretest and post-test
3. Retention test

### Data Collection

The research was undertaken according to one-group pretest- post-test design.

Pre-test	Teaching using game activities	Post-test	Retention test
T1	X	T2	T3

*Figure1: One-group pretest-posttest designs*

The experimental procedures were divided into 5 stages:

1. Clarification of the objectives of teaching to participants.
2. Participants' testing by pre-test to measure basic knowledge of English vocabulary.
3. Teaching and learning was carried out, using the instructional plans that the researcher had constructed.

One plan covered 16 hours.

4. Post-test was taken after the instructional activity was completed by using the same setof tests used previously.

5. Repeat tests again after 14 days to measure the retention of learning with the of English language retention test. This is a test in parallel with the pre-test and post-test.

### Data Analysis

The Data analysis is presented in 3 parts:

1. The effectiveness of the instructional plan was analyzed by the effectiveness index (E.I.).
2. The comparison of the English vocabulary learning ability of students by using games was analyzed by comparing the students' mean score between pretest and post-test by using mean, standard deviation (S.D.) and t-test.

3. Retention of students after using games in learning vocabulary was investigated by using mean, standard deviation (S.D.) and t-test.

## RESULTS

### 1 The effectiveness of the instructional plan was analyzed by the effectiveness index (E.I.).

**Table 1:** The effectiveness of the instructional plan to improve Pratomsuksa 4's English vocabulary learning ability by using games

Number of students	Total score of the test	Pre-test	Post-test	Effectiveness Index : E.I
21	30	242	569	0.8428

Table 1 demonstrates that the effectiveness index was 0.8428 which means the English learning ability of students after implementing the instructional plans increased up at 0.8428 levels or 84.28%

### 2 The Comparison of Achievement between Pretest and Post-test.

**Table 2:** The comparison of an achievement between pretest and post-test of Pratomsuksa 4 students.

Test	N	$\bar{X}$	S.D.	Percentage	t	df	Sig
Pre-test	21	11.52	1.63	38.41	27.866	20	0.000*
Post-test	21	27.10	1.61	90.32			

Table 2 demonstrates the result of comparison of mean scores before learning and after learning. The achievement scores of pretest and post-test are significantly different at the 0.05 and t-test was at 27.866

### 3 The Retention of students after using games for learning vocabulary.

**Table 3:** The comparison of students' retention after 14 days of using games in vocabulary learning

Number	Score	
	post-test	after 14 days
1	28	27
2	25	24
3	26	26
4	27	25
5	25	24
6	28	26
7	29	28
8	27	25
9	25	24
10	29	28
11	26	26
12	27	26
13	25	27
14	28	27
15	29	27
16	29	27
17	30	27
18	27	25
19	28	25
20	25	26
21	26	24
Sum	569	544
$\bar{X}$	27.10	25.90
S.D	1.61	1.30

Percentage 90.33

86.33

**Table 4:** The students' English vocabulary retention after 14 days of learning

Test	N	$\bar{X}$	S.D.	percentage	t	df	Sig
Post-test score	21	27.10	1.61	90.33	4.512	20	.000*
Retention score	21	25.90	1.30	86.33			

Table 4 demonstrates that the English vocabulary learning ability of Pratomsuksa 4 students after class was 90.33% and after 14 days, the retention was 86.33%. The post test result was at 13.67% which shows that students learning ability after learning immediately is higher than after 14 days as significantly different at the .05 level of statistic.

## CONCLUSION AND DISCUSSION

1. The effectiveness of the instructional plan to improve Pratomsuksa 4's English vocabulary learning ability by using games was analyzed by the effectiveness index (E.I.). The effectiveness index was at 0.8428 which means that the English learning ability of students after used the instructional plans increased at 0.8428 levels or 84.28 %. This was because the instructional plan used games created by the researcher is appropriate. The games could attract learner's attention. It also encouraged learners to change their learning behaviors and students learning skills. Using games in teaching can enhance self-learning. The instructional plans were reviewed and evaluated by experts before use. In line with Rixon (2012: 5) [5], it is suggested that the nature of the game can allow players to develop their language skills. Suwansri (2008: 19) [6] claims that good games help to entertain and not discourage students in the classroom. In accordance with the results of the research by Singjan (2013: 85) [7] who found the results of English vocabulary learning ability of PrathomSuksa 6 students by using LT and games, the effectiveness index of the English vocabulary learning plan was 0.6038, that means the English learning ability of students after using the instructional plans increased at 0.6038 levels or 60.38% and Traitant (2010: 83) [8] who studied the use of games to improve Prathomsuksa 5 students' English language skills, Foreign Language Learning department in Municipality 9 (Wat KhaoKhrabha) school, Saraburi Municipality Education Office, found that the effectiveness index was 0.6195 that means the English learning ability of students were increased after used the instructional plans at 0.6195 levels or 61.95%.

2. The comparison of the English vocabulary learning ability of students between Pre-learning and Post-learning. The achievement scores of pretest and posttest are significantly different at the .05 level of statistic. The score of posttest of students are higher than the pre-test after learning through games as significantly different at the .05 level of statistic which means that the students' English vocabulary learning ability were improved after learning through games. That was because children are naturally motivated by games. Games are an activity with rules and goals and an elements of fun. The main reason why games are considered as effective learning aids is that they spur on motivation and students get very absorbed in the competitive aspects of the games, Kanhasuwan (2011: 3) [9] and Peirnkob (2011: pp. 206-207) [10]. According to Traichan (2010: 83) games can be used to improve students' English- language skills. His study found that students achievement after learning was significantly higher than before learning at the .05. Similarly, Chan Sing (2010: 36-60) [11], studied the effects of using bingo games. The study found that the students had a higher score in post-test achievement than before at the .05 level of significance, Thangthong (2010: 65) [12] who studied the development of reading and writing skills by using English games found that English language learning ability after using the games were significantly higher than before learning at the .05. Kalaya (2009: 35-74), studied and developed English vocabulary learning activities by using games in primary school students in Ban Nong Prue School the result showed the students' score after learning by game activity was significantly different at the .05.

3. The result of students' retention towards English learning by games

After the researchers taught the participants through games, the retention of the participants was evaluated by using a test. The pre-test and post-test results were analyzed and compared. The results of the comparison showed that students' retention was decreased because during research the weather had changed and some participants had caught a cold and were sick. Their sickness had an effect on their retention, so the scores of the test after 14 days were decreased. According to Issarapreeda (2010: 230) [13] there are several ways to improve memory efficiency. One important way is to avoid having other learning outcomes inserted. This will hinder the memorization or confuse students' memory.

### ACKNOWLEDGEMENT

The researchers would like to thank Rajabhat MahaSarakhm University, advisor, co-advisor and experts for this occasion and helping.

### REFERENCES

- [1] Office of the Education Council. "Education in Thailand 2004." Ministry of Education, Bangkok : n. p. , 2004. Government Document.
- [2] Wallace, Michael. Jeremy (1984). *Teaching vocabulary*. London. Heinemann Educational Books.
- [3] Soontornroj. V. (2011). *Development of teaching and learning*. Mahasarakham. Faculty of Education Mahidol University.
- [4] Kaliya. N (2003). *Development of English Learner Vocabulary Activities*. KhonKaen University: KhonKaen University.
- [5] Rixon, Shelagh (2012). *Developing Listening Skill*. Macmillan Publisher. London.
- [6] Suwansri. N (2008). *Pre-school education Bangkok*. Tonks Publishing House.
- [7] Singjan. P (2013). *The results of English language learning management of PrathomSuksa VI students by using of collaborative learning management, LT collaborative learning*. M.Ed. and Teaching Mahidol University.
- [8] Traitat. A (2010). *Report on the use of English-language skills training. Learn foreign languages For students of Prathomsuksa 5, 9 schools ( Wat KhaoKha) Education Office of Saraburi*. Academic Achievement: School District 9 (Wat KhaoKhrabha).
- [9] Kanhasuwan. L (2011). *The book and the scientific game*. 8th edition, Bangkok. Thai WattanaPanich.
- [10] Peirnkob. S (2011). *Development of Thai language teaching*. Bangkok. Development Project Teaching with the project and the academic papers of the Faculty of Education. Chulalongkorn University.
- [11] Chan Sing. N (2010). *Effects of using bingo games to improve English vocabulary grade 2*. Mahasarakham University.
- [12] Thangthong. C (2010). *The development of English reading and writing skills for Foreign students in Dan South Subdistrict School, Rong Kham District, Kalasin Province*. Academic performance. South DanaiWittaya School.
- [13] Issarapreeda. P (2010). *Psychology of learning and teaching*. Bangkok. Graphic Arts.



## **NON-VERBAL COMMUNICATION OF ANGER EXPRESSION BETWEEN VIETNAMESE AND ENGLISH**

Nguyen Thi Ngan

*Institute for Research and Development of New Technologies  
17 Pham Kinh Vy street, Ben Thuy ward, Vinh, Nghean, Vietnam  
Corresponding E-mail : quocngan37@gmail.com*

### **ABSTRACT**

A large number of studies relating to non-verbal communication and emotional expression have been conducted over the past years. However, little investigation has been conducted to focus on non-verbal communication of anger expression. Therefore, this study is undertaken in order to somehow fill in the gap. The objectives of the study were to find the similarities and differences in non-verbal anger expression and to address factors influencing anger expression in Vietnamese and English languages. In order to fulfill its objectives, 50 Vietnamese and 50 Anglicists were asked to fill in questionnaires. Results indicated that despite bearing some similarities in anger expression via facial expression, hand gestures and postures between Vietnamese and Anglophone culture had differences which are noticeable.

**KEY WORDS:** non-verbal communication, anger expression, Vietnamese culture, Anglophone culture, cultural issue

### **INTRODUCTION**

#### **I. Reasons for choosing the topic**

Non-verbal communication seems to be the most powerful form of communication. More than voice or even words, non-verbal communication assists to create speakers' images in others' minds. Also, people can express emotions and feelings in front of others, which are hardly conveyed by words. Furthermore, multicultural communities have been increasingly established, in which English-speaking citizens occupy 963 million in 2010, the second rank after Chinese. It raises a need to study the similarities and differences in communication within people speaking English, especially non-verbal communication. It is believed the awareness of the non-verbal communicative culture may simplify the information exchange process and avert misunderstandings.

Therefore, the research "**Non-verbal Communication of Anger Expression between Vietnamese and English**" is conducted in order to somehow assist learners clarify the comparison and contrast between the two non-verbal communicative cultures.

#### **II. Objectives of the Study**

This Study aims at finding out the similarities and differences of expressing anger through non-verbal cues in Vietnamese and Anglophone cultures and addressing factors influencing anger expression.

#### **III. Scope of the Study**

Non-verbal aspects in communication in these two cultures require numerous amounts of time and effort to conduct research; as a result, it is challenging for the author to address all aspects of the issues. Due to time constraints, resources and the author's knowledge and experience, the primary focus will inevitably be on facial expression, eyes, and hand gestures.

As English-speaking people come from different countries and cultures, it is difficult to cover all perspectives. Therefore, the participants come from the UK, the US, Australia, Canada, and New Zealand.

### **MATERIALS AND METHODS**

#### **I. Materials and methods**

- Descriptive method: describing and interpreting the collected data with the help using a powerful source from books, magazines and websites related to this subject.

- Analytical method: analyzing the collected data to find out the similarities and differences of Vietnamese and Anglophone cultures and the impact of these issues between the non-verbal aspects in communication between the two cultures.

- Contrastive method: setting up cultural similarities and differences within the non-verbal aspects in communication between various cultures.

## II. Data analysis (I moved this part from RESULT to MATERIAL AND METHODS)

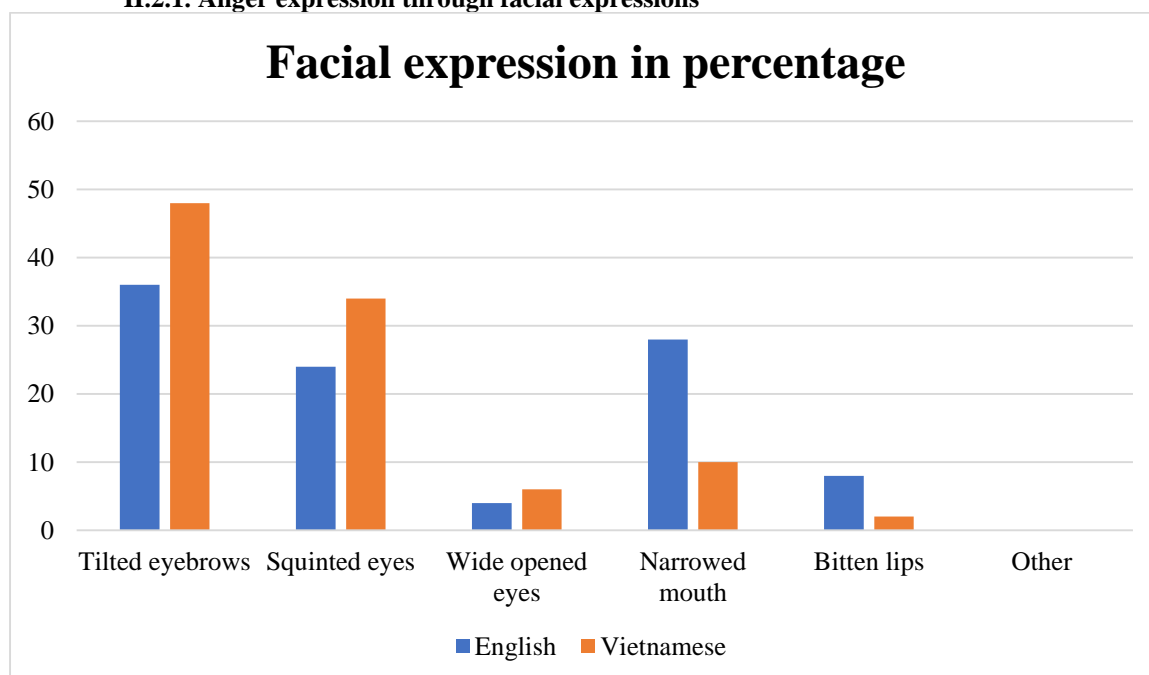
### II.1. Selection of subjects and research instrument

Probability samples are used as they allow the author to make inferences about the whole population. 100 participants are divided into 2 groups: 50 Vietnamese and 50 Anglicists who are from the UK, the US, Australia, Canada, and New Zealand. Each group has an equal number of males and females. In order to ensure the study's reliability and validity, except the variable above, all the participants were randomly chosen from different ages. Because the questionnaires will be delivered in Vinh city, the author visited English centers and English clubs held by foreign teachers to collect data. Most of the participants are enthusiastic and supportive enough to fulfill the questionnaires.

Survey questionnaire is employed to address the research questions. As regard to the design of the survey questionnaire, closed-ended questions are chosen because responses are easier to collect and analyze.

### II.2. Data analysis

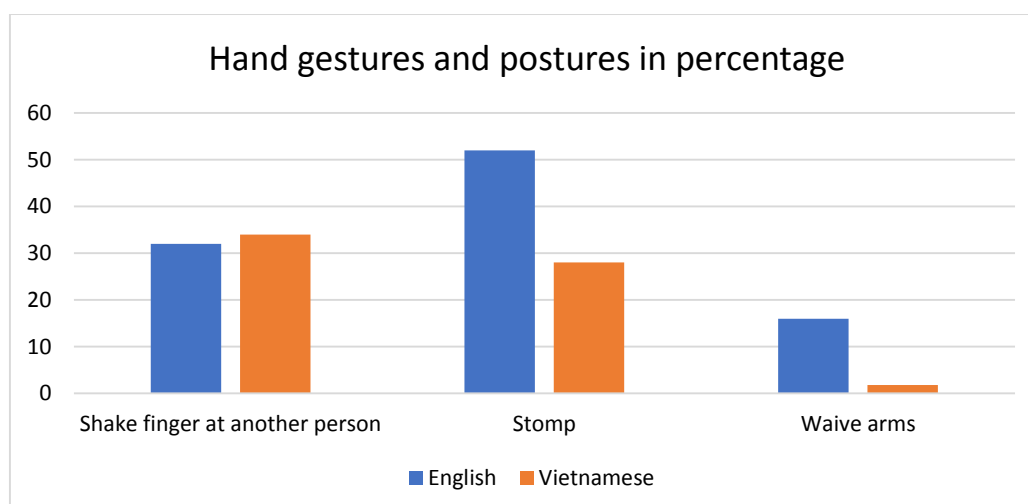
#### II.2.1. Anger expression through facial expressions



As illustrated by the table, tilting the eyebrows to show the anger is chosen by the largest number of participants coming from both Anglicist and Vietnamese cultures. Nearly half of the Vietnamese participants (48%) tilt their eyebrows when they are angry. Although the number of the Anglicist participants who express their anger in the same way is smaller than that of the Vietnamese ones, this figure is still the greatest (18 out of 50 accounts for 36%). Ranking the second position is squinted eyes which makes up 34% of Vietnamese respondents. Meanwhile, regarding Anglicist respondents, narrowed mouth with 28% ranks second, and it is followed by squinted eyes at 24%.

While some similarities between Anglicist and Vietnamese cultures in anger expression through the eyes are noticeable, they still bear some minor differences. The number of the Anglicist participants who choose "wide opened eyes" is the smallest with just only 4% of the total respondents.

#### II.2.2. Anger expression through hand gestures and postures



It is clear from the chart that by far the greatest proportion is shaking finger at another person, which accounts for 52% of the total Anglicist participants. This number is nearly double the proportion collected from Vietnamese respondents (28%). In Vietnamese culture, it is most likely that there are no arms waive at all when people show their anger as 38% Vietnamese respondents pick up this choice. In comparison, just only 16% of Anglicist ones, which is the smallest percentage, choose this. Shaking finger at another person also receives high responses from participants in Anglicist and Vietnamese culture (32% and 34% respectively).

## RELATED LITERATURE

### I. Culture

As Harrison and Huntington (2000 : xv) noted, “the term ‘culture’, of course, has had different meanings in different disciplines and different contexts”. By stating “culture is the human-made part of the environment,” W. J. Lonner and R. S. Malpass (1994:7) contrasts culture and nature. In their opinion, things in environment will never become cultural without the “touch” of humans.

According to H. Triandis (1994:23), “culture is a set of human-made objective and subjective elements that in the past have increased the probability of survival and resulted in satisfaction for the participants in an ecological niche, and this became shared among those who could communicate with each other because they had a common language and they lived in a similar time and place.” The subjective elements of culture here are elements such as values, attitudes, beliefs, orientations and underlying assumptions prevalent among people in a society. All of these elements act as a framework that influences one’s interpretation of the world and interactions in it.

### II. Communication

#### II.1. Definition

Larry A., Richard E. Porter and Edwin R. McDaniel (2006:12) select the all-encompassing definition of “*human communication is the process through which symbols are transmitted for the purpose of eliciting a response*”. Lustig (1996: 29) defines communication as “*a symbolic process in which people create shared meanings*”. In the both definitions, the center is “symbol”. A symbol may be “a word, action or object”, containing thoughts, perception or feelings which one wants to communicate with others.

#### II.2. Forms of communication

In order to create shared meaning, people have to use code or symbol. In reality, the two kinds of codes or symbols are verbal (spoken and written) and non-verbal (unspoken). These are referred to as forms of communication.

#### II.3. Components of communication

The followings are components of communication according to Hymes (1972) :

- Situation: setting and sense
- Participants: speaker, presenter, hearer, receiver, narrator
- End: purpose, result or goal
- Act sequences: model or language content
- Key: clues that establish the “tone, manner, or spirit” of the speech act

- Instrumentalities: channel, form or style
- Norms: norms of interpretation, norms of interaction
- Genres: kind of speech act or event

Among these, the participants (speaker and hearer) and situation are prominent to the choice of message coder (language or non-verbal cue used). The participants' background impacts much on the choice of the coder used. The background includes age, sex, living place, occupation, etc. when discussing different participants and situations, the underlying effect of power (P), social distance (D) and rank of imposition (R) have to be considered. With combination of the three factors, the choice of message coder can have diversity.

#### **II.4. Cross-cultural communication**

The relationship between culture and communication is often compared with the bond between the voice and the echo. From culture and communication, there are three branches of communication as follows:

- Intra-cultural communication: the communication between people who live in the same country and come from the same cultural background.
- Inter-cultural communication: the communication between people who live in the same country but come from different cultural background.
- Cross-cultural communication: the communication between people who live in different countries and come from different cultural background.

### **III. Non-verbal communication**

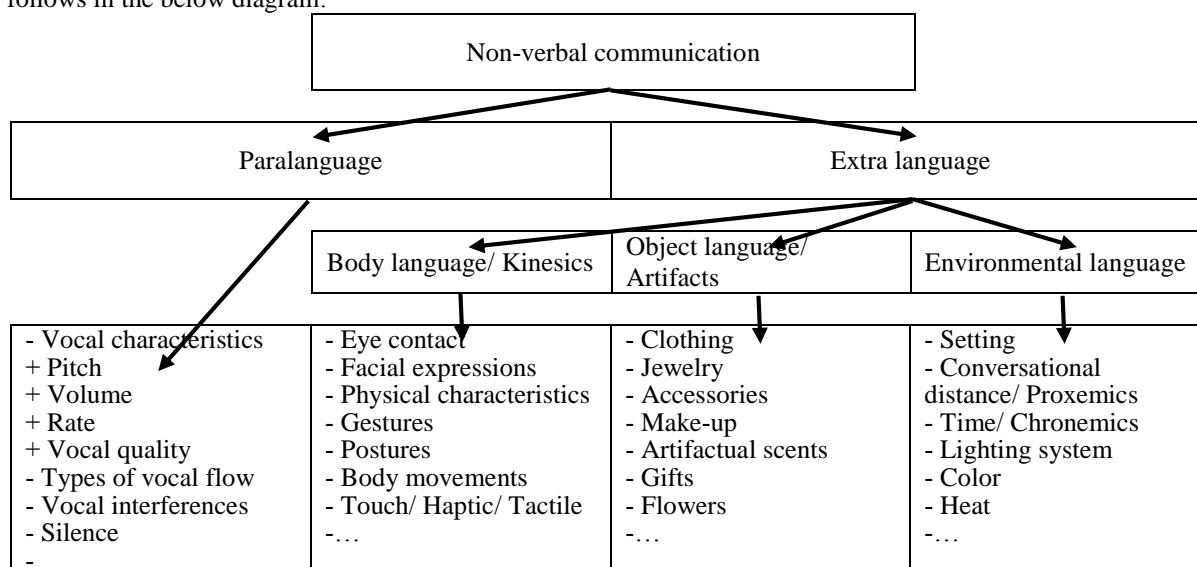
#### **III.1. Definition**

Non-verbal communication is understood as a way of communicating without the use of written or spoken language. According to Lustig (1996: 187 – 188), non-verbal communication is a multi-channeled process that is usually performed simultaneously; it typically involves a subtle set of nonlinguistic behaviors that are often enacted subconsciously. Non-verbal behaviors can become part of the communication process when someone intentionally tries to convey a message or when someone attributes meaning to the non-verbal behavior of another, whether or not the person intends to communicate a particular meaning. As Lustig pointed out, when some meaning is attached to a nonlinguistic behavior, whether by message transmitter or perceiver, that behavior becomes part of a communication process.

The detailed description of non-verbal communication is presented by Nguyen Quang: “all the components of the message that, when taken together, constitute a communication which is not verbally coded but both vocally and non-vocally channeled. Non-verbal communication is composed of paralinguistic factors (non-verbal – vocal channel), such as rate, volume, etc., and extra-linguistic factors (non-verbal – non-vocal channel), such as body language (gestures, postures, facial expressions, etc.) object language (including clothing, jewelry. Etc.) and environmental language (proxemics, settings, etc.) ”

#### **III.2. Classification of non-verbal communication**

Of the various classifications, Nguyen Quang (2001: 9) presents a detailed and easy-to-follow methodology as follows in the below diagram:



## RESEARCH RESULT

### Anger expression in Vietnamese and English

Anger can be defined as a strong feeling that people have when something has happened that they think is negative and unfair. From the author's observation and analysis of videos and photos available on the Internet, the most popular expressions form of anger are as follows:

#### Eyebrows

When angry, the eyebrows will tilt to the forward center of the face and will be straight and lower. There will be times when non-verbal communication of anger will be felt from others just from looking at the eyebrows.

#### Eyes

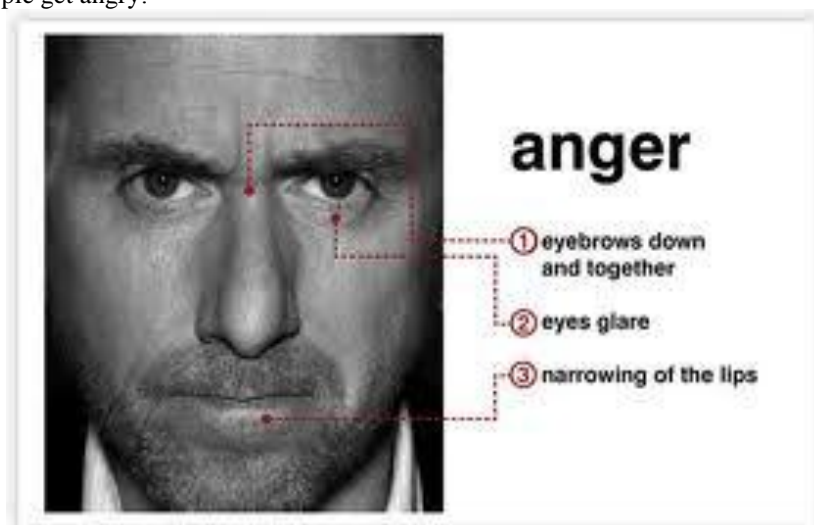
When reading the non-verbal language of anger the eyes will have a glare to them. In some instances, people will squint their eyes even with the eyebrows lowered or straight.

#### Mouth

The non-verbal language of anger will also show through with people's mouth. When the micro expressions of anger are shown at the mouth it will be done so through the narrowing of the lips. It may seem as if people are biting their lips or holding them so tight that they cannot speak.

#### Other non-verbal cues from the body

When people are angry their body language or actions will be more animated. People may shake their finger at another person and at times their hands will be as far away from the body as possible. A person may stomp, waive their arms, punch at non-animated objects or people. The following picture is an illustration of facial expressions (including eyes, eyebrows, and mouth) and hand gesture when people get angry:



## CONCLUSIONS AND DISCUSSIONS

### I. Discussion

On the whole, the author has carried out a comparative study of nonverbal communication in anger expression in Vietnamese and English – speaking countries. Research questions have been addressed through the process of in-depth data analysis. In this part, the author will briefly sum up the outcomes of the study. Above all, main findings reveal that the Anglicist people tend to express their anger via nonverbal communication more frequently than the Vietnamese people. The biggest difference lies in hand gestures and posture expressions. In Anglicist culture, anger is often expressed through “shaking finger at another person” or

“stomping feet”. On the other hand, many Vietnamese people show their anger through “waiving arms”. Therefore, ways of anger expression through hand gestures and postures are different between various cultures. Another striking finding of the research is the difference in eye expression. Many scholars claim narrowed eyes are a universal expression true to all cultures. However, it has been proved from the study that tilting the eyebrows and squinting eyes seem to be more universal.

## II. Conclusion

Cross-cultural study of emotional expression needs updating as the world has been changing day by day and it is central to our understanding of people all around the world. Therefore, it offers other researchers opportunities to carry out further studies. What has been found in the present study is still on the surface of the matter. It is suggested that the study could be improved by expanding the research sampling and conducting three research methods simultaneously if possible in order to avoid such limitations.

Another alternative is to narrow the scope of study. For instance, a comparison study between Vietnamese and American or British culture should be considered.

Hopefully, this paper can be a useful reference document for teachers and students who are interested in the cross-cultural communication. Moreover, the researcher would like to raise the awareness and understanding of possible similarities and differences in non-verbal communication in two cultures. We are living in the world in which cross-cultural communication is indispensable. Therefore, communication between different cultures should be improved. Then the study could be seen as an attempt to provide more knowledge about Vietnamese and Anglicist culture and to boost mutual understanding between two cultures.

## ACKNOWLEDGEMENTS

For the completion of this work, I would like to express my deepest gratitude to my supervisor, Ph. D. Tran Ba Tien, who has helped me with enthusiastic guidance and adequate help. I would like to convey my gratefulness to Rajabhat Maha Sarakham University, Kingdom of Thailand for the upcoming 7<sup>th</sup> International Conference on Sciences and Social Sciences (ICSSS 2017) which I have a precious opportunity to attend. I believe this is an occasion that I can enhance my knowledge in educational field as well as broaden my mind in other areas.

I would especially like to thank experts from Rajabhat Maha Sarakham University, Kingdom of Thailand for their reading and editing my paper. I have learned a lot from them.

## REFERENCES

- [1] Harrison, L. E., Huntington, S. P. (2000) *Culture Matters : How Values Shape Human Process*. New York : Basic Books.
- [2] Hymes, D. (1974). *Foundations of Sociolinguistics : An Ethnographic Approach*. Philadelphia : University of Pennsylvania Press.
- [3] Larry, A., Richard, E. P., & Edwin, R. M. (2006) *Communications between Cultures*. Belmont, CA: Thompson Publishers.
- [4] Lonner, W. J., Malpass, R. (1994) *Psychology and Culture*. Pearson.
- [5] Lustig, M. W., et. al. (1996). *Intercultural Competence*. Harper Collins College Publishers.
- [6] Nguyen Quang. (1994). *Intercultural Communication*. CFL – Vietnam National University – Hanoi.
- [7] Triandis, H. C. (1994). *Culture and Social Behavior*. New York: McGraw-Hill.
- [8] Triandis, H. C. (1972). *The Analysis of Subjective Culture*. New York: Wiley.

## GENERIC SKILLS AMONG GRADUATES IN KING MONGKUT'S UNIVERSITY OF TECHNOLOGY THONBURI

Jiraporn Wongkerd\*, Phanida Vasutapitak and Sasitorn Suwannathep

*Department of Social Sciences and Humanities  
King Mongkut's University of Technology Thonburi (KMUTT),  
126 Pracha-utit Rd., Bangmod, Thungkru, Bangkok 10140, Thailand  
(\* Author for correspondence, e-mail : [jiraporn.kongkum@mail.kmutt.ac.th](mailto:jiraporn.kongkum@mail.kmutt.ac.th))*

### ABSTRACT

Teaching and learning in general education was the key mechanisms for developed King Mongkut's University of Technology Thonburi (KMUTT) graduates to be global citizenship. KMUTT has been operating since 2010. The office of the general education was entering the second phase which was a period of academic development in general education to the development of the potential learners who focused on outcome based education. The objective of this study were comparisons of knowledge and generic skills developed by the general education course and level of importance for the application in the work or life of KMUTT graduates students who studied in the faculties and they had different work experience. The sample groups were 1,654 graduates. The study tool was questionnaire. MANOVA for by SPSS programme was used for data analysis. The result were (1) The graduates of different faculties had levels of knowledge and generic skills from the general education course and the level of importance for work or life a life were different significance at.01 level. (2) The graduates with different work experience had levels of knowledge and generic skills from the general education course and the level of importance for work or life a life were different significance at.01 level

**KEYWORDS:** general education, knowledge, generic skills, graduate



## INTRODUCTION

In this era of globalization, generic skills are one of the important indicator of success in higher education. The generic attributes refer to some favourable personal qualities that is the benefit to person. In the last decade, the employers have started to look for other job related attributes such as flexibility, adaptability, willingness to learn, self-motivation, and effective communication in university graduates (Green, Hammer, & Star, 2009). These attributes are believed to enable individuals to adapt to and contribute to the fast-growing modes of learning and fast-changing world of work in the twenty-first century. The universities, being reactive to these requirements, need to revise their curriculum in order to produce graduates with certain generic attributes. This has driven the current global curriculum reforms that highlight the shaping of young people into individuals who are not only experts in a certain subject, but who are also equipped with certain kinds of literacy, metacognitive skills, and values (Bridgstock, 2009). One mechanism to develop students with the generic skill can be carried out through general education (GEN) courses.

The Management of GEN division in Higher Education has started to process since 1910. The aim was for the students to learn about philosophy, science, knowledge, including humanities. Later on in 1945, the GEN's frame was assigned into 5 branches: communication, humanities, social science, natural study and physiology. In the changing era 1965, the main effort was to teach teaching method and the administration. The new era 1999-2015, it is to stress the linkage to the subjects' period or with the real live of the learners, build the environment to be the learners' communities, learning outside the classroom, and respond to various learners. The general study curriculum in the united states has been developed for along time. There is a power to manage teaching and learning in many countries. (UPD GE Committee, 2016). The format of Thai general study to develop the general study curriculum based on USA's format. The general study division means the subjects that aim to develop the learners to have the spacious knowledge in response to the famous world's vision. Those are to understand the natural own self, others and society, to pay attention to learn and to be a reasonable thinkers, to be able to use languages for communication to have sound mind in sound body, to have the virtue, to concern about the Art culture's value of Thai and international communities, to be able to bring the knowledge in living and maintaining well in the society (Patcharapa Tantichuwet, 2010).

King Mongkut's University of Technology Thonburi (KMUTT) commits to produce the graduates who are equipped to have both great competency and good citizenship. In order to achieve this aim, KMUTT plans to develop an excellent student community. The community hopes to strengthen all students to be a self – reliance, to learn outside class room, and to become a 'perfect' human (Humanization). Thus, the new curriculum in the year 2010 of KMUTT was developed with these aims in mind. The developed curriculum designs for all students were to take 31 credits under the 'banner' of GE: 25 credits are compulsory, and the rest were elective. With this aim in mind, each subject must have a set of activities guided by the knowledge from both science and technology, and society. These activities desired to encourage the students to know how to analyze and apply the knowledge in a real situation. It was to enable the graduates to know how to utilize the learnt knowledge in their lives after their graduation (Wilson & Livingston, 1996). The idea of these types of learning based on Problem-Based Learning and Activity-Based Learning.

The office of GEN conducts the study KMUTT graduates' opinions toward develop generic skill form GEN course in the academic year 2015. The researcher ask question about the level of knowledge, skills and attitudes based on the learning outcomes of the study in GEN and the importance of adoption, work or life. This research has shown that graduates can compete in the changing job market and to ensure it remains relevant and competitive in a challenging globalization era. The data will be used to improve the structure of GEN. The phase 2 of the office will start teaching the students in the academic year 2018.

## RESEARCH OBJECTIVES

1. To compare knowledge and generic skills that of the graduates received from learning in GEN and the importance of applying generic skills to the work or life who KMUTT graduates study in different faculties.
2. To compare knowledge and generic skills that of the graduates received from learning in GEN and the importance of applying generic skills to the work or life who KMUTT graduates with different work experience.

## DESIRABLE GENERIC SKILL IN THE GEN AT KMUTT

For almost four decades, the GE curriculum in Higher education in Thailand faced a difficulty in clarifying both a boundary and a purpose of the study as well as the unclear of a 'job' description of the courses under the 'banner' of the GE. The problem started to resolve in 2005 when Ministry of Education required the GE curriculum to be designed to produce the graduates who are better equipped for the challenges in this 21st century. The education must enable people to utilize their learnt knowledge in a way that benefits them for the better. That is to help them to live and thrive in life both at present and in the future.

With this in mind, the Board Office of Higher Education establishes Thai Qualifications Framework for Higher Education (TQF: HEd). It is to guarantee the quality of Thai graduate at all departments. It also hopes to how all people both inside and outside the country can have a confidence in Thai graduates: that Thai graduates are not inferior to anyone who graduated anywhere in the world. TQF consists of five areas, as following: (The Ministry of Education, 2005).

1. Ethics and Moral mean firstly, it will design to equip students to develop a good ethics and integrity, as well as to recognize their responsibility in both a personal level and society. Secondly, it must also help students to be able to adapt themselves accordingly to the life challenges such as the conflict in values. Thirdly, it should help students to develop a good moral in all level of their engagements.

2. Knowledge means the ability to comprehend; to think, to present, to analyze as well as to identify facts in a principle, a theory and a process. This includes the ability to learn without a teacher.

3. Cognitive Skills means the ability to analyze a situation, and to implement the learnt knowledge, as well as the understanding of any learnt principle, theory and process theory to an unexpected situation.

4. Interpersonal Skills and Responsibility means the ability to work in a group, including a leadership quality. The graduates must be trained to be responsible in oneself and one own action not only for oneself but also for the sake of others. They must also learn to plan and be responsible for their own learning.

5. Numerical Analysis, Communication and Information Technology Skills means the ability to analyze numbers. The learners must be able to utilize all learnt knowledge from mathematics, statistics, as well as communication skills in both speaking and writing and information technology in any given situation in their lives.

Since 2010, KMUTT has developed a new curriculum guided by TQF. This curriculum aims to broaden students' horizon of learning, to enlarge their vision, to have a right perception of self, others and society. At the end of the course, it hopes that: the graduates will have a heart to learn. They can think logically, and can communicate effectively. Good morals are held. They will value the art and culture both inside and outside Thailand. Above all, they can utilize their learnt knowledge to live and work excellently in all society. This idea was in line with the declaration of Education Ministry as it was declared on 25 May, 2010 by Ministry of Education.

Apart from these desired outcomes, the standard framework from a national higher education in 2009, general philosophy, according to the standard of undergraduate scheme in 2005 was a main resource in how GE curriculum was structured. The curriculum also considered to add a necessary knowledge which it will help students to develop their learning skill in each subject. How KMUTT's GE curriculum in 2005 is in accordance with TQF, can be seen in Table 1 (see below).

Table 1. KMUTT's GE curriculum in 2005 is in accordance with TQF

TQF	TQF1	TQF2	TQF3	TQF4	TQF5
	Ethical and moral development	Knowledge	Cognitive skills/ Learning skills*	Interpersonal skills and responsibility	Analytical and communication skill
KMUTT-STUDENT QF	KMUTT's citizenship, Social Responsibility, Humanization	Knowledge	Thinking Skill, Learning Skill, Professional Skill, Management Skill	Humanization, Adaptability, Leadership, Social Responsibility	Thinking Skill, Learning Skill, Professional Skill, Management Skill, Communication Skill

\* The qualification standard scale in higher education in learning, that was increased in the part of GEN curriculum in KMUTT. That was combined in the cognitive skills.  
Source: KMUTT C4ED (<http://www.c4ed.kmutt.ac.th/home>)

Six subjects were required for the graduates who finished their degree in 2014, as following:

**GEN101 Physical Education**

This course aims to study and practice sports for health, principles of exercise, care and prevention of athletic injuries, and nutrition and sports science, including basic skills in sports with rules and strategy from popular sports. Students can choose one of several sports provided, according to their own interest. This course will create good health, personality and sportsmanship in learners, as well as develop awareness of etiquette of playing, sport rules, fair play and being good spectators.

**GEN 111 Man and Ethics of Living**

This course studies the concept of living and working based on principles of religion, philosophy, and psychology by fostering students' morality and ethics through the use of knowledge and integrative learning approaches. Students will be able to gain desirable characteristics such as faithfulness, social responsibility, respect for others, tolerance, acceptance of differences, self-discipline, respect for democracy, public awareness, and harmonious co-existence.

**GEN 121 Learning and Problem Solving Skills**

This course aims to equip students with the necessary skills for life-long learning. Students will learn how to generate positive thinking, manage knowledge and be familiar with learning processes through projects based on their interest. These include setting up learning targets; defining the problems; searching for information; distinguishing between data and fact; generating ideas, thinking creatively and laterally; modelling; evaluating; and presenting the project.

**GEN 231 Miracle of Thinking**

This course aims to help the students learn to define the description, principle, value, concept and nature of thinking. It is for developing students to acquire the skills of systematic thinking, systems thinking, critical thinking and analytical thinking. The Six Thinking Hats concept is included. Moreover, idea connection, story line and writing are explored. Examples or case studies are used for problem solving through systematic thinking using the knowledge of science and technology, social science, management, and environment, etc.

**GEN 241 Beauty of Life**

This course aims to promote the understanding of the relationship between humans and aesthetics in a amidst the global culture. It is concerned with the perception, appreciation and expression of humans on aesthetics and value. It is hoped that students will be able to experience learning that stimulates an understanding of the beauty of life, artwork, music and literature, as well as the cultural and natural environments.

**GEN 351 Modern Management and Leadership**

This course examines the modern management concept including basic functions of management planning, organizing, controlling, decision-making, communication, motivation, leadership, human resource management, management of information systems, social responsibility-and its application to particular circumstances.

The evaluation of the learning outcome from these six subjects are guided by 6 attributes according to desired characteristics as following: (1) Ethics and Moral, (2) Knowledge, (3) Cognitive Skills, (4) Interpersonal Skills and Responsibility, (5) Numerical analysis, Communication and Information Technology Skills, and (6) Learning Skill.

**Table 2** Knowledge and skills are defined to measure the desirable characteristics of GEN courses.

<b>KMUTT-STUDENT QF</b>	<b>Subjects</b>	<b>Knowledge and Skills</b>
KMUTT's Citizenship	GEN 101, GEN 111, GEN 121	- Moral and Ethic - Follow the rules of society
Social Responsibility	GEN 101, GEN 111	- Responsibility - Public Mind
Humanization	GEN 101, GEN 111, GEN 121 GEN 231, GEN 241, GEN 351	- Health care - Self Esteem - Recognize the difference - Open mind

<b>KMUTT-STUDENT QF</b>	<b>Subjects</b>	<b>Knowledge and Skills</b>
Adaptability	GEN 101, GEN 111, GEN 121, GEN 231, GEN 241, GEN 351	- Understand and sympathize - Adaptability - Optimism
Leadership	GEN 101, GEN 111, GEN 121, GEN 231, GEN 241, GEN 351	- Leadership - Self-assertion - Teamwork
Management Skill	GEN 101, GEN 231, GEN 351	- Problem Management - Risk Management - Set the Goal and Planning - Time Management - Financial Management - Project Management
Communication Skill	GEN 101, GEN 111, GEN 121, GEN 351	- Report Writing - Proposal Writing - Summary and Presentation - English Listening Skill - English Reading Skill - English Speaking Skill - English Writing Skill
Learning Skill	GEN 101, GEN 111, GEN 121, GEN 231,	- Data Collection and Knowledge Formation - Technology for Learning - Independent Study - Self-Directed Learning
Thinking Skill	GEN 101, GEN 111, GEN 121, GEN 231	- Systematic Thinking - Critical Thinking - Creative Thinking
Knowledge	GEN 101, GEN 111, GEN 121, GEN 231, GEN 241, GEN 351	- Apply knowledge to Practice - Basic general knowledge in the field of study

### **MATERIALS AND METHODS**

1. Questionnaire of 38 items was designed according to evaluate tens attributes. (see in table 2) They were created in order to assess whether the graduates had acquired the desired outcomes after they passed all five courses in a 'banner' of GEN. Each question had four levels to be rated: from (1) Very Weak. (2) Low (3) High, and (4) Very High

<b>Example Question</b>	<b>Generic skill of level</b>	<b>Importance of level</b>
00.Basic general knowledge in the field of study		

2. The subject leaders of all 10 modules under this GEN curriculum were called to select and modify the set of questionnaires which designed to evaluate the desired outcomes. This set consisted of 38 questions: Citizenship, Social Responsibility and Adaptability were each assessed with 2 questions. Leadership and Knowledge were each assessed with 3 questions. Learning Skill and Thinking Skill were each assessed with 4 questions. Humanization was each assessed with 5 questions. Management was each assessed with 6 questions. Communication Skill was each assessed with 7 questions.

3. Analyze the quality of questionnaires to used discrimination and reliability.  
- Discrimination by item – total correlation applying Pearson product-moment correlation, the measurement 38 items had discrimination power ranging.34 -.66. and.46 -.68

- Reliability applying Alpha coefficient. The questionnaire has reliability of.95 and 0.96  
4. 38 items were used to collect data from 1,802 students who succeeded in bachelor degree in 2015. These graduates enrolled in GEN since the academic year 2010. There are all six subjects that were to be

analyzed. However, there were only 1,654 interviewees who responded all information that can be used for analysis (91.78% of those surveyed).

5. Analyzed the collected data using Statistical Package for the Social Science (SPSS program) as the following steps:

- Analysis of basic statistics of the studied variables in order to know the characteristics of the sample group by calculating the mean and standard deviation (S.D.).
- The inferential statistics using in this research were One - Way MANOVA

## RESULTS

1. Comparison knowledge and generic skills that of the graduates received from learning in GEN and the importance of applying generic skills to the work or life who KMUTT graduates study in different faculties.

**Table 3** Levels of graduates' generic skills from each faculties

Faculties	N	Generic skill of level			Importance of level		
		Mean	S.D	Level	Mean	S.D	Level
Science	311	3.07	0.39	High	3.31	0.37	High
Engineering (ENG)	781	2.87	0.44	High	3.15	0.47	High
Industrial Education and Technology (FIET)	425	3.06	0.39	High	3.24	0.41	High
Information Technology (SIT)	97	2.98	0.41	High	3.12	0.46	High
Architecture and Design (SOAD)	40	2.59	0.52	High	2.75	0.64	High

The result of the graduates who studied in the faculty of Science estimated that they had gained knowledge and generic skills from general education course that was the highest level (mean 3.07), secondary was the faculty of FIET (mean 3.06), third was the faculty of SIT (mean 2.98), fourth was the faculty of ENG (mean 2.87) and the last one was faculty of SOAD (mean 2.59). Graduates from all faculties assessed themselves as being adaptability and leadership were highest scoring. This might was due to the fact that all subjects focus on the goal of developed the two skills. The least developed skill from every faculty was communication skill.

According to the TQF, graduates of the Faculty of Science estimated that knowledge and general skills were importance to the work or life (mean 3.31), secondary was the faculty of the FIET faculty (mean 3.24), third was the faculty of ENG (mean 3.15), fourth was the faculty of SIT (mean 3.12) and the last one was faculty of SOAD (mean 2.75). All of the graduates assessed adaptability and leadership were the most importance in work or life. Communication skill was the least importance life skill.

**Table 4** Overview of multivariate variance test of knowledge level and generic skills developed by general education course and importance for the application to work or life between the graduates in different faculties.

Source of variation	Wilk's lambda Value	F	Hypothesis df	Error df	Sig.
Faculties	.92	17.59	8.00	3298.00	.00

According to the table 4 overview of graduates at different faculties had levels of knowledge and generic skills from the general education course and the level of importance for work or life a life were different significance at.01 level

**Table 5** Multivariate variance test of knowledge level and generic skills developed by general education course and importance for the application to work or life between the graduates in different faculties.

Source of variation	Dependent Variable	SS	df	MS	F	Sig.
Faculties	Generic skill of level	20.140	4	5.035	28.432	.00
	Importance of level	15.051	4	3.763	19.149	.00

According to the table 5 the test results were consistent with the overall picture. The graduates in different faculties had levels of knowledge and generic skills from the general education course and the level of importance for work or life a life were different significance at.01 level

2. Comparison knowledge and generic skills that of the graduates received from learning in GEN and the importance of applying generic skills to the work or life who KMUTT graduates with different work experience.

**Table 6** Levels of graduates' generic skills from each work experience

Work experience	N	Generic skill of level			Importance of level		
		Mean	S.D	Level	Mean	S.D	Level
1-3 month	454	2.88	0.43	High	3.12	0.48	High
4-6 month	499	2.97	0.44	High	3.20	0.44	High
7-9 month	561	2.99	0.43	High	3.24	0.43	High
10-12 month	140	3.07	0.41	High	3.28	0.45	High

The result of the graduates with 10-12 months of work experience estimated that they had gained knowledge and generic skills from general education course that was the highest level (mean 3.07), secondary was the graduates with 7-9 months of work experience (mean 2.99), third was the graduates with 4-6 months of work experience (mean 2.97) and the last one was the graduates with 1-3 months of work experience (mean 2.88). Graduates assessed themselves as being adaptability and leadership were highest scoring. This might was due to the fact that all subjects focus on the goal of developed the two skills. The least developed skill from every faculty was communication skill.

According to the TQF, graduates with 10-12 months of work experience estimated that knowledge and general skills were importance to the work or life (mean 3.28), secondary was the graduates with 7-9 months of work experience (mean 3.24), third was the graduates with 4-6 months of work experience (mean 3.20) and the last one was the graduates with 1-3 months of work experience (mean 3.12). All of the graduates assessed adaptability and leadership were the most importance in work or life. Communication skill was the least importance life skill.

**Table 7** Overview of multivariate variance test of knowledge level and generic skills developed by general education course and importance for the application to work or life between the graduates in different work experience.

Source of variation	Wilk's lambda Value	F	Hypothesis df	Error df	Sig.
Work experience	.98	5.39	6.00	3298.00	.00

According to the table 7 overview of graduates with different work experience had levels of knowledge and generic skills from the general education course and the level of importance for work or life a life were different significance at.01 level

**Table 8** Multivariate variance test of knowledge level and generic skills developed by general education course and importance for the application to work or life between the graduates in different work experience.

Source of variation	Dependent Variable	SS	df	MS	F	Sig.
Work experience	Generic skill of level	5.10	3	1.70	9.13	.00
	Importance of level	3.75	3	1.25	6.15	.00



According to the table 8 the test results were consistent with the overall picture. The graduates with different work experience had levels of knowledge and generic skills from the general education course and the level of importance for work or life a life were different significance at.01 level

## CONCLUSIONS AND DISCUSSION

1. The graduates of different faculties had levels of knowledge and generic skills from the general education course and the level of importance for work or life a life were different significance at.01 level. That was graduates in each faculty estimated that they had knowledge and generic skills from general education course and a significant level of work or life in different way. Graduates studied in the faculty of science was the highest, secondary was faculty of FIET and the last one was graduate from the faculty of SOAD. So as to the difference nature of faculty and this founded as the factors that were concern of work characteristics, culture and values of the organization. According to the research of Institute for Employment Research, University of Warwick (2010). To specify that the different faculties impact on generic skills development differently. The graduates taken the importance of the application to the work that was especially useful, the skills impact on the graduates to live with other people. The KMUTT graduates from every faculty estimated that ability in adaptability and leadership that office of general education told that was important. KMUTT aimed to produce the graduates who will become a leader of global citizen. Thus, firstly, the graduates must have a good ethic and moral as well as integrity. Secondly, they have to be skillful in learning and be innovative. They must also be skillful in their expertise, have a good skill for life and work in general. Thirdly, they must also be skillful in acquiring information, communication and technology, Lastly, they must be aware of the impact of the inter-changing world. However, the credit of courses under the 'banner' of general education was only one-fourth of the total credit of bachelor degree, if KMUTT needs to achieve that aims, all other courses must also develop their curriculum, which facilitates that aim or have some activities outside classroom which help the graduates to develop that characteristics.

2. The graduates with different work experience had levels of knowledge and generic skills from the general education course and the level of importance for work or life a life were different significance at.01 level. That is, graduates with different work experience assess that they have improved their knowledge and generic skills from general course and level of importance for work or life. The graduates with 10-12 months of work experience estimated that they had gained knowledge and generic skills from general education course that was the highest level, secondary was the graduates with 7-9 months of work experience and the last one was the graduates with 1-3 months of work experience. Owing to generic skills that had influence to person behavior which reflects the role that shows out to the society, personal identity and self image, personal characteristics that was to rise from the attitude, values, the individual specific characteristics and motivation that were to developed because these things were compound inside personal (McClelland, 1973). The procession that causes change was experience learning. Effective learning is seen when a person progresses through a cycle of four stages: of (1) having a concrete experience followed by (2) observation of and reflection on that experience which leads to (3) the formation of abstract concepts (analysis) and generalizations (conclusions) which are then (4) used to test hypothesis in future situations, resulting in new experiences (Kolb, 1984). Practice and experiment in working, that help to incubate person to have skills and experience to improve potentially.

## ACKNOWLEDGEMENTS

1,802 students who succeeded in bachelor degree in 2015. These graduates enrolled in GEN since the academic year 2010

## REFERENCES

- [1] Bundit Thipakorn. (2016). The qualification standard scale in higher education in learning, that is increased in the part of general education curriculum in KMUTT. Retrieved 10 December. From <http://www.c4ed.kmutt.ac.th/home>
- [2] Green, W, Hammer, S and Star, C. (2009). Facing up to the challenge: why it is so hard to develop graduate attributes?. Higher Education Research and Development, vol.28, no 1, pp 17-29
- [3] Kolb, D. A. (1984). Experiential Learning: Experience as the Source of Learning and Development. Englewood Cliffs, NJ: Prentice Hall.



- [4] McClelland, David C. (1973). "Testing for Competence rather than Intelligence." American Psychologist. Retrieved 15 May 2017, from [www.ei.haygroup.com](http://www.ei.haygroup.com)
- [5] Miller, T.K., & Winston, R.B. (1991). Administration and leadership in student affair. Muncie, IN: Accelerated Development.
- [6] Ministry of Education. (2005). The ministry of education declared the topic of standard scale of Bachelor degree's curriculum. Retrieved 10 December 2016. From <http://www.moe.go.th/websm/2015/nov/399.html>
- [7] Patcharapa Tantichuwet. (2010). A study of patterns and characteristics of education administration in general education program in USA and Asian countries. Bangkok: Dhurakij pundit university.
- [8] Ruth Bridgstock. (2009) The graduate attributes we've overlooked: enhancing graduate employability through career management skills. Higher Education Research and Development, 28:1, 31-44.
- [9] UPD GE Committee. (2016). General education through the Years: A Timeline from 1910 to 2016. Retrieved 13 December 2016. From <http://oat.upd.edu.ph/post/ge-timeline-infographic-version/wppaspec/oc1/cv0/ab7/pt234>
- [10] Wilson, J., & Livingston, S. (1996). "Process Skills Enhancement in the STS Classroom". pp. 57-59. in R.E. Yager (ed). Science/Technology/Society as Reform in Science Education. New York: State University of New York Press.

# ORAL PRESENTATION

# AN APPLICATION OF TASK-BASED INSTRUCTION IN TEACHING READING SKILLS TO NON-ENGLISH MAJOR STUDENTS AT VINH UNIVERSITY

Tran Thi Phuong Thao

*Foreign languages teachers training Department, Vinh University, Vietnam*

*Corresponding author. Tel. +84904392924*

*Corresponding E-mail address: phuongthaocat@yahoo.com*

## ABSTRACT

This research investigates the application of task-based approach to teaching reading skill to non English major students at Vinh University (VU). It examines the present situation of teaching reading skills of English and the problems students encounter during reading an English text. It also addresses the effectiveness of task-based instruction (TBI) in teaching reading skill in comparison with traditional methods, together with useful implications to the applying TBI to teaching reading at VU and similar teaching contexts.

**KEYWORDS:** Task-based approach, Teaching reading, Reading strategies

## INTRODUCTION

Over the last decade part of the twentieth century, ELT (English Language Teaching) methodology has developed very rapidly and has been subject to changes and controversies. Communicative approach to teaching and learning English has been a significant development; at present, it is used worldwide in teaching and learning English, especially, in EFL and ESL situations. This approach covers training of all four basic skills- listening, speaking, reading, and writing. Success of teaching English through communicative approach depends entirely on the practice of these skills. Among the major skills, teaching reading has a significant place as it is very important for higher education.

In English reading teaching, there have been some traditional language learning approaches that have been used for many years, such as Grammar-Translation Method, Question-and-answer Model and PPP Model. Traditional approaches have a number of advantages. However, the focus of traditional teaching is on language form and the class is teacher-centered. For many years, teachers have relied on the textbooks, directing learners to repeat and practice the language sounds, words and structures. The classroom has always been just an artificial environment for language learning. Few opportunities are created for any social interaction of any kind. Owing to the lack of interaction in the process of teaching and learning, most of the students fail to practice oral English, not to mention achieving the communicative competence. Students depend too much on the teacher and lack a sense of responsibility for their own learning.

In order to make the reading class more effective in terms of developing students' reading ability and interest of learning English, the task based approach might come as an effective teaching method. TBT strongly emphasizes "learning by doing", and the emphasis is on the task rather than the language.

General view of teaching reading and task based instruction

Reading is one of the most important ways for people to get information, to take pleasure, and to obtain knowledge. It is difficult to define reading in a word. Many thinkers and researchers have defined it in many different ways. The definition and meaning of reading depend, largely, on the purpose of the reader, on the text and textual contents, on the attitude of the readers towards the text, on the reading materials and on the experience and schemata of the reader. However, experts have tried to define it differently, in their own way of observation and thought. Some argue that reading is a conceptual and thinking process through print, and the process is interpretative.

Reading is not a passive skill. It requires frequent practice and exercise. To be an effective reader, one should make a logical link between the language of the text and his mental perception. Therefore, the language should suit the level and perception of the reader. Students should enable themselves to enter the world of the text without seeking the help from the traditional teaching method of comprehension checks. "Instead they could be more actively engaged in negotiation for potential meaning, both individually and with other students. Interest in the activity can sustain interest in the text or be fuelled by interest in the text." (Greenwood, 1998) Task-based teaching can be regarded as a strong version of Communicative Approach, is a goal-oriented teaching method effective in enhancing student motivation. It can offer English learners exposure to authentic materials, opportunities to use the target language, and motivation to learn, which are all considered to be essential conditions for language learning (Willis, 1996). Moss reported TBIT helped ESL learners develop various skills because TBIT creates situations where learners need to communicate to get the job done (Moss & Van Duzer, 1998). The negotiation of meaning occurs when some form of information exchange transpires for a real purpose thereby making the context of communication as relevant as the content (Harmer, 1996; Nunan, 1998). Many of the types of Task-based teaching, consciousness-raising, and discovery learning activities that are not only intended to introduce language forms in authentic data but also engage them in truly meaningful and effective communication such as negotiation of meaning for the task completeness.

In task-based classroom, the main focus is the performance of the task. One well-known definition of task is provided by Nunan (2004). He considers a task as "any classroom work which involves learners in comprehending, manipulating, producing, or interacting in the target language while their attention is principally focused on meaning rather than form". In my opinion, a task is goal-oriented, meaning-focused first and form-focused then, contextualized, and implemented as the basis for teaching and learning. It can enable teacher's teaching in the direction of strong form realization of CLT, and help students achieve the reachable and communicative outcome when they are exposed to authentic and comprehensible input, then do the task through interactions (in pairs or in small groups) in which their own experiences of target language are exploited, and lastly access the completeness through the outcome. As Willis (1996) points out: "tasks differ from grammatical exercises in that learners are free to use a range of language structures to achieve task outcomes – the forms are not specified in advance".

## MATERIALS AND METHODS

On the basis of the theory, task-based language teaching and learning is different from the traditional methods. The application of this approach in teaching English reading was carried out for non-English major students at VU. The survey was conducted on the 2nd non-English major students and teachers of English to find out the reality of teaching and learning in reading classes as well as the reality of applying TBI in reading lessons. It also aimed to provide suggestions to promote teaching English reading with TBI. Therefore, it was undertaken the quantitative approach and the qualitative approach. Additionally, a quasi-experiment method was used to evaluate the effectiveness of TBI in teaching reading. The methods are in the forms of questionnaires, interviews, classroom observation and tests. The questionnaires investigate the current situation of teaching and learning reading for non – English major students at VU. The interviews served as helping the author to find out more information about the reality of complementing TBI in teaching reading. Moreover, they also provided further suggestions to promote teaching English reading with TBI. The test was designed in order to find an answer to the question: “How effective is the task-based approach in teaching English reading at VU?”

## RESULTS

The results of the survey questionnaires have revealed both good points and bad points in teaching and learning reading skills to students at VU.

### 1. Strong points

Firstly, concerning the attitudes of the teachers and the students toward reading comprehension, the data show that most of them were aware of the important role of reading in teaching and learning English. This creates good chances for the teachers to motivate their students to read and if they find appropriate techniques to teach this skill to their students, they will be certainly more successful. Another good point is that some teachers have exploited the reading texts in the light of Communicative Language Teaching in one way or another. This means that when teaching reading they not only teach their students how to read but also encourage them to speak and write although the proportion of the teachers who often do this is not very high. This can help students to get a deeper understanding of the text and develop other language skills. There is also good news that what the students suggested in the survey questionnaires indicates their need of improving communication skills.

However, there are some weak points remaining in teaching and learning reading skills to non English major students at VU which will be identified and analyzed in the following section.

### 2. Weak points

According to the statistics of the data, many teachers and students found the reading texts in the textbook difficult and uninteresting. This suggests that teachers should do some adjustments to make the texts more appropriate. Besides, although the majority of the informants were interested in the teaching reading followed communicative approach such as TBI, many of them found it difficult to apply this in reading lessons. They do not know how to apply this way of teaching and learning. The Grammar-Translation method is still preferred. Therefore, it can be said that communicative methods seem to be infrequently carried out in reading lessons. There is little chance for the students to practice speaking English during reading lessons.

Another bad point is that there is little interaction between the students in the classroom. Students often work individually, not in pairs or in groups. Therefore, the reading lessons are not communicative. Last but not least, the fact that the students come from different towns and provinces in Vietnam results in their differences in learning styles, attitudes, motivation, background knowledge and level of English. Their reading ability is not even, which may cause potential problems in teaching and learning English. In short, the data show that there are both strong points and weak points in the teaching and learning of reading skills of non English major students at VU.

As we all know, to learn a language well, the intrinsic motivation of learners is a crucial factor. However, how to arouse learners' interest depends on the way the teacher teaches them. Today's English reading classrooms are still teacher-dominated, and most teachers focus on grammatical rules. This way of teaching will put learners in a passive position in reading classroom, and hinder them improving communication ability. However, if task based instruction is applied in reading classroom, the situation will be totally different. According to Gray (1990), TBI focuses on language awareness, not on grammatical rules, and many linguists advocate using authentic materials as the sources of tasks. Thus, learners can be put into an English environment of the real use and can be encouraged to think in English rather than translate what they read into Vietnamese. And TBI needs the communication between the teacher and learners, just like what mentioned above, “learner and teacher as joint decision-maker in TBI”. In this situation, learners will have a feeling that they are involved

in the class, and they are responsible for how they should read. And the “learning by doing” principle makes learners to acquire the knowledge by doing tasks rather than reading silently by themselves or listening to the teacher and taking notes. In this way, learners can feel the fun in reading, and they will be more interested in English. In a word, adopting TBI is a good way to remedy the disadvantages of translation method and it is a more effective way to learn English.

From the interview with students, their thoughts about TBI were quiet positive. They indicated that more emphasis was shown on interaction in class. This interaction was encouraged not only individually but within group work as well. The students stated that the teacher presented various tasks in class and they made use of practice opportunities. They also indicated that an enjoyable classroom atmosphere developed as a result of the tasks and the nature of this enjoyable classroom learning situation affected their learning.

The result from the test appeared that means scores of the experimental class is higher than that of the controlled class ( $7,6 > 6,6$ ). (Furthermore,  $VE = 0,24$ ;  $VC = 0,25$  :  $VE < VC$  .This can be explained that students of the experimental class can read better, so differences among the students in the experimental class are fewer than in the controlled class.

## CONCLUSIONS AND DISCUSSION

Based on the above analysis, it is possible to conclude that the teaching and learning reading to non English major students at VU are far from being satisfactory although both the teachers and the students have positive attitudes toward reading. The reading texts are still exploited as a source of materials for language lessons in which too much time is spent on vocabulary and grammatical structures. The traditional methods being applied in the teaching process neither improve students' reading skills nor develop other language skills as well as the necessary knowledge of the target language.

TBI with its advantages can provide students with large space and long time for practice. The course of completing task is the process of cultivating the students' ability of using English. If students want to fulfill a task, they have to be engaged in the language activities and analyze information with the help of independent study and cooperative study. By comparing the results of the same test between two classes with two teaching methods, the findings practically showed the outweigh of TBI in comparison with the traditional methods. To sum up, the information from the surveys and test result provides useful clues for some suggestions for teaching and learning reading skills through task based approach to non English major students.

1. Increasing students' reading interest and motivation and training students become efficient readers.

From the results in the questionnaire, 65% of the students found the reading lessons not interesting because of the long and difficult texts. So, it makes the lessons boring and not motivating enough for students. Therefore, the teacher should vary reading activities and give different reading tasks to students in different lessons to avoid boredom.

Meanwhile, it is essential to make students aware their important role in the reading classroom. Students should be actively involved in reading tasks. They have to discuss problems in pairs or small groups. They should read more, and discuss with other students whenever they find anything difficult. They should also discuss their problems with teachers, when necessary and discover meaning by themselves. At the beginning of the semester, the teacher should divide class into many groups; change the group leader in turn after each reading lesson. It is a good way for all students in a group to realize their duty for the task group. Students must be engaged in doing tasks and learning by doing should be encouraged in the classroom. Students should be active organizers, not passive recipients. Students' doing tasks will be assessed and given marks by teacher, adding it to the mid-term mark for each student. Doing so, students have more motivation to take part in reading activities.

In order to help students to read effectively, teacher should teach them with different reading strategies to deal with the texts as well as encourage their positive and extensive reading habit. As shown in the study, most of the students reported that the most difficult part in reading English is vocabulary. This means that they lacked necessary vocabulary related to the reading topic and limited background knowledge. So, teacher should encourage students to form the positive and extensive reading habit. Reading extensively outside the classroom can help them enrich their vocabulary and knowledge. According to Nuttal (1996:168), “the best way to improve your knowledge of a foreign language is to go and live among its speakers. The next best way is to read extensively in it”. Teacher should provide students with the materials related to the topics they are learning, the source of these materials (from some books, websites...) and the way to read effectively. Besides, teacher also should provide a variety reading exercises such as summarizing, finding new words, answering the questions about the passage, making outline...with different levels of difficulty. These exercises may be given to students after each lesson. The students should be encouraged to do these exercises individually, in pairs or in groups. Then, teacher should give assessment to them and ask students to point out the difficulties they may encounter

when doing the tasks. It is very important for the teachers to know the students' difficulties to help them overcome.

## 2. Improving teachers' professional knowledge about teaching methodology

Though some English teachers at VU use modern approaches to the teaching reading, they are not trained and hence cannot apply the methods properly. They have a lot of difficulties in understanding the theories and principles of TBI, it is important for them to be given more task-based literature and models to refer to in their teaching practice. Therefore, arrangements should be made to train teachers in the new approaches to teaching reading. More workshops and seminars should be held so that the teachers can share their teaching experience as well as improve their knowledge about it. As a result, the teachers may contribute to the effectiveness implementation of TBI if they are given adequate and relevant training in TBI.

It is advisable to encourage teachers to apply TBI into their reading classroom. However, in the context of mixed-level classes at VU, it is very important to design and choose suitable tasks, because if the tasks are too easy, the students will lose their interest and if the tasks are too difficult, they will be discouraged to take part in.

## 3. Shifting classroom procedure from teacher-centered to learner-centered approach

The existing teacher-centered procedure tends to make the learners into passive recipients of knowledge. No chance is given to them to interact or communicate with teacher or among themselves. All this is in contrast with current methodological thinking, especially with task based language teaching, where the objective is to achieve communicative competence and language learning is regarded as developmental process which involves the creative functioning of the learners mind. Only learners own active efforts can ensure the development of such competence. By changing the procedure from passive memorizing and lecture method to developing reading skills through free communication in the classroom, where learners interact with each other, help and evaluate themselves in pair/group works, the system should change from teacher-centered to learner-centered. Teacher should not lecture and should not be the controller of the class; rather they should be parts of it. They should guide, monitor, help and provide feedback to students.

## 4. Adapting the reading text in the textbook toward task based reading activities

From the difficulties which students encountered with textbook, teachers need to adapt the reading exercises and even the reading text to make them more suitable for reading ability and students' interests. Because as Lamie (1999) stated: "however good the textbook, it will never be perfect for every teacher's teaching situation. In some respect it will always need adapting, modifying or supplementing." Therefore, it is necessary for teachers to be flexible in using the textbook and do not need to follow exactly and complete all the exercises in it. Teachers can omit one or two or leave them as homework for students. Teachers can also replace difficult exercises with easier ones that are suitable for students' levels. Teacher need to design reading exercises to different reading tasks: ordering and sorting, problem solving task etc...

This can lead to good results if the teachers work together to find the optimal solution. For example, which part of the textbook need to adapt, replace or simplify it... It can be said that if there is an adaptation in the reading exercises in the textbook, it will help students overcome many difficulties in learning reading. In addition, the university should provide the faculty with more teaching equipment such as projectors in each language class and documents of ELT methodology in order for everyone to study and have deeper understandings of teaching methodology in general and TBI in particular.

In summary, the research has found that despite a number of limitations and constraints in applying TBI in the classrooms and the current traditional examinations, we still see the benefits of TBI. Its effectiveness was proved by the test scores between experimental and controlled class. However, in order to make the application of TBI more successful, many solutions were recommended. In my point of view, the implementation of TBI at VU will be successful if there is contribution and cooperation of the administrators, teachers and students. Among these factors, teachers are central to long- lasting changes that can affect the success or failure of the innovation. Besides the administrators' support and assistance, the teachers must try their best to adapt themselves to use TBI. Good communicative competence, creativity and enthusiasm are necessary for the teachers to apply TBI in teaching effectively.

## REFERENCES

- Gray (1990). Modeling Design and Control of Flexible Manipulator Arms: A Tutorial Review. *Proceedings 29th IEEE Conference on Decision and Control, San Francisco, CA*, pp. 500-506.  
Greenwood, J. (1998). *Class Readers*. Hongkong: Oxford University Press.



- Moss, D & Van Duzer, C. (1998). *Project-Based Learning for Adult English Language Learner*. ERIC Digest. Washington DC: National Clearinghouse for ESL Literacy Education, ED427556
- Lamie, J.M. (1999). *Making the Textbook More Communicative*, Retrieved on January 5th, 2013, from <http://www.iteslj.org/Articles/Lamie-Textbooks.html>
- Nunan, D. (2004). *Task-based language teaching*. Cambridge, UK: Cambridge University Press.
- Nunan, D. (2005), "Important Tasks of English Education: Asia-wide and Beyond", *Asian EFL Journal*, Vol.7, Issue 3.
- Nuttall (1996). *Teaching Reading Skills in a foreign language*. Oxford: Heinemann.

## DEVELOPMENT OF TEACHING SKILL AND LEARNING OUTCOMES EVALUATION IN 21ST CENTURY OF TEACHER BY TEACHER COACHING FOR ENHANCING STUDENTS' LEARNING AND INNOVATION SKILLS

Chalermkieat Dulsamphana, Supparang Ruangvanichb, Suphak Dulsamphanc,\*

*a Biotechnology Program, Faculty of Science Chandrakasem Rajabhat University, Bangkok, Thailand 10900*

*b Technology Multimedia Program, Faculty of Science Chandrakasem Rajabhat University, Bangkok, Thailand 10900*

*c General Science Program, Faculty of Science Chandrakasem Rajabhat University, Bangkok, Thailand 10900*

\* Corresponding author. Tel: 083-305-5795; fax: 02-541-7877

E-mail address: s\_uphak@yahoo.co.th

### ABSTRACT

The purpose of this research was to study students' learning and innovation skills acquired when studying the science course with teacher who learned about teaching skills and learning outcomes evaluation in 21st century by researchers' coaching. The sample groups were 39 Mattayomsuksa 1 students at Benjamachanusorn School, Nontaburi Province in the second semester of 2016 academic year. The questionnaire of 5 rating scales used to identify students' learning and innovation skills after they take class for 10 weeks. It consisted of four components as following (1) creativity and innovation skills (2) critical thinking and problem solving skills (3) communication skills and (4) collaborative skills. Statistics used for the data analysis were frequency and percentage. The study found that most students more than 80% response that they learned all four skills of learning and innovation skills. Most students learned creativity and innovation skills (85.7%), communication skills (85.1%), collaborative skills (83.1%), and critical thinking and problem solving skills (80.5%) respectively. In this findings show that teaching in classroom can enhance students' learning and innovation skills. Therefore I suggest that, teachers should study to understand about teaching skills and learning outcome evaluation in 21st century.

**KEYWORDS:** Teaching Skills, Learning Outcome Evaluation, Teacher Coaching, Learning and Innovation Skills

## INTRODUCTION

The globalization and growth of technology have led to lasting changes in the societies of 21st century. Crucially, these changes are reflected in the types of problems encountered in everyday life and thus, in demands for the skills students need in order to successfully master life's challenges. It is the mission of education to adequately supply students not only with factual knowledge but also with a skills required in today's societies. The Partnership for the 21st century skills (2009) also proposed that the students in today's world must have the essential skills to be successful in their life and workplace, such as information, media and technology skills, communication and collaborative skills, and critical thinking and problem solving skills. Thailand also recognized the importance of the above subject. The educational reform thus focused on learning process and utilization of technologies in education essentially to improve quality of teaching and learning. Therefore, teachers and educators play an important role in supporting and motivating students. They should always improve themselves to be well-rounded about knowledge and skills in 21st century and integration in classroom.

The majority of the research on teacher coaching approaches has been conducted in Western countries. In the United States, teacher coaching became widespread after implementation of 2001's No Child Left Behind Act (Dole, 2004), which increased pressure on low-performing schools to show improvement or risk sanctions. The principal's role in guiding his or her staff members has been an important focus on efforts to improve instruction in the U.S. However, a growing number of studies have pointed to the potential of coaches to support teachers to improve achievement, particularly in the area of literacy. (Piper & Suilkowski, 2015) Coaching activities vary widely along a spectrum from general conversations about a curriculum to joint lesson planning to modeling and lesson study (Denton & Hasbrouck, 2009)

The theoretical approach to coaching in this study follows Guskey's (1985) model of teacher change. In this model, high quality teacher professional development leads to changes in pedagogy, which result in improvements in student outcomes. It is after the teachers observe those improvements that changes in teacher beliefs and attitudes occur. This model suggests that teachers require significant support during the implementation stage, as teacher buy-in will not occur until evidence of success is visible to teachers, using informal metrics derived by teachers. One-on-one coaching is one way to provide this direct support. Over time, the instructional change will prove long-lasting, as teachers derive their support for new instructional approaches from personal experiences of success rather than from the influence of the trainer, second-hand anecdotal information, or success stories from elsewhere.

We believed that if teachers have a relevant understanding of the elements of 21st century learning skills, know how to evaluate and able to organizing activities to empower these skills effectively, they will enhance the importance skills to the students. The coaching is a process by which teachers serve as peer coaches to one another to improve the quality of teaching and learning in their colleague's classrooms. Therefore the researcher need to improve the teaching skills and how to evaluate learning outcomes of the teacher by the process of teacher coaching. This research focus on science teacher at junior high school to promote students' learning and innovation skills that composed of 4 Cs including 1) creativity and innovation skills 2) critical thinking and problem solving skills 3) communication skills and 4) collaborative skills. The objective of the present study was to identify learning and innovation skills acquired when students undertaking Science 2 subject by the teacher was coached by the researcher.

## MATERIALS AND METHODS

This study employed a quantitative approach where questionnaire was administered to 39 students who were undertaking Science 2 subject. The questionnaire was answered by students after completing their lessons subjects in week 10 in the second semester of 2016 academic year at Benjamarachanusorn School, Nontaburi Province.

A questionnaire consisted of four components to elicit students' responses to the learning and innovation skills (4Cs skills) based on the following:

- a. Creativity and Innovation Skills
- b. Critical Thinking and Problem Solving Skills
- c. Communication Skills
- d. Collaborative Skills.

The questionnaire employs a 1-5 point Likert scale with 1 being Strongly Disagree and 5 being Strongly Agree. Section A consists of statements which examines students' perception on creativity and innovation skills. Section B survey students' perception on their critical thinking and problem solving skills. Section C gather students' perception on communication skills, while Section D elicit students' perception on collaborative skills.

The study was divided into 4 steps as shown below.

Step 1: Development of the teacher: In this step the participant 1 teacher learned the lesson about teaching skills and learning outcomes evaluation in 21st century that created by researcher for 2 weeks prior to instruction with closely coaching by the researcher. The lesson consisted of 4 modules as follows.

Module 1 The framework of the 21st century skills

Module 2 Teachers and teaching skills in the 21st century

Module 3 Integration of learning and innovation skills into classroom

Module 4 An evaluation learning outcome of the 21st century skills

Step 2: Created the lesson plan: In this step the teacher created 10 lesson plans for teaching 10 weeks in the Science 2 subject based on active learning and inquiry approach through working group activity and an experimental with closely coaching by the researcher.

Step 3: Teaching with lesson plan for 10 weeks with closely coaching by the researcher.

Step 4: Evaluating students' learning and innovation skills: In week 10 of the course activity, the students were self assessed their learning and innovation skills by a questionnaire.

Students' responses were analyzed using descriptive statistic in the form of frequency and percentage.

A process of teacher coaching in this study consists of three basic parts:

1. A pre-conversation

2. An observation

3. A post-conversation

1. During the pre-conversation the teacher discussed the specific lesson planed, its context, and other relevant factors that influence student learning outcomes. Researchers as the teacher coaching were responsible only for providing that teacher with another perspective of the learning environment and the element of 21st century skills so he could mutually improve teaching and learning.

2. Next, the teacher coaching observed in the teacher's classroom as an observer. The coach was not involved in teaching the lesson, in interacting with the students or teacher in any way. The coach only observes and records observable behaviors and actions.

3. Finally, the teacher coaching schedules a post-conversation, to discuss the outcome of the lesson. The observed teacher should take the lead in this conversation, with the observer adding factual information about what happened during the lesson. He may discuss what worked well, what didn't work at all, and what could be changed or improved to have a positive impact on the teaching and learning in the classroom. Important aspects of this stage was the reflection on what has happened during the lesson and analysis of its impact on student learning.

## RESULTS

The findings of the research based on the four components of learning and innovation skills namely: creativity and innovation skills, critical thinking and problem solving skills, Communication skills and Collaborative skills. Table 1-4 shows students' responses on 4Cs skills. When 1 = Strongly Disagree, 2 = Disagree, 3 = Uncertain, 4 = Agree, and 5 = Strongly Agree

### 1. Students' Responses on creativity and innovation skills

This section consist of 5 statements to elicit students' feedback on what they gained in creativity and innovation skills. These responses as shown in Table 1 below.

Table 1 Students' responses on creativity and innovation skills

Statements	Students' responses (%)					total agree (4+5)
	1	2	3	4	5	
A1. I learned how to brainstorm and forward ideas appropriately with group members	-	-	12.8	61.6	25.6	87.2
A2. I understand and able to gather information for the experiment	-	-	12.8	51.3	35.9	87.2
A3. I am confident to communicate new ideas and give suggestions freely among group members	-	-	20.5	51.3	28.2	79.5
A4. I open and responsive to new and diverse perspectives and incorporate in work	-	-	5.1	53.9	41.0	94.9
A5. I applied creative ideas to make a real and useful contribution to their work	-	-	20.5	38.5	41.0	79.5
Total agree						85.7

From table 1 showed that majority of respondents or 85.7% agree that they learned creativity and innovation skills. Most of them or 94.9% agree that they learned to open and responsive to new diverse perspective and incorporate in work (A4). When students are able to open mind and responded to new and diverse perspectives with others, this would further enhance their ability the make further creativity and innovation skills appropriately. When 87.2% of students responded they were able to brainstorm and forward ideas appropriately with group members (A1) and they become understand and able to gather information (A2). In addition, 79.5% of the students told that they were confident to communicate new ideas and give suggestions with others (A3) and applied creative ideas to make a real and useful contribution to their work (A5). This finding has shown that students benefit in developing their creativity and innovation skills especially in open their mind and responsive to new diverse perspective and incorporate in work

## 2 Students' Responses on critical thinking and problem solving skills

This section comprises of 5 statements that require students to respond their critical thinking and problem solving skills. These responses as shown in Table 2 below.

Table 2 Students' responses on critical thinking and problem solving skills

Statements	Students' responses (%)					total agree (4+5)
	1	2	3	4	5	
B1. I am motivated to speak and forward opinions in identifying problems and solution	-	-	30.8	46.1	23.1	69.2
B2. I learned how to judge solutions and identify good views among group members	-	-	12.8	61.6	25.6	87.2
B3. I can focus on the main idea needed for the experiment	-	-	15.4	66.7	17.9	84.6
B4. I learned how to draw conclusion from the finding	-	-	17.8	41.1	41.1	82.2
B5. I learned how to interrupt appropriately during interaction	-	-	20.5	43.6	35.9	79.5
Total agree						80.5

Table 2 showed that majority of students or 80.5% respond that they learned creativity and innovation skills. A total of 87.2% of respondents acknowledged they feel they learned how to judge solutions and identify good views among group members (B2). When 84.6% of the students agreed that they were able to focus on the main idea when working the experiment (B3). In addition, 82.2% responded that they learned how to draw conclusion from the finding (B4) and 79.5% learned how to interrupt appropriately during interaction (B5). When 69.2% agreed that they were able to motivated to speak and forward opinions in identifying problems and solution (B1).

### 3. Students' Responses on Communication Skills

This section consisted of 5 statements that require students to give their feedback on communication skills. These responses as shown in Table 3

Table 3 Students' responses on Communication Skills

Statements	Students' responses (%)					total agree (4+5)
	1	2	3	4	5	
C1. I Used communication to inform, instruct, motivate and persuade to others in the group	-	-	10.3	46.1	43.6	89.7
C2. I learned how to communicate with other in diverse environments	-	-	10.3	48.6	41.1	89.7
C3. I listened to decipher meaning, including knowledge, values, attitudes and intentions of others	-	-	10.3	43.6	46.1	89.7
C4. I learned how to write based on the findings	-	-	23.1	53.8	23.1	76.9
C5. I learned how to organize ideas in preparing and writing the summary	-	-	20.5	46.2	33.3	79.5
Total agree						85.1

Table 3 showed that Most of students (85.1%) respond that they developed their communication skills. A big percent of the respondents (89.7%) agree that they used communication to inform, instruct, motivate and persuade to others in the group (C1), they learned how to communicate with other in diverse environments (C2) and they were able to listen to decipher meaning, including knowledge, values, attitudes and intentions (C3). In addition, 79.5% learned how to organize ideas in preparing and writing the summary (C5). 76.9% of the respondents learned how to write based on the findings (C4).

### 4. Students' Responses on Collaboration Skills

This section consisted of 5 statements that require students to give their feedback on collaboration skills. These responses reveal insights on students' perceptions on collaboration skills acquired as shown in Table 4.

Table 4 Students' responses on collaboration skills

Statements	Students' responses (%)					total agree (4+5)
	1	2	3	4	5	
D1. I can work well and politely with others in diverse groups	-	-	23.1	46.2	30.7	76.9
D2. I Exercised flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal	-	-	20.5	30.8	48.7	79.5
D3. I listened to decipher meaning, including knowledge, values, attitudes and intentions of others	-	-	20.5	28.2	51.3	79.5
D4. I can work well and politely with others in diverse groups	-	-	12.8	48.7	38.5	87.2
D5. I Exercised flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal	-	-	7.7	35.9	56.4	92.3
Total agree						83.1

Table 4 showed collaboration skills that respondents attained during undertaking in Science 2 subject. A majority of respondents (83.1%) respond that they were developed their communication skills. A total of 92.3%

of respondents agreed that they learned to work successfully with students from different social and culture groups (D5) and 87.2% became more perceptive and sensitive to the needs of others during group work (D4). In addition, 79.5% of the students have also exercised flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal) and shared responsibility for collaborative work, and value the individual contributions made by each team member (D2, D3). 76.9% agreed that they can work well and politely with others in diverse groups (D1).

## CONCLUTIONS AND DISCUSSION

In view of findings from this study, learning and innovation skills can be enhanced to students if the teacher has a clear understanding of the elements of 21st century learning skills and how to assess those skills. The challenges are (1) how to assist teachers to obtain the of 21st century skills. (2) how to redefining the role of teachers. Instruction doesn't consist primarily of lecturing to students who sit in rows at desks, dutifully listening and recording what they hear, but, rather, offers every child a rich, rewarding, and unique learning experience. (3) how to encouraged teachers to adapt and adopt new practices that acknowledgeable. (4) how to providing teachers with opportunities to learn. (5) how to Improving the quality of teaching through teacher learning. The finding in this paper address that the teacher coaching can improve the quality of teaching and learning in their student's classrooms. Additional research is required the school adopt a coaching model, participating teachers receive training on how to have meaningful dialogue, how to use reflection in conversation and how to coach one another. The feedback that teachers give one another through classroom observations, goal setting and discussion ultimately serves to improve student achievement. It requires teachers to take ownership over their goals and empowers teachers to transform their teaching by pushing one another to grow and improve. Like other coaching models, the goal is to support teachers in becoming more reflective about their teaching skills and strategies and to motivate teachers to improve their instructional delivery. School leaders need to be supportive of this work and create an atmosphere where teachers share ideas, brainstorm solutions to common teaching challenges, and learn from one another.

## ACKNOWLEDGEMENTS

This research has been supported by a grant from Office of the Higher Education Commission (OHEC) Thailand. We would like to thank BenjamarachanusornSchool, Nontaburi Province for providing teachers, students and research facilities.

## REFERENCES

- Dole, J. A. (2004). *The changing role of the reading specialist in school reform*. The Reading Teacher, 57 (5), 462e471. <http://dx.doi.org/10.1598/rt.57.5.6>
- Denton, C. A., & Hasbrouck, J. (2009). A description of instructional coaching and its relationship to consultation. *Journal of Educational & Psychological Consultation*, 19, 150e175. <http://dx.doi.org/10.1080/10474410802463296>.
- Guskey, T. R. (1985). Staff development and the process of teacher change. *Educational Researcher*.15 (5), 5e12. <http://dx.doi.org/10.3102/0013189x015005005>.
- Partnership for 21st century skills. (2009). *Framework for 21st century learning*. Tucson,AZ: Author. [www.21stcenturyskills.org/documents/framework\\_flyer\\_updated\\_april\\_2009.pdf](http://www.21stcenturyskills.org/documents/framework_flyer_updated_april_2009.pdf)
- Piper, B., Zuilkowski, S.S. (2015). *Teacher coaching in Kenya: Examining instructional support in public and nonformal schools*. Teaching and Teacher Education, 47, 173-183. [www.elsevier.com/locate/tate](http://www.elsevier.com/locate/tate)



## USING AN ENGLISH MODIFIED METACOGNITION INSTRUCTIONAL PACKAGE TO ENHANCE HIGH VOCATIONAL EDUCATION CERTIFICATE STUDENTS' VOCABULARY KNOWLEDGE

Kanok-on Sripanya and Dr. Anyarat Nattheeraphong

*Faculty of Humanities and Social Sciences, Mahasarakham University,  
Khamriang Sub-District, Kantarawichai District, Maha Sarakham 44150 Thailand  
Tel. +(66) 0-4375-4369, 0-4375-4361 ext. 4735, 4703 Fax. +(66) 0-4375-4369  
Corresponding E-mail address: Kanokon5566@gmail.com*

### ABSTRACT

The purposes of this study were to (1) explore the use of a Modified Metacognition Instructional Package (MMIP) to enhance students' vocabulary knowledge in a case study in the Sakon Nakhon Technical College and (2) compare the development of students' vocabulary knowledge in ESP activities towards MMIP's attitudes. The research tools were a series of semi-structured interviews and a summative report used in order to obtain more in-depth information.

The findings of the study showed that students were able to develop self-confidence regarding personal listening comprehension skills and able to interact with listeners at a more satisfactory level as seen from positive feedback gathered from those listeners. In addition, using videos which contain contents related to industrial technology was helpful in building students' confidence to use English. Observation during listening activities employed individual teaching notes to rank students' comprehension. The findings indicated that listening practice improved listening comprehension.

**KEYWORDS:** Metacognition, Instructional Package, Vocabulary knowledge, Listening comprehension

## INTRODUCTION

Vocabulary knowledge is an English communication skill of utmost importance; it is the first and most basic of a language student's skills both in the classroom and in daily life (Nation, 2001). As the field of Industrial Technologies currently uses English technical terms almost exclusively, it is important to note that these technical terms are being used without a foundational or practically tested English adaptation (Wenden, 1985).

When observing educational methods used in a Vocational school setting, the context of this research involves the employment of a transfer of inspiration to improve the English language being taught, specifically regarding globalization and international economies in this century (Graddol, 1997: p4). Among others, this fundamental reason has been a source of encouragement for the researcher to continue a pursuit of study in order to develop methodologies which would improve use and education of English - specifically with regard to vocabulary knowledge, in the technological terms of researchers' workplace being Technical Colleges located in North East of Thailand.

According to national regulations and teaching requirements, English language is being taught at the Sakon Nakhon Technical College. Teachers in this college rigorously work on developing their teaching schedules, their focus mostly ranging between unit plan design and planning learning activities. They have chosen learning content preparation materials which are centering on include an assessment of teachers' role, centering on the teacher for the formulation and focusing of education plans. Over three years of researcher's experiences; however, a significant lack of students' attendance in English classroom has been noticed, especially those studying in the area of Industrial trades. It has been judged to be mainly due to the fact that they are unable to concentrate in English activities.

As mentioned earlier, the students frequently skip their English classroom hours, especially students of Industrial trades. The preliminary reason was thought to be because they could not concentrate in English activities (as seen and found in the need analysis justification). An example can be seen in the interview result that follows:

"Since I was a child, studying in English was boring, and I wondered why teacher laughed when I spoke in the wrong tone. She chuckled, although all she taught was English grammar. [Her method] was not adapted to English teaching because what I needed to learn were different techniques in English, not only grammar, things which would be useful for [my future/my life in] Industrial trades."

Consequently, this answer encouraged the researcher's passion to search for methodology, theory, material for enhance in English teaching, in order to match the fulfill needs similar to the student in the quote above. As seen in this topical research, a relevant study has previously been officially approved under the title "Using an English Modified Metacognition Instructional Package to Enhance High Vocational Education Certificate Students' Vocabulary Knowledge."

This strongly encourages the researcher to find ways in which the processing of Metacognition strategies can be used to enhance students in ESP vocabulary knowledge, students with prior abilities ranging from low level to standard level. It was relevant to the purpose of this research as it is based on Metacognition theory, and how it did not occur in Thailand. From this point, The researcher employed the Modified Metacognition Instructional Package (MMIP) as adapted from an instructional package developed by Wongchaliaow (2003), the Head of an Industrial Technology program in Sakon Nakhon Technical College to plan the lessons and evaluate/ and monitor the student's vocabulary knowledge ability before-, while- and after the course of learning by traditional methods teaching method in MMIP. This strategy is relevant to this researcher's project as it also involved attention given to the students' attitude towards learning English.

### Purpose of the Research

This research aimed to modify a Metacognition Instructional Package in order to enhance High Vocational Certificate Students' emphasis on ESP vocabulary knowledge at Sakon Nakhon Technical College. Assumption of this research involving both the process and the rationale of study are included in a 2-part purpose statement of the research as follows:

1. To explore the use of a Modified Metacognition Instructional Package (MMIP) to enhance students' vocabulary knowledge in a case study in the Sakon Nakhon Technical College.
2. To compare the development of students' vocabulary knowledge in ESP activities towards MMIP's attitudes.

### Research Question

According to the aim of the study, expectations are high in the attempt to raise the awareness of vocational teachers to understand how students in this type of education still have further and additional needs. There exist gaps in understanding that need to be built upon in addition to the regular English lesson included in the official curriculum. One of four skills that needs to be improved is that of vocabulary knowledge, with a listening specific practical terms related to listening detailed in the MMIP.

Therefore, to provide a clear answer to the two-part statement questions above and consequently, it is hoped that the findings of this study give a clear picture of how these expectations could be answered with some solutions to the problem. To aid in to this, the following questions have been constructed:

1. Does the MMIP effectively enhance the student's vocabulary knowledge in ESP contexts?
2. What are students' attitudes towards the MMIP instructional package?

### **The Scope of the Research**

This study addresses the acknowledged need to enhance student's vocabulary knowledge, and the steps taken to achieve this goal are divided into IV chapters. The methods of this approach are directed by the MMIP, and wisdom in the procedure and progress in this research were investigated by means of self-regulated listening, and learning relating to machinery maintenance. This instructional package, from Professor Wongchaliaow (2003), the head of Industrials technology department, is designed to control, students' concentration on research processing based on the Metacognition Theory in an English for Specific Purposes class of Industrial Technology.

The population in this study is comprised of second year students of high vocational education, a sample size of thirty-three people. Included in this sample were seven student volunteers, all of whom were majoring in Industrial Technology. The data collection research tools used were a Need Analysis, an audit to reflect the level of information's reliability, and semi-structured interviews used in order to get in-depth information. Summative reports and an exploration of the extent to which the students showed improve their attitude towards English vocabulary learning made through descriptive analysis.

The duration of the study planned to conduct research in the first and second semesters of the academic year 2016 for amount of three hours per week, eighteen weeks, for a total duration of one year (The Office of Vocational and Professional, 2007).

### **MATERIALS AND METHODS**

The research instruments related to literature review based on Vocabulary Size Test (VST) and Depth of Vocabulary Knowledge (DVK) were used widely to test listening need analysis, an audit to reflect the level of information's reliability, and semi-structured intertwined reasons included questionnaires, stimulated recalls, think-aloud, student diary, and observation by teacher diary were the means used in collecting data for the current study.

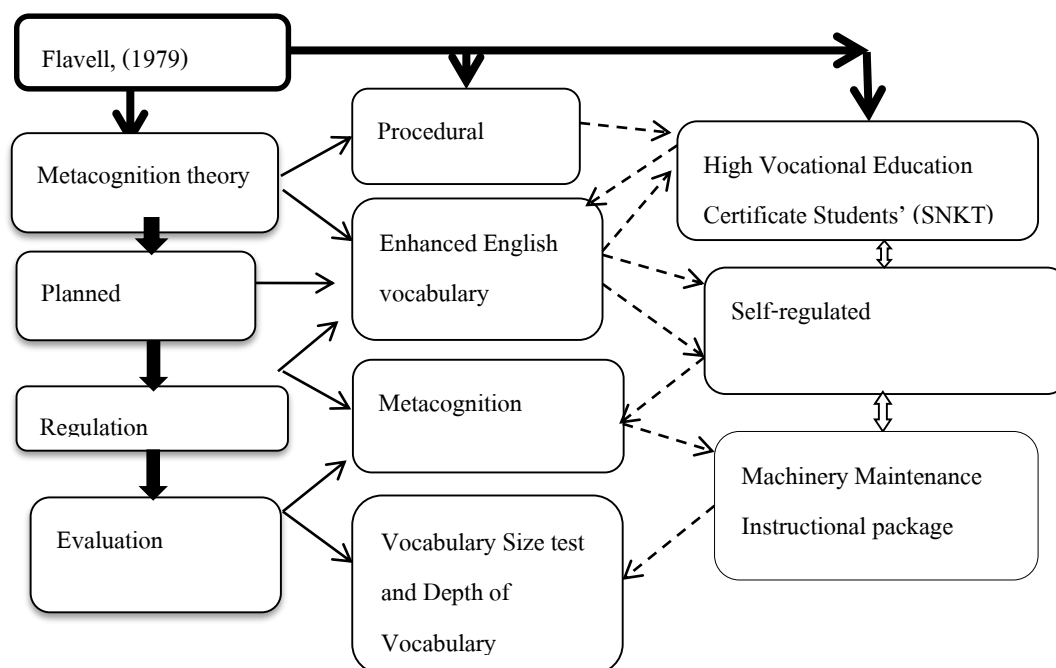
To analyze the data, transcripts were made of the interviews; notes were made from the videotape on the vocabulary listening activities and students' performance in the classroom. These data were triangulated with the information obtained from the interviews. All data were examined in order to answer the research questions about the influences of aural authentic texts on listening comprehension in ESL students and about students' attitudes towards language learning as a result of implementing the MMIP authentic materials in language instruction. Each step discussed in detail in the following interviews section used in order to get in-depth information in summative reports and an exploration of the extent to which the students showed enhance their attitude towards English vocabulary learning made through descriptive analysis.

Researchers adopted the mixed methods approach which was organized in case study. The study was began with a qualitative approach using focused interviews with second year students of high vocational education, a sample size of thirty-three people. Included in this sample were seven student volunteers, all of whom were majoring in Industrial Technology. The data collection research tools used were a Need Analysis, an audit to reflect the level of information's reliability, and semi-structured interviews used in order to get in-depth information. There was linking, reflecting and feedback evaluating the students in listening skill over three periods of study. Summative reports and an exploration of the extent to which the students showed improvement their attitude towards English vocabulary learning made through descriptive analysis. The main goal was to better understand and formulate ways to enhance vocabulary knowledge through English listening skill. The greatest part involved encouraging the students majoring in industrial technology to learn English vocabulary knowledge. They were learned with the MMIP by Machinery Maintenance English Video, Semi-Structure Interview, Student Paper Lecture, and Teacher diary These data were triangulated with the information obtained from the interviews. All data were examined in order to answer the research questions about the influences of aural authentic texts on vocabulary knowledge listening comprehension for industrial

students and about students' attitudes towards language learning method was investigated, followed by a review of the data collection instruments.

With these findings, the researcher designed a questionnaire (quantitative) given that the purpose of the presented study. Participants were seven student volunteers who wanted to enhance ESP vocabulary knowledge though attitude in the MMIP test at Sakon Nakhon Technical College, Thailand. The tests were constructed with Pre- test, While- test and Post- test were a part of our study that wanted to analyze the students' attitude towards learning ESP vocabulary knowledge, and sought to produce an improved process which would yield an empirical result with data purification performed by interpretive qualitative research (Creswell, 2012) by the research framework presented in Table 1.

Table 1 Research framework adopt: Creswell (2012). Related with Vocabulary Size test and Depth of Vocabulary knowledge by Foomani (2015)



As demonstrated above, the researcher notes a significance of ESP vocabulary knowledge learning listening abilities by differed analysis based on Metacognition Theory and Machinery Maintenance Instructional package. This is followed by a description of the research context, participants, and pedagogical method investigated, followed by a review of the data collection instruments used. As the important objective of this study was to examine the influences with ESP instructional package of in-house materials, or Vocabulary Knowledge (DVK) language that is used among native speakers of the language (video recorded), on Vocabulary Knowledge (DVK) listening skills in students of English as a second language. On the other hand, out-of-class listening provides the opportunity for self-regulation in listening, learning relating to machinery maintenance, instructional package from Wongchaliaow (2003) for control student concentrated in research processing based on a metacognitive theory.

This study was an English specific study carried out in industrial contexts involving different students specializations, either industrial trade technology or repair and maintenance for machines, and activities were chosen from the MMIP to improve High Vocational Education Students' English Listening for comprehension. These activities included connections from the accompanying segments:

1. YouTube Unique English in Mechanical exchanges
2. Speakers Links to Downloadable MP4 files and Links to vocabulary for ESL in PowerPoint setting.
3. Pre-test and Post-test paper sheets in an instructional package.
4. Semi-structured attitude interview after a finished course.

## RESULTS

To answer the first research question, the following sections present the numerical and stimulated recall questionnaire data pertaining in to four result;

1. Students' use of attention and memory that analysis through the weekly listening vocabulary of Listening Diagnostic test (Harding L., Alderson J., Brunfaut T, 2015) for pre-test, while-test, post-test listening vocabulary knowledge test and semi-structured interview were presented in Table 2.

Table 2 : Activities results

Score : 30	Pre-test	While-test	Post – test
1. Aegy	10	19	22
2. Yiw	8	11	15
3. Cathy	6	15	17
4. Pat	9	13	18
5. Sai	7	17	18
6. Jet	11	15	16
7. Aem	10	12	17

Out of the seven students present at the beginning of the first session, only one student, named Aegy, commented that he felt relaxed when trying to listen to the test, even though he reported that he did not understand all of the vocabulary used in what the native speaker said.

In Weeks 1 - 2, the environment included students Aegy, Yew, Cathy, Pat, Aem and Sai, and although these six students had, what the researcher felt was suitable, time to adjust to the situation of testing, the students still reported that they felt a bit uncomfortable when being surrounded by English in the classroom. Students also commented on a need to adapt to English in general.

In week 3, all seven students reported that they understood English listening comprehension videos more easily without any difficulties. And at the end of the English video, six students, including Aegy, Yew, Cathy, Pat, Aem and Sai, began to find themselves more understanding what the teacher explained further from the video content as show in an example bellows.

1.1 Aegy;

Teacher, I can understand the words of the teacher is a large part of the past week, but there are also some vocabulary and sentence sentences that I still do not mind.

1.2 Yiw;

Teacher, I could understand the first time, but not all the words, because I was interested in the content of the teacher, and I went back to listen and study. Third, I think I can understand. I feel it is easy. I think I understand 100% story.

1.3 Cathy;

I learned this lesson than the first start of class.

1.4 Aem;

The first time I understood 30% -35% for the first time, now I'm beginning to understand 90% of it.

1.5 Sai;

I began to understand when the teacher had an article on teaching listening, which, after reading, could be understood by listening, making me more confident that I listen.

1.6 Pat;

I still cannot listen to the 1-2 lectures because I think the story that the teacher listened to was too long for my attention.

1.7 Jet;

This lesson I feel is a fast learner, and some words are difficult words. I do not understand.

2. Problem-solving analysis through the weekly listening development test from the students' point of view., It will be noted from the answer using by analyzing on the weekly work of the students. In the teaching record of all 7 students, they quite understand what they heard. However, 4 of the 7 students, including Jet, Cathy, Aem and Pat, often find it difficult to understand the mini-lectures because in the video, the teaching precedes swiftly, the rate of speaking, and the use of unfamiliar vocabulary. Understand more about the content after the student has repeatedly rehearsed the story. The student's perspectives on repeatability are as follows.

2.1 Jet;

"Sometimes in what the teacher explains more, I can understand 90% because flesh is a matter that interests me and starts much easier".

2.2 Cathy;

"Right now, right now. But finally, of course, I do not understand because of the vocabulary I think I understand 100%, but the results come down to just 80%."

2.3 Aem;

I can hear faster, but sometimes the stories and sentences in Video very long, I'll take the time to understand them slowly.

2.4 Pat;

I will understand the teacher's additional lecture, because I cannot hear and understand in a short time.

3. Use of evaluation students' attitudes towards the MMIP by semi-structured interview, By using student inquiries once a month, during their in-class times, both in terms of work quality and student attitudes it can be observed that progress is being made.

3.1 Materials in the classroom Teaching English of the MMIP have some influence on the ability of students to listen in vocabulary background knowledge. Following is the students' perspectives about the vocabulary listening practice that they had in the language class such as the student's perspectives on repeatability are as follows.

Aegy:

That's right. Before, what I would do is I was breaking things down, if I knew a word, like 'deputies', I would be saying: Hey, I know what that word means!, but the conversation went on. Then I found, as I got further into a conversation, I would hear five or six words, and

Yiw:

Hey, I know the whole phrase!, so I would summarize the phrase, meanwhile, same problem was, the story was moving along. Now, I just take it in as a, you give me a phrase, yes, well then just move on!, and so, I no longer need to analyze and summarize and put it on the shelf so I can do something else. Now, I can keep up and move along with the text".

Exposure to authentic language/listening to language from a native speaker improve the student's level of listening comfort, as well as improves students' self-confidence while listening to the language for speaking purposes.

Pat:

"Yah, right, it's along the lines of common sense. It's the same thing. And I could probably have put 'strongly agree' cause I do that all the time, I'm constantly doing that, so yah, actually, I could have put 6 for that. You know, I'm trying to use general knowledge to interpret the story, the meaning, and I do realize there's lots of words I don't understand, so, I do use the other words that I do understand to, urn, to reinforce, or to, give me the sense of what the story's about."

Because students have limited language skills, students avoid conversations with native speakers. English classes are places where most students are trained in language skills and the participants of which have agreed to create an atmosphere of comfort and confidence such as an example follows.

Yiw:

The vocabulary is sometimes very difficult. Sometimes I cannot understand. Because it is different from what I've studied in the video, he spoke very fast and I think he can understand only 50%

Cathy:

I'm able to comprehend better, I hear it better, so I don't have to go word for word. And so now I can sort of anticipate what's coming next, especially if you understand the topic, so you sort of know, you get thinking where they're going down with, the path... you may have heard the argument before... or you've heard a similar discussion.

Students tend to expose themselves and use target language when speaking with native speakers of said target language. In addition, it can be concluded that students can understand the listening side of language better after receiving the listening experience from native speakers of the language and of genuine material. When language is used by native speakers in a controlled environment, such as a classroom, the material can be more clearly heard, and therefore the listener is more capable of understanding the language than when a similar situation might be happening in nature outside the classroom such as an example follows.

Aem:

I understand listening is a matter of interest to me."before, then I, I sort of guess what's coming next. But, if I have no idea what the topic is or I never heard it before, obviously, I don't. It depends really. It depends on my own past experiences and knowledge of the topic, where I can guess. Otherwise,

Jet:



I'm not guessing, I don't try and guess on a topic I don't know. If I don't know the topic, I'm actually concentrating on the MMIP actual text, on what they're actually saying, otherwise, it could backfire...".

4. Results from teacher and students diary of affective control, perceptions and beliefs in MMIP English material. Results from teacher and students diary of affective control, perceptions and beliefs in MMIP English material. The fundamental purpose of the students' time and activities with a teacher was to obtain information, and from the teacher's observations, we can learn more about development in the students' English-language listening ability. While 3 out of 7 students were newcomers, the teacher had the others as former students from the previous semester. On the basis of students' class attendance, their ability to respond in class, together with their approach to native speakers video, the teacher diary perceived that 4 out of 7 students (57%) : Sai, Yiw, Cathy, and Pat, had clearly progressed in English-listening ability. Three other students taking part whose listening progress was not obviously noticed by the teacher were: Aegy, who came after the class had already started; Jet and Pat, who were repeatedly absent from the language class. Evidently, these three students had less time with classroom listening experiences than the rest of students in the same class.

5. Results from the classroom observation showed the obtaining of information about the nature and proportion of MMIP input provided in the ESP classroom. The results from a 5-week period of class observation revealed that during the 18-weekday language program, 85% of the total class hours were delivered in English spoken by native English speakers (video) : 55% through the teacher, 10% through mini-lecture tapes, 8% through guest speakers, 8% through people met on field trips, and 4% through motion pictures.

The remaining 15% of the entire class was spent on other activities including exercises, listening to classmates reading, and listening to classmates answering questions. The analyzed transcripts of five-week class observation also revealed a variation of classroom behaviors indicated the students' listening and understanding of the target language. Classroom behaviors were coded and grouped into major categories: following instructions, answering questions, not answering questions / not following instructions, nodding or shaking head as listening, and smiling and/or laughing as listening.

The first category, following instructions, consisted of classroom events in which the students performed to demonstrate their understanding of the teacher's directions, such as introducing themselves to guest speakers, pronouncing vocabulary repeating after the teacher, and taking notes while listening to the mini-lectures. The second category included events where the students participated verbally, responding with a either single word, a phrase or sentence, nonverbally, with a head nodding or a head shaking, or by answering the teacher's questions. The final category of responses contained circumstances where the students did not accurately respond to the teacher's questions or directions; for instance, the students repeated the definition given when the teacher asked for a word for that definition. The next category included events where the students indicated an understanding of the message by nodding, shaking head, or using paralinguistic cues such as "uh huh," and "yeah". The last category consisted of occurrences where the students smiled or laughed, which was judged to signify their listening and understanding of the heard message. Using transcripts of the class observation, frequency counts of coded events related to each category were totaled. The results from class observation indicated that the students generally displayed an acknowledgment, in a way or another, while they were listening to the teacher. Most of the time, the students nodded their head or gave a precise answer when the teacher asked a question. When given an instruction to do certain things, the students normally responded accurately. Nevertheless, the students sometimes kept quiet and did not respond to what the teacher said. While they were listening, the students often nodded their head. Occasionally, the students smiled or laughed when they heard what the teacher said.

6. Results from the self-evaluation questionnaire, the purpose of self-evaluation questionnaire in Appendix E. It was used to obtain individual student's perceptions of his/her listening-comprehension ability. To determine the progress in the students' listening ability, as a consequence of implementing authentic materials in the ESP class over a semester period, the questionnaire was administered at both the beginning and the end of the language program. Graph1. presented the students' responses as taken from the self-evaluation questionnaire obtained at the beginning of the study, comparing them to those received at the completion of the semester. The two sets of responses obtained from each student were collected, and the outcome of which then helped to reveal any given student's improvement in comprehending the English listening comprehension test.



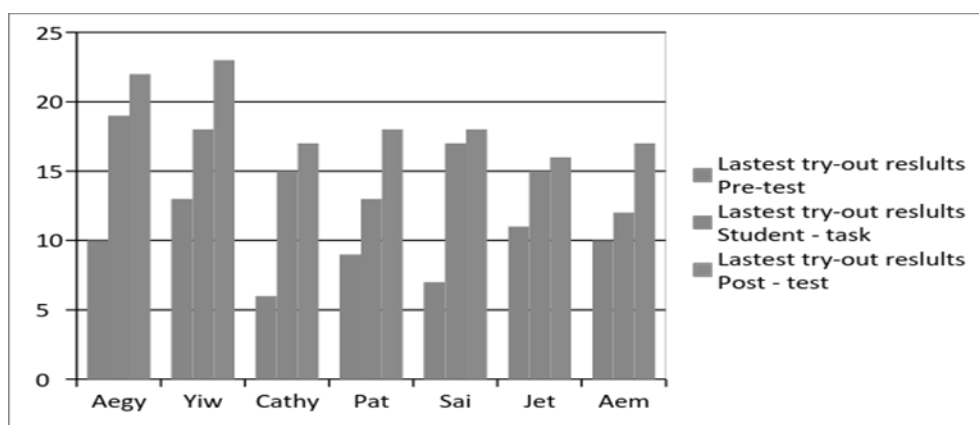


Figure 1 The Student's Improvement Graph

Based on the findings from the graph, it showed that the development of listening comprehension especially from the evaluation of listening tests. Recorded observation of behavior during listening activities include post-individual teaching notes to rank the students' understanding of English listening from the beginning of the activity, followed by when, at the end of the learning activity, listening practice can be seen to improve listening comprehension. After taking part in a listening experience with a video that corresponds to what they are interested in the classroom, students' scores can be seen to move upwards or downwards in significant ways. These graph were demonstrated that the individual student's progress in understanding the target language heard inside and outside the ESL classroom respectively. Based on the results from students' self-evaluation reports on English-language listening comprehension, both inside and outside classroom, the current study was composed of three major groups of students. The first group consisted of two students: Jet and Yiw, whose listening comprehension had not progressed in either setting. The second group consisted of only one student, Aegy, whose comprehension had improved in listening to native speakers of English, both inside and outside ESP class. The other group consisted of the students whose comprehension had progressed only in classroom listening practice namely; Yiw, Aem, and Pat, and whose comprehension had progressed only in listening to native speakers outside class.

Regarding to the findings related to the Students' Attitudes of the MMIP material towards ESP Language Learning. Based on the interviews with students, it can be summarized that the implementation of aural authentic materials in the ESP classroom helped increase the students' motive for language learning. The students were enthusiastic about listening to the vocabulary target language and meeting more native speakers outside the classroom.

Considering the findings obtained principally from the self-evaluation questionnaire, on which the individual student rated his/her ESP vocabulary comprehension of spoken English, once at the beginning and once at the end of the language program, the students could be arranged into two major groups. One included those students whose competence in listening comprehension had improved after having experienced listening to authentic materials in the ESP classroom. The other included those students whose listening ability in the target language appeared to be unchanged over the period of their language program.

## CONCLUSIONS AND DISCUSSION

In conclusion, the findings related to the influences of authentic material from English videos. Based on the outcomes of the interviews, in-classroom observation, and the self-evaluation questionnaire. It can be summarized that the implementation of aural authentic materials in the ESP classroom had some influences on listening ability in industrial students. The exposure to aural authentic language helped increase students' level of comfort in listening to native speakers of the target language. Implementing authentic materials in class also helped increase students' self-confidence in listening to the target language spoken by native speakers' video of the language. Since the students had limited language skills, they normally avoided a conversation with a native speaker, especially in the situation of needing to work at an international company. An ESP classroom therefore, was a place where the students primarily practiced the language skills, and concurrently built comfort and self-confidence. When they felt that they had self-confidence enough in language ability, the students tended to expose themselves more on using the target language with native speakers. It can also be summarized that the students' listening comprehension improved after they had experienced authentic language and authentic materials in the ESP classroom.

Furthermore, students' progress in listening comprehension was more evident in their ability to understand the language in a structured environment of the classroom than that occurred in a natural setting outside classroom. Having been exposed to English language spoken-video materials by various groups of native speakers and an SLA speaker, the students experienced difficulty in understanding. This was judged according to certain features of authentic language, including pace, accent, dialect, and level of formality when speaking.

Summary of findings related to the learning Strategy use from the outcomes of the classroom observation: it can be summarized that the ESP students used several learning strategies when they listened to aural authentic language in the classroom. The learning strategy most frequently used was that of paying attention when someone was speaking. Other learning strategies that the students used in listening to the English language were taking notes, asking questions about the material, and using a dictionary to look-up the meanings of unfamiliar words. The findings from the interviews with students and learning strategy questionnaire revealed that, in addition to pay attention when someone was speaking, the students normally asked the other person to either repeat what was said, or to speak more slowly, when the student did not understand something. Watching television was the most popular strategy for the students to practice the second-language listening skills. Conversely, listening to radio was the strategy most infrequently used by these ESP students. Results for Secondary Research Question #2: Attitudes towards Language Learning. The following section presents the findings related to the secondary research question concerning the influences of implementing aural authentic materials on the students' attitudes towards learning English. Having experienced MMIP authentic materials in class, the students desired to have more exposure to a variety of the English language spoken by various groups of native speakers. Following is the students' viewpoints about the listening practice that they had in the language class.

When comparing listening with speaking, reading, and writing, listening is the most frequently used language skill in both the classroom and daily communication. In a language class, comprehension of aural vocabulary input plays a critical role in second-language acquisition and learning. It is, therefore, important that listening is emphasized in the early phases of second-language instruction. Despite the significance of listening skill, a traditional language classroom focuses extensively on reading and writing skills, and exposes MMIP with industrials' students more to write input than aural input (Mareschel, 2007). Recently, the interest in listening skill has increased markedly by the growing number of studies related to listening in second-language contexts (Yelham, 2016). Residing in an English-speaking country, ESP students are surrounded by the target language both in the classroom and the community. Ability in target-language listening comprehension is important for the students' daily survival. Many ESL students, however, experience difficulty making the transition from hearing classroom language to understanding natural speech in the real world (Foomani, 2015). Based on the interviews with students, it can be summarized that the implementation of aural authentic materials in the ESP classroom helped increase students' motivation for language learning. The students were enthusiastic about listening to the target language and eager to meet native speakers outside the classroom.

## DISCUSSIONS

In the current study, the listening materials implemented in the ESL classroom were primarily audio-taped mini-lectures. To the extent that the mini-lectures, presented for a few-minute long, were not real lectures addressed directly to this group of students, neither their audio-taped or real lectures in a real college lecture hall, these mini lectures are not considered pure authentic. However, the mini-lectures were not totally scripted materials in which a person had to perform reading something that was written for them. Rather, on the basis of degree of authenticity, the mini-lectures are considered semi-scripted materials because of the fact that they represented the way a real lecturer talks to a real class and that they contained some features of an unplanned spoken discourse, such as redundancy, ungrammatical features, and incomplete sentences. Influences of MMIP listening comprehension improved in a second language. It starts immediately upon students' exposure to the target language. At the beginning, the students may not understand what they heard because of their unfamiliarity with native accents, vocabulary items, and native speakers' normal speed of utterance. Nevertheless, the students gradually developed their language comprehension as they have opportunities to experience language used by native speakers of the target language. The present study shows that students may take six months to two years after their arrival in a new environment to demonstrate basic competence in the second language (Peregoy and Boyle, 1997).

The language that takes place in ESL classroom is generally characterized as being different from the language that takes place outside classroom. Many students face problems shifting from understanding talking in classroom for understanding the natural spoken language. It is quite common for second language students to

complain that native speakers speak too fast. Students feel that faster speech is more difficult to understand. They find it easier to handle if the language is spoken slowly (Derwing and Munro, 1997). In spite of the fact that students are able to gather some meaning from authentic speech. They still find themselves in trouble understanding native speakers of the target language. This is generally the result of second language students misunderstanding that comprehension requires understanding every single word.

### ACKNOWLEDGEMENTS

The thesis would not have been accomplished without the help from several people. I would like to extend my grateful thanks to many people who provided considerable encouragement and wholehearted support throughout my research study.

I would like to express my appreciation to my beloved advisor Dr. Anyarat Nattheeraphong, Dr. Intisarn Chaiyasuk, Dr. Pimyupa Praphan, Asst.Prof.Dr.Ladawan Wattanaboot, and Dr. Pilanut Phusawisot and for valuable suggestions, and devoting time to make a contribution to the success of my study.

I specifically would like to thank all experts who commented thoughtfully and constructively on many aspects of my instructional and research instruments.

I was very fortunate to have many friends within the Faculty of Humanities and Social Sciences. I thank them all for their being very supportive.

I would also like to thank Jakarapon Ta Wongchaliaow expert-level industrial technology teacher, Waewta Potingam, English teacher and students at Sakon Nakhon Technical College. This study would not have been possible without their assistance and participation.

Special thanks go to Chamnan Para, English teacher Department of Western Languages and Social Sciences, Mahasarakham University for his assistance as a translator and for his time as a criterion observer.

My heartfelt thanks to my parents Thongbai Nueangkota, Pantong Nueangkota, my uncle Sane Nueangkota, Kulap Nueangkota, Therdsak Nueangkota for their support and everlasting encouragement throughout my educational years.

### REFERENCES

- Ajideh, Parviz. 2009. Autonomous Learning and Metacognitive Strategies Essentials in ESP Class. *English Language Teaching*. 2 (1), 162-168.
- Analol'evna Sura, N. (2013). *ESP Listening Comprehension for IT-Students as a Language Skill*. Middle-East.
- Authentik en français. (2001). *Mars/Avril*. Trinity College, Dublin.
- Bacon, S. M. (1992). Phases of listening to authentic input in Spanish: A descriptive study. *Foreign Language Annals*, 25, 317-334.
- Baker, L., & Brown, A. L. (1984). *Metacognitive skills and reading*. In P. D. Pearson, M. Kamil, R. Barr, & P. Mosenthal (Eds.), *Handbook of reading research*, New York, NY: Longman, 1, 353-394.
- Becerra, C.L.T., Ayure, C.P.A., Ordonez, M.N.Z., and Bohorquez, G.M. (2015). Facilitating Vocabulary Learning through Metacognitive Strategy Training and Learning Journals. *Colomb. Appl. Linguist. J.* 17 (2), 246-259.
- Berne, J. (2004). Listening Comprehension Strategies: A Review of the Literature. *Foreign Language Annals*. 37 (4), 521-531.
- Bishop, D. (1998). Development of the children's communication checklist (CCC) : a method for assessing qualitative aspects of communicative impairment in children. *Journal of Child Psychology and Psychiatry*, 39, 879-891.
- Bishop, D., Chan, J., Adams, C., Hartley, J., & Weir, F. (2000). *Conversational responsiveness in specific language impairment: evidence of disproportionate pragmatic difficulties in a subset of children*. *Development and Psychopathology*, 12, 177-199.
- Boekaerts, M. (1999). Self-regulated learning. *International Journal of Educational Research*, 31, 445-457.
- Bolitho, R., Carter, R., Hugues, R., Ivanic, R., Masuhara, H. & Tomlison, B. (2003). Ten questions about language awareness. *ELT Journal*, 57, 251-260.
- Bonk, W.J. (2000). Second Language Lexical Knowledge and Listening Comprehension. *International Journal of Listening Comprehension*, 14 14-31.
- Buck, G. (2001). *Assessing Listening*. Cambridge: Cambridge University Press.
- Chamot, A. U., Barnhardt, S., El-Dinary, P. B. & Robbins, J. (1987). *The learning strategies handbook*. White Plains, NJ: Longman.

- Chiang, Ch. S., & Dunkel, P. (1992). The effect of speech modification, prior knowledge, and listening proficiency on EFL lecture learning. *TESOL Quarterly*, 26, 345-374.
- Chuenjit, T. (2011). *The Influence of Vocabulary Knowledge on the English Listening Comprehension of Thai Hospital Pharmacists. Master's Thesis in English for Careers, the Language Institute, Thammasat University, Bangkok, Thailand.*
- Cobb, T. (2007). Learning about language and learners from computer programs. *Reading in a Foreign Language*, 25 (3), 301-315.
- Creswell, J. W. (2012). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research*. 4th ed. Boston, MA: Pearson.
- Davis, K. A. (1995). Qualitative Theory and Methods in Applied Linguistics Research. *Journal of Educational Psychology*, 35: 169-174
- Derwing, T.M. & Munro, M. J. (1997). *Foreign Accent, Accent, intelligibility, and comprehensibility: Evidence from four Lls*. Studies in Second Language Acquisition, 19, 1-16.
- Ehrman, M. & Oxford, R., 1990: Adult language learning styles and strategies in an intensive training setting. *Modern Language Journal*, 74, 311-326.
- Flavell, J. H. (1979). Metacognition and Cognitive Monitoring: A New Area of Cognitive-Developmental Inquiry. *American psychologist*, 34 (10), 906.
- Flynn, S. (1988) *Linguistic Theory in Second Language Acquisition*. Dordrecht: Kluwer (Studies in Theoretical Psycholinguistics, 8).
- Foomani, E.M. (2015). Lexical Influencing in Listening: Depth of Vocabulary Knowledge and Listening Proficiency. *International Journal of English Language Education*, 3 (2), 105-117.
- Garza, T. J. (1991). Evaluating the use of captioned video materials in advanced foreign language. *Foreign Language Annals*, 24 (3), 239-258.
- Goh, C. C. (2000). A Cognitive Perspective on Language Learners' Listening Comprehension Problems. *Systems*, 28 (1), 55-75.
- Graddol, D. (1997). *The Future of English?*. UK: The British Council 1997.
- Gu, Y. (2003a). Vocabulary learning in second language: person, task, context and strategies. Electronic Journal. *TESL-EJ*, 7 (2), 1-26.
- Gu, Y. (2003b). Fine brush and freehand: The vocabulary learning art of two successful Chinese EFL learners. *TESOL Quarterly*, 37, 73-104.
- Hans, A. (2013, October). Role of Listening Skills in Our Daily Life. *International Journal of Research in Engineering and Science (IJRES)*, 1 (6), 38-43.
- Harding, L., Alderson, J. C., & Brunfaut, T. (2015). *Diagnostic Assessment of Reading and Listening in a Second or Foreign Language: Elaborating on Diagnostic Principles*. Language Testing, 0265532214564505.
- Harwood, N. (2010). *English Language Teaching Materials: Theory and Practice*, Cambridge: Cambridge University Press, 3-30.
- Herron, C. (1994). *An investigation of the effectiveness of using an advance organizer* Hillsdale, NJ: Lawrence Erlbaum Associates.
- Huckin, T., Haynes, M. & Coady, J. (eds) (1993). *Second Language Reading and Vocabulary* Ablex, Norwood, N.J. In Industrial Trades Thompson, I.
- Johnstone, R. (1997). Research on language learning and teaching: 1996, *Language Teaching*, 30 (3), 149-165.
- Laufer B, Nation ISP (1999). *Vocabulary size and use: Lexical richness in L2 written learning and motivation*. In G. D. Phye (Ed.), *Handbook of academic learning - Learning*, 47, 289-294. In O. Kagan & B. Rifkin (Eds.), *The learning and teaching of Slavic languages and cultures: Towards the 21st century* (pp. 109-133). Bloomington, IN: Slavica.
- Liu Na & Nation, I.S.P. (1985). Factors affecting guessing vocabulary in context. *RELC Journal*, 16 (1), 33-42.
- Macaro, E. (2006). Strategies for Language Learning and for Language Use: Revising the Theoretical Framework. *The Modern Language Journal*, 90, 320-337.
- Macaro, E., Graham, S. & Vanderplank, R. (2007). *A Review of Listening Strategies: Focus on Sources of Knowledge and on Success*. In: A.D. Cohen and E. Macaro (eds), *Language Learner Strategies: 30 Years of Research and Practice* (pp. 165-185). Oxford: Oxford University Press.
- Mareschal, C. (2007). *Student Perceptions of a Self-Regulatory Approach to Second Language Listening Comprehension Development* (Doctoral Dissertation, University of Ottawa (Canada)).
- Markham, P. and Latham, M. (1987). The Influence of Religion-Specific Background Knowledge on the Listening Comprehension of Adult Second-Language Students. *Language Learning*, 37 (2), 157-170.



- Maximo, R. (2000). Effects if rote, context, keyword, and context/ keyword method on retention of vocabulary in EFL classroom, *Language Learning*, 50 (2), 385-412.
- Mcdonough, J., Shaw, C. and Masuhara, H. (2013). *Material and Methods in ELT*, 3-33. (3rd ed.). Oxford, UK: Wiley-Blackwell. ISBN-13: 9780631227373.
- Mcdonough, J. (1997). *Research Methods for English Language Teachers*. London: Arnold.
- McLeod, L. (1997). Young children and metacognition: Do we know what they know they know? And if so, what do we do about it?. *Australian Journal of Early Childhood*, 22 (2), 6-11.
- Meara, P. (1980). Vocabulary acquisition: a neglected aspect of language learning. *Language Teaching and Linguistics*, 13 (4), 221-246.
- Meara, P.M. and Milton, J.L. (2003). *XLex: Swansea Vocabulary Levels Test (Version 2.02)* [Computer software]. Swansea: Lognostics.
- Mecarty, F.H. (2000). Lexical and Grammatical Knowledge in Reading and Listening Comprehension by Foreign Language Learners of Spanish. *Applied Language Learning*, 11 (2), 323-348.
- Mendelsohn, D.J. (1994). *Metacognitive strategy use and second language test performance*. Language Learning to Listen. San Diego: Dominie Press.
- Mody, R. (2013). ELISS Need Analysis Report (p. 6). *Maharakham English Language Initiative for Second Schools (ELISS)*. British Council Divisions.
- Nation, I.S.P. (2001). *Learning Vocabulary in Another Language*. Cambridge: Cambridge University Press.
- Nunan, D. (1991). Methods in second-language acquisition classroom-oriented research: a critical review, *Studies in Second Language Acquisition*, 13 (2), 249-174.
- O'Malley, J.M. & Chamot, A.U. (1990). *Learning Strategies in Second Language Acquisition*. Cambridge: Cambridge University Press.
- O'Malley, J.M., Chamot, A.U. & Küpper, L. (1989). Listening Comprehension Strategies in Second Language Acquisition. *Applied Linguistics*, 10 (4), 418-437.
- Oxford, R. L. (1990). *Language learning strategies: What every teacher should know*. Boston: Heinle & Heinle.
- Paltridge, B. (2002). *Genre, text type and the EAP classroom*. In Johns, Anne M. (Eds.), *Genre in the Classroom: Multiple Perspectives*, (pp. 73-90). United States: Lawrence Erlbaum Associates, Publishers.
- Pillette, M. & Graham, S. (2000). *Objectif Bac 2*. London: Collins Educational.
- Pintrich, P. (1995). Understanding Self-Regulated Learning. In P. Pintrich (Ed.), production. *Applied Linguistics*, 16 (3), 307-322.
- Purpura, J. E (1997). An analysis of the relationships between test takers' cognitive and Metacognitive Strategy Use and Second Language Test Performance, *A Journals of Research in Language Studies*, 47 (2), 289-235.
- Qian, D. (1998). *Depth of Vocabulary Knowledge: Assessing it's role in adult's reading*. University of Toronto.
- Qian, D. (1999). Assessing the roles of depth and breadth of vocabulary knowledge in reading comprehension. *Canadian Modern Language Review*, 56 (2), 282-308.
- Qian, D. (2002). Investigating the Relationship Between Vocabulary Knowledge and Academic Reading Performance: An Assessment Perspective. *Language Learning*, 52 (3), 513-536.
- Qian, D., & Schedl, M. (2004). Evaluation of an in-depth vocabulary knowledge measure for assessing reading performance. *Language Testing*, 21 (1), 28-52.
- Read, J. (2000). The development of a new measure of L2 vocabulary knowledge. *Language Testing*, 10 (3), 355-371. *Research*, 31 (6), 445-551.
- Richards J.C. (1980). *The role of vocabulary teaching*. TESOL Quarterly, 10 (1), 77-89.
- Richards, J. C., & Renandya, W. A. (2002). *Methodology in language teaching: An Anthology of Current Practice*. Cambridge: Cambridge University Press.
- Richards, J.C. (1992). *The role of vocabulary teaching*. TESOL Quarterly, 10 (1), 467.
- Rogers, C.V. & Medley, F.W. (1988). Language With A Purpose: Using Authentic Materials in the Foreign Language Classroom, *Foreign Language Annals*, 21 (5), 423-506.
- Rost, M. (2002). *Teaching and Researching Listening*. Harlow, England: Longman.
- Rubin, J. (1996). Can Strategy Instruction Improve Listening Comprehension?. *Foreign Language Annals*, 29 (3), 331-342.
- Rubin, J. (1994). A Review of Second Language Listening Comprehension Research. *The Modern Language Journal*, 78, 199-221.
- Santos, D., Graham, S. and Vanderplank, R. (2008, forthcoming). Second Language Listening Strategy Research: Methodological Challenges and Perspectives. *Evaluation and Research in Education*, 21 (2), 111-113.

- Schmidt-Rinehart, B.C. (1994). The effects of topic familiarity on second language listening comprehension. *The Modern Language Journal*, 78 (2), 179-189.
- Schmitt, N. (1997). *Vocabulary learning strategies*. In N. Schmitt & M. McCarthy (Eds). *Vocabulary: Description, acquisition and pedagogy*, Cambridge: Cambridge University Press, 199-227.
- Secules, T., Herron, C., & Tomasello, M. (1992). The Effect of Video Context on Foreign Language Learning, *The Modern Language Journals*, 76 (4), 480-490.
- Staehr, L.S. (2009). Vocabulary Knowledge and Advanced Listening Comprehension in English as a Foreign Language. *Studies in Second Language Acquisition*, 31 (4), 577-607.
- Starfield, (2002). *Continuum Companion to Research Methods in Applied Linguistics*. "I'm a second-language English speaker": Negotiating writer identity and authority in Sociology One. *Journal of Language, Identity and Education*, 1 (2), 121-140.
- Stephen, C. (2006). *Early Years Education: Perspectives from a review of the international literature*. Scottish Executive Education Department, Edinburgh.
- Tellier M. (2008). *The effect of gestures on second language memorization by young children*. Gesture, John Benjamins, 8 (2), 219-235.
- Teng, F. (2014). *Assessing the Depth and Breadth of Vocabulary Knowledge with Listening Comprehension*. PASAA.48.
- Thanajaro, M. (2000). *Using authentic materials to develop listening comprehension in the English as a second language classroom* (Doctoral dissertation, Virginia Polytechnic Institute and State University).
- The Office of Vocational and Professional, (2007). *Curriculum for the Certificate of vocational education*. Vocational Education Commission. Bangkok, Thailand.
- Thurairaj S. and Sinha Roy, S. (2013). Teachers' Emotions in ELT Material Design. *International Journal of Social Science and Humanity*, 2 (3), 232-236.
- Tomlinson, B. (2003). *Develop Material for Language Teaching*, 1-7. London: Continuum.
- Tomlinson, B. and Masuhara, H. (2010). *Research for Materials Development in Language Learning*, 1-9. Cambridge, UK: Cambridge University Press.
- Tsui, A.B.M. and Fullilove, J. (1998). *Bottom-Up or Top-Down Processing as a Discriminator of L2 Listening Performance*. *Applied Linguistics*, 19 (4), 432-451.
- Twain, (1910). *Invitation to learning: English & American novels: Learn English through story*, 242. Columbia Broadcasting System, inc.
- Vandergrift, L. (1998). *La Métacognition et La Compréhension Auditive en Langue Seconde*. *Canadian Journal of Applied Linguistics*, 1, 83-105.
- Vandergrift, L. (1997). The Comprehension Strategies of Second Language (French) Listeners: A Descriptive Study. *Forgien Lagunage Annales* 30 (3), 387-409.
- Vandergrift, L. (2003). *Orchestrating Strategy Use: Toward a Model of the Skilled Second Language Listener*. *Language Learning*, 53 (3), 463-496.
- Vanderplank, R. (1988). Implications of Differences in Native and Non-Native Speaker Approaches to Listening. *British Journal of Language Teaching* (formerly Audio-Visual Language Journal, 26 (1), 32-41.
- Waring, R. (1997). A comparison of the receptive and productive vocabulary sizes of some second language learners. *Immaculata (Notre Dame Seishin University, Okayama)*, 1, 53-68.
- Wenden, A. L. (1999). An introduction to metacognitive knowledge and beliefs in language learning: Beyond the basics. *System*, 27, 435-441.
- Wenden, A L (1985). Learner strategies, *TESOL Newsletter*, 19 (5), 1-7.
- White, C., Schramm, K. & Chamot, A.U. (2007). *Research Methodology in Language Learner Strategies*. In: Cohen, A.D., Macaro, E. (Eds.), *Language Learner Strategies: 30 Years of Research and Practice*. Oxford University Press, Oxford, 93-116.
- Wilkins, A.D. (1972). *Linguistics in Language Teaching*. Hodder & Stoughton Educational.
- Winne, P. (1995). *Inherent details in self-regulated learning*. *Educational Psychologist*, 30, 173-187.
- Wolvin, A. & Coakley, C. G. (1996). *Listening*. 5th ed. Boston: McGraw-Hill.
- Wongchaliaow, J. T. (2003). *The Instructional Package of Repairing and Maintenance the machine* (Master's thesis). Sakonnakhon Technical College, Thailand
- Y'ian, W. (1998). *What Do Tests of Listening Comprehension Test? - A Retrospection Study of EFL Test-Takers Performing a Multiple-Choice Task*. *Language Testing*, 15 (1), 21-44.
- Yeldham M. (2016). *Examining the Usefulness to Learners of Processes Taught in L2 English Listening Courses*. *IRAL* 2016, 54 (1), 43-72.
- Yin, R. K. (2013). *Case Study Research: Design and Methods*. 4th ed. Publications Sage. Thousand Oaks.

- Zhao, Y. (2009). *Structural and mutational studies on the importance of oligosaccharide binding for the activity of yeast PNGase*. Glycobiology, 19 (2), 118-25.
- Zimmerman, B. J., & Risemberg, R. (1997). *Self-regulatory dimensions of academic learning and motivation*. In G. D. Phe (Ed.), The educational psychology series. Handbook of academic learning: Construction of knowledge, 105-125.



**ASSESSING CLASSROOM LEARNING ENVIRONMENT INVENTORY ACCORDING TO  
CONSTRUCTIVIST APPROACH IN AUGMENTED REALITY TECHNOLOGY (AR) CLASSES FOR  
FACILITATING CREATIVE THINKING ABILITIES OF SECONDARY STUDENTS**

Arpakorn Donvichana, Panatda Tansuphob, and Wandee Rakraic

*<sup>a</sup>Department of Master of Science Education, Faculty of Education, Rajabhat Maha Sarakham University,  
Maha Sarakham, Thailand 44000*

*Corresponding author. Tel.: +66 8 8714 3871; Fax: +66 43 713 206*

*E-mail address: [arpakorn910@gmail.com](mailto:arpakorn910@gmail.com)*

*<sup>b,c</sup>Department of Chemistry, Faculty of Science and Education; Rajabhat Maha Sarakham University  
Maha Sarakham, Thailand 44000*

*\* Corresponding author. Tel.: +66 8 0 400 1572; fax: +66 43 722 257*

**ABSTRACT**

The aims of this research study were 1) to assess on classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) for facilitating creative thinking abilities of secondary students, 2) to assess students' perceptions of their creative thinking abilities, and 3) to predict associations between students' perceptions of their constructivist approach in augmented reality technology (AR) classes and their creative thinking abilities. A sample size consisted of 315 students in 7 schooling classes under Secondary Educational Service Area Office Northeast Region with the classified random sampling was selected. These perceptions were obtained using the 30-item Constructivist Learning Environment Survey (CLES), six each in five scales, namely: Personal relevance, Uncertainty, Critical voice, Shared control, and Student negotiation. Students' critical thinking abilities were assessed with the 24-item Creative Thinking Ability Questionnaire (CTAQ), six items each in four scales, namely; Originality, Fluency Flexibility, and Elaboration thinking ability scales. The items were measured by a five point Likert type scales. Validity and reliability with Cronbach Alpha Reliability were analyzed. Associations between students' perceptions of their AR classes and their creative thinking abilities toward AR were correlated and predicted. The R<sup>2</sup> values indicate that 39%, 38%, 38%, 30%, and 44% of their creative thinking abilities outcomes for Personal Relevance, Uncertainty, Shared Control, Critical Voice and Student Negotiation scales of the CLES to the Originality, Fluency, Flexibility, Elaboration and Totalized Thinking Ability scales of the CTA, respectively. Suggestion that both students and teacher were assessed classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) classes for facilitating creative thinking abilities of secondary students are positive in four of five scales of the CLES, and negative in Critical Voice scale. Desirable future applications of the CLES for research purposes and in improving teaching in secondary education in Thailand are considered.

**KEYWORD:** Assessment, classroom learning environment inventory, constructivist approach, augmented reality technology (AR), facilitation, creative thinking abilities, and secondary students

## INTRODUCTION

Augmented reality (AR) is a live direct or indirect view of a physical, real-world environment whose elements are "augmented" by computer-generated or extracted real-world sensory input such as sound, video, graphic, hepatics or GPS data (Schuettel, 2017) [1]. It is related to a more general concept called computer-mediated reality, in which a view of reality is modified (possibly even diminished rather than augmented) by a computer. Augmented reality enhances one's current perception of reality, whereas virtual reality replaces the real world with a simulated one (Steuer, 2016) [2]. Augmented reality is used in order to enhance the experienced environments or situations and to offer enriched experiences. Originally, the immersive augmented reality experiences were used in entertainment and game businesses, but now other business industries are also getting interested about AR's possibilities for example in knowledge sharing, educating, managing the information flood and organizing distant meetings. Augmented reality has a lot of potential in gathering and sharing tacit knowledge (Kaasinen, Aromaa, & Rauhala, 2015) [3]. Augmentation techniques are typically performed in real time and in semantic context with environmental elements, such as overlaying supplemental information like scores over a live video feed of a sporting event.

With the help of advanced AR technology (e.g. adding computer vision and object recognition) the information about the surrounding real world of the user becomes inter active and digitally manipulable. Information about the environment and its objects is overlaid on the real world. This information can be virtual (Chen, 2009) [4] or real, e.g. seeing other real sensed or measured information such as electromagnetic radio waves overlaid in exact alignment with where they actually are in space (Huang, Z., Hui, P., Peylo, C., and Chatzopoulos, D. (2013) [5]. Augmented reality brings the components of the digital world into a person's perceived real world. One example is an AR helmet for construction workers which display information about the construction sites. The first functional AR systems that provided immersive mixed reality experiences for users were invented in the early 1990s, starting with the Virtual Fixture system developed at the U.S. Air Force's Armstrong Labs in 1992 (Rosenberg, L.B. (1992) [6]. Augmented reality is also transforming the world of education, where content may be accessed by scanning or viewing an image with a mobile device. [16] In educational settings, AR has been used to complement a standard curriculum. Text, graphics, video, and audio may be superimposed into a student's real-time environment. Textbooks, flashcards and other educational reading material may contain embedded "markers" or triggers that, when scanned by an AR device, produced supplementary information to the student rendered in a multimedia format (Stewart-Smith, 2012) [7].

As AR evolved, students can participate interactively and interact with knowledge more authentically. Instead of remaining passive recipients, students can become active learners, able to interact with their learning environment. Computer-generated simulations of historical events allow students to explore and learning details of each significant area of the event site (Lubrecht, A. (2012) [8]. Augmented reality technology enhances remote collaboration, allowing students and instructors in different locales to interact by sharing a common virtual learning environment populated by virtual objects and learning materials (Kaufmann, 2013) [9]. Secondary educational schools in Thailand education system are interested in learning easily from interactive experiences, and expanded with supplemental video information. Paper-based science book illustrations could seem to come alive as video without requiring the students to navigate to web-based materials. There are a lot of secondary educational schools which individual privacy, there exists the ease of access to information that one should not readily possess about a given student. This is accomplished through facial recognition technology. Assuming that AR automatically passes information about students' learning that the user sees, there could be anything seen from social media, criminal record, and marital status (TRoesner, Kohno, Denning, Calo, & Newell, (2015) [10]. To investigate students' perceptions of their constructivist approach in augmented reality technology (AR) classes for facilitating creative thinking abilities, this focused on this research study.

Defining the classroom or school environment in terms of the shared perceptions of the students and teachers has the dual advantage of characterizing the setting through the eyes of the participants themselves and capturing data which the observer could miss or consider unimportant. Students are at a good vantage point to make judgments about classrooms because they have encountered many different learning environments and have enough time in a class to form accurate impressions. Also, even if teachers are inconsistent in their day-to-day behaviour, they usually project a consistent image of the long-standing attributes of classroom environment. To discussion focuses on the merits of combining quantitative and qualitative methods when studying educational environments (Fraser & Tobin 1991) [11]. The Constructivist Learning Environment Survey (CLES) is being used in the present study to assess students' perceptions of classroom learning environments. Originally developed by Peter Taylor, Barry Fraser, and Darrell Fisher at Curtin University of Technology in Perth, Australia (Taylor et al., 1997) [12]. This version consists of 30 items, six each in five scales. Rather than having items from different scales mixed together throughout the instrument, items in this version are grouped

into blocks according to their scale of this present study. The CLES has been used in a variety of studies, including qualitative studies of the nature of science knowledge and learning of science teachers and their students, a study of science education reform efforts in many countries, a study of secondary preservice teacher beliefs, an investigation of the relationships between classroom environment and student academic efficacy, such as; students' attitudes toward science. However, in this research study was designed to assess students' perceptions of their classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) classes for facilitating creative thinking abilities. The purpose of this study was to validate an instrument to explore students' preferences toward the constructivist learning environments for approach in augmented reality technology (AR) classes. The instrument was customized and modified from the CLES questionnaire. It included five components of constructivist learning: Personal Relevance, Uncertainty, Shared Control, Critical Voice and Student Negotiation scales.

Based on Guilford (1950) [13] interests in individual differences, he explored the multidimensional aspects of the human mind, describing the structure of the human intellect based on a number of different abilities. His work emphasized that scores on intelligence tests cannot be taken as a unidimensional ranking that some researchers have argued indicate the superiority of some people, or groups of people, over others. In particular, Guilford showed that the most creative people may score lower on a standard IQ test due to their approach to the problems, which generates a larger number of possible solutions, some of which are original. Guilford's work, thus, allows for greater appreciation of the diversity of human thinking and abilities, without attributing different value to different people (Guilford, 1980) [14]. In this research study, an adapted version of Guilford's creative thinking skill test of his work in students' intelligence and creativity to the 24-item Guilford Divergent thinking Questionnaire (GDTQ) to the 24-item Creative Thinking Ability (CTA) questionnaire in 4 scales in augmented reality technology (AR) classes of fluency, flexibility, originality, and elaboration ability scales were used (Chanthala, Santiboon, & Ponkham, 2017) [15] of this research study.

## METHODOLOGY AND MATERIALS

To investigate the assessing classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) classes for facilitating creative thinking abilities of secondary students under the Secondary Educational Service Area Offices in the Northeast of Thailand, using the popular science education research instrument and the policy of Thai government for improving the Thailand 4.0 and the skills of Thai people, especially, secondary students' learning achievements and their skills in the 21st century was described in this research study.

### Research Objective

To assess classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) with the secondary students' perceptions of their AR classes.  
To assess students' perceptions of their creative thinking abilities in augmented reality technology (AR) classes.  
To predict students' perceptions of their classroom learning environment inventory and their creative thinking abilities according to constructivist approach in augmented reality technology (AR) with the secondary students' perceptions of their AR classes.

### Research Instruments

The Constructivist Learning Environment Survey (CLES)

The Constructivist Learning Environment Survey (CLES) was being used in the present study to assess both teachers' and students' perceptions of classroom learning environments. Originally developed by Peter Taylor, Barry Fraser, and Darrell Fisher at Curtin University of Technology in Perth, Australia (Taylor et al., 1997) [12]. This version consists of 30 items, six each in five scales. The CLES has been used in a variety of studies, including qualitative studies of the nature of science knowledge and learning of science teachers and their students. This instrument was customized and modified from the CLES questionnaire. It included five components of constructivist learning: Personal Relevance, Uncertainty, Shared Control, Critical Voice and Student Negotiation scales.

### The Creative Thinking Ability (CTA) Questionnaire

Adapted version of Guilford's creative thinking skill test of his work in students' intelligence and creativity to the 24-item Guilford Divergent thinking Questionnaire (GDTQ) to the 24-item Creative Thinking Ability (CTA) questionnaire in 4 scales in augmented reality technology (AR) classes of fluency, flexibility, originality, and elaboration ability scales were used (Chanthala, Santiboon, & Ponkham, 2017) [15]

## Sample

Administrations to the sample size consisted of 315 secondary students in 7 schools in secondary educational school level under the Secondary Educational Service Area Offices throughout of Northeast Region of Thailand were used to assess students' perceptions of their classroom learning environment inventories in the 21st century in augmented reality technology (AR) classes for facilitating creative thinking abilities of secondary students according to constructivist approach with the CLES and students' creative thinking abilities toward science with the CTA were associated.

## Data Analysis

Assuming that the scaling of the items approximated a 5- point Likert scale, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the CLES forms and the CTA as specified. Factorial validity and adequacy of fit for the dimensionality of the CLES and the CTA were assessed through principal component analyses. The multiple correlations were significant of students' perceptions of their AR classroom learning environment inventories in the 21st century according to constructivist approach in augmented reality technology (AR) classes for facilitating creative thinking abilities of secondary were predicted.

## RESULTS

To assess classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) with the secondary students' perceptions and their facilitating creative thinking abilities in AR classes. Students' perceptions of their classroom learning environment inventory and their creative thinking abilities according to constructivist approach in augmented reality technology (AR) with the secondary students' perceptions of their AR classes were associated.

### Validity of the CLES

Description of quantitative data of analyzing responses for science students' assessments is reported in Table 1. Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales were obtained for the sample in this present study as indices of scale reliability and discriminant validity for the forms of the CLES.

Table 1 Scale Internal Consistency (Cronbach Alpha Coefficient) Reliability, Discriminant Validity (Mean Correlation of a Scale with Other Scales), Mean Score, Average Mean Score, Standard Deviation, Variance, and F-test for the CLES

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach Alpha Reliability	Discriminant Validity	F-test
Personal Relevance (PR)	21.67	3.61	4.37	19.11	0.82	0.82	12.89***
Uncertainty (UN)	21.51	3.59	3.84	14.74	0.75	0.84	11.52***
Shared Control (SC)	21.09	3.52	4.46	19.88	0.83	0.82	2.34*
Critical Voice (CV)	20.55	3.43	4.81	23.15	0.86	0.81	3.22**
Student Negotiation (SN)	21.19	3.53	4.43	19.64	0.85	0.82	10.67***

N=315, \*p<.05, \*\*p<.01, \*\*\*p<.001

In Table 1 reveals that the results of the CLES scale form were statistically significant, the mean score ranged from 20.55 ( $\bar{X} = 3.43$ , S. D. = 4.81, Variance = 23.15, and F – test = 3.22) in Critical Voice scale to 21.67 ( $\bar{X} = 3.61$ , S. D. = 4.37, Variance = 19.11, and F – test = 12.89) in Personal Relevance scale. The reliability coefficients for the CLES ranged from 0.75 to 0.86. The Discriminant Validity (Mean correlation of a scale with other scales) of augmented reality technology (AR) classes ranged from 0.81 to 0.84 when using the individual student as the unit of analysis. On the whole, these results are acceptable which was considered satisfactory for further use in this study.

### Validity of the CTA

The quantitative data of analyzing responses for science students' assessments is reported in Table 1. Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales were obtained for the sample in this present study as indices of scale reliability and discriminant validity for the forms of the CTA.

Table 2 Scale Internal Consistency (Cronbach Alpha Coefficient) Reliability, Discriminant Validity (Mean Correlation of a Scale with Other Scales), Mean Score, Average Mean Score, Standard Deviation, Variance, and F-test for the CLES

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach Alpha Reliability	Discriminant Validity	F-test
Originality Thinking (OT)	21.76	3.63	3.94	15.81	0.85	0.88	6.82***
Fluency Thinking (FuT)	21.52	3.59	4.16	17.30	0.87	0.87	2.13*
Flexibility Thinking (FT)	21.91	3.65	4.41	19.42	0.88	0.87	0.89
Elaboration Thinking (ET)	22.10	3.68	4.23	17.93	0.88	0.87	6.73***

N=315, \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

In keeping, Table 2 shows the results of the CTA scale form were statistically significant, the mean score ranged from 21.52 ( $\bar{X} = 3.59$ , S. D. = 4.16, Variance = 17.30, and F – test = 2.13) in Fluency Thinking Ability scale to 22.10 ( $\bar{X} = 3.68$ , S. D. = 4.23, Variance = 11.93, and F – test = 6.71) in Elaboration Thinking Ability scale. The reliability coefficients for the CTA ranged from 0.85 to 0.88. The Discriminant Validity (Mean correlation of a scale with other scales) of augmented reality technology (AR) classes ranged from 0.87 to 0.88 when using the individual student as the unit of analysis. On the whole, these results are acceptable which was considered satisfactory for further use in this study for the CTA Form.

Associations between Classroom Learning Environment Inventory according to Constructivist Approach in Augmented Reality Technology (AR) Classes for Facilitating Creative Thinking Abilities

Focusing on the CLES, the statistical procedures also involved the investigation of associations between students' perceptions of their physics laboratory classroom learning environment and their creative thinking abilities toward science. The simple correlation values ( $r$ ) are reported in Table 5 which show significant correlations ( $p < .05$ ) between students' creative thinking outcomes and classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) classes. These associations are positive for the scales of Personal Relevance, Uncertainty, Shared Control, Critical Voice and Student Negotiation scales, there was a more favourable the CTA towards their CLES environment inventory. The second type of analysis consisted of the more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the CLES and their creative thinking abilities towards their CTA when the effect of relationships between the scales is controlled.

In this study, it was also considered important to investigate associations between students' perceptions of Classroom Learning Environment Inventory according to Constructivist Approach in Augmented Reality Technology (AR) classes and their critical thinking with their critical thinking abilities. The selection of an evaluation and assessment instrument suitable was required. Table 3, 4, 5, 6 and 7 suggest that the scales of the CLES and the CTA are reliable for measuring critical thinking abilities in seminar on education class. Using simple correlation ( $r$ ), multiple correlations ( $R$ ), Multiple Regression Validity ( $\beta$ ), and Determination Efficient Predictive value ( $R^2$ ) were associated and predicted in Fluency, Flexibility, Originality, Elaboration, and Totalized Thinking Ability Scales, respectively.



Table 3 Associations between Classroom Learning Environment Inventory according to Constructivist Approach in Augmented Reality Technology (AR) Classes for Facilitating Originality Creative Thinking Ability Skill

Scale	Simple Correlation Validity (r)	Standardized Regression Weight Validity (β)
Personal Relevance (PR)	0.52***	0.24***
Uncertainty (UN)	0.50***	0.20***
Shared Control (SC)	0.54***	0.32***
Critical Voice (CV)	0.38***	-0.08
Student Negotiation (SN)	0.36***	0.07
Multiple Correlation (R)	0.623***	
Determination Efficient Predictive Value (R <sup>2</sup> )	0.389***	

N=315, \*p<.05, \*p<.05, \*p<.05

Table 4 Associations between Classroom Learning Environment Inventory according to Constructivist Approach in Augmented Reality Technology (AR) Classes for Facilitating Fluency Creative Thinking Ability Skill

Scale	Simple Correlation Validity (r)	Standardized Regression Weight Validity (β)
Personal Relevance (PR)	0.50***	0.21***
Uncertainty (UN)	0.45***	0.10
Shared Control (SC)	0.56***	0.39***
Critical Voice (CV)	0.39***	-0.07
Student Negotiation (SN)	0.36***	0.12*
Multiple Correlation (R)	0.618***	
Determination Efficient Predictive Value (R <sup>2</sup> )	0.382***	

N=315, \*p<.05, \*p<.05, \*p<.05

Table 5 Associations between Classroom Learning Environment Inventory according to Constructivist Approach in Augmented Reality Technology (AR) Classes for Facilitating Flexibility Creative Thinking Ability Skill

Scale	Simple Correlation Validity (r)	Standardized Regression Weight Validity (β)
Personal Relevance (PR)	0.55***	0.35***
Uncertainty (UN)	0.45***	0.10
Shared Control (SC)	0.50***	0.24***
Critical Voice (CV)	0.42***	-0.02
Student Negotiation (SN)	0.37***	0.11*
Multiple Correlation (R)	0.614***	
Determination Efficient Predictive Value (R <sup>2</sup> )	0.377***	

N=315, \*p<.05, \*p<.05, \*p<.05

Table 6 Associations between Classroom Learning Environment Inventory according to Constructivist Approach in Augmented Reality Technology (AR) Classes for Facilitating Elaboration Creative Thinking Ability Skill

Scale	Simple Correlation Validity (r)	Standardized Regression Weight Validity ( $\beta$ )
Personal Relevance (PR)	0.46***	0.24***
Uncertainty (UN)	0.38***	0.07
Shared Control (SC)	0.50***	0.34***
Critical Voice (CV)	0.34***	-0.07
Student Negotiation (SN)	0.29***	0.08
Multiple Correlation (R)	0.551***	
Determination Efficient Predictive Value (R <sup>2</sup> )	0.304***	

N=315, \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 7 Associations between Classroom Learning Environment Inventory according to Constructivist Approach in Augmented Reality Technology (AR) Classes for Facilitating Creative Thinking Abilities

Scale	Simple Correlation Validity (r)	Standardized Regression Weight Validity ( $\beta$ )
Personal Relevance (PR)	0.56***	0.28***
Uncertainty (UN)	0.49***	0.13*
Shared Control (SC)	0.58***	0.36***
Critical Voice (CV)	0.42***	-0.07
Student Negotiation (SN)	0.38***	0.11*
Multiple Correlation (R)	0.662***	
Determination Efficient Predictive Value (R <sup>2</sup> )	0.439***	

N=315, \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

The simple correlation values (r) are reported in Table 3, 4, 5, 6, and 7 which show significant correlations ( $p < 0.001$ ) between students' responses of their classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) classes was assessed with the CLES all of five scales. These associations are positive for the scales of Personal Relevance, Uncertainty, Shared Control, Critical Voice and Student Negotiation scales. The second type of analysis consisted of the more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the CLES and facilitating creative thinking abilities towards their constructivist approach in augmented reality technology (AR) classes when the effect of relationships between the scales is controlled.

The multiple correlations (Rs) are significant for classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) classes with students' perceptions of their science classroom learning environment inventories for Originality, Fluency, Flexibility, Elaboration and Totalized Thinking Abilities, respectively and showed that when the scales are considered together there is a significant in some scales of the CLES association with the CTA. The R<sup>2</sup> values indicate that 39%, 38%, 38%, 30%, and 44% of their creative thinking abilities outcomes for Personal Relevance, Uncertainty, Shared Control, Critical Voice and Student Negotiation scales of the CLES to the Originality, Fluency, Flexibility, Elaboration and Totalized Thinking Ability scales of the CTA, respectively. Suggestion that both students and teacher were assessed classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) classes for facilitating creative thinking abilities of secondary students are positive in four of five scales of the CLES, and negative in Critical Voice scale. Desirable future applications of the CLES for research purposes and in improving teaching in secondary education in Thailand are considered.

## CONCLUSIONS AND DISCUSSIONS

Because of the augmented reality is used in order to enhance the experienced environments or situations and to offer enriched experiences. Originally, the immersive augmented reality experiences were used in entertainment and game businesses, but now other business industries are also getting interested about AR's possibilities for example in knowledge sharing, educating, managing the information flood and organizing distant meetings. Augmentation techniques are typically performed in real time and in semantic context with



environmental elements, such as overlaying supplemental information like scores over a live video feed of a sporting event. Secondary educational schools in Thailand education system are interested in learning easily from interactive experiences, and expanded with supplemental video information. Paper-based science book illustrations could seem to come alive as video without requiring the students to navigate to web-based materials. There are a lot of secondary educational schools which individual privacy, there exists the ease of access to information that one should not readily possess about a given student. To investigate students' perceptions of their constructivist approach in augmented reality technology (AR) classes for facilitating creative thinking abilities.

Students are at a good vantage point to make judgments about classrooms because they have encountered many different learning environments and have enough time in a class to form accurate impressions. They usually project a consistent image of the long-standing attributes of classroom environment. The Constructivist Learning Environment Survey (CLES) was being used in the present study to assess students' perceptions of classroom learning environments, originally developed by Peter Taylor, Barry Fraser, and Darrell Fisher at Curtin University of Technology in Perth, Australia was used. This version consists of 30 items, six each in five scales. Rather than having items from different scales mixed together throughout the instrument, items in this version are grouped into blocks according to their scale of this present study. The CLES has been used in a variety of studies, including qualitative studies of the nature of science knowledge and learning of science teachers and their students to improve their science education reform. This instrument was customized and modified from the CLES questionnaire. It included five components of constructivist learning: Personal Relevance, Uncertainty, Shared Control, Critical Voice and Student Negotiation scales. An adapted version of Guilford's creative thinking skill test of his work in students' intelligence and creativity to the 24-item Guilford Divergent thinking Questionnaire (GDTQ) to the 24-item Creative Thinking Ability (CTA) questionnaire in 4 scales in augmented reality technology (AR) classes of fluency, flexibility, originality, and elaboration ability scales were used (Chanthala, Santiboon, & Ponkham, 2017) [15] of this research study.

The purposes of this research study were 1) to assess on classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) for facilitating creative thinking abilities of secondary students, 2) to assess students' perceptions of their creative thinking abilities, and 3) to predict associations between students' perceptions of their constructivist approach in augmented reality technology (AR) classes and their creative thinking abilities. A sample size consisted of 315 students in 7 schooling classes under Secondary Educational Service Area Office Northeast Region with the classified random sampling was selected. Internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the CLES forms and the CTA as specified. Students' perceptions of their classroom learning environment inventory and their creative thinking abilities according to constructivist approach in augmented reality technology (AR) with the secondary students' perceptions of their AR classes were associated.

Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales were obtained for the sample in this present study as indices of scale reliability and discriminant validity for the forms of the CLES and CTA are valid and reliable. The simple correlation values ( $r$ ) are reported in Table 3, 4, 5, 6, and 7 which show significant correlations ( $p < 0.001$ ) between students' responses of their classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) classes was assessed with the CLES all of five scales. These associations are positive for the scales of Personal Relevance, Uncertainty, Shared Control, Critical Voice and Student Negotiation scales. The second type of analysis consisted of the more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the CLES and facilitating creative thinking abilities towards their constructivist approach in augmented reality technology (AR) classes when the effect of relationships between the scales is controlled.

The multiple correlations ( $R_s$ ) are significant for classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) classes with students' perceptions of their science classroom learning environment inventories for Originality, Fluency, Flexibility, Elaboration and Totalized Thinking Abilities, respectively and showed that when the scales are considered together there is a significant in some scales of the CLES association with the CTA. The  $R^2$  values indicate that 39%, 38%, 38%, 30%, and 44% of their creative thinking abilities outcomes for Personal Relevance, Uncertainty, Shared Control, Critical Voice and Student Negotiation scales of the CLES to the Originality, Fluency, Flexibility, Elaboration and Totalized Thinking Ability scales of the CTA, respectively. Suggestion that both students and teacher were assessed classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) classes for facilitating creative thinking abilities of secondary students are positive in four of five scales of the CLES, and negative in Critical Voice scale. To conclude, the researchers are confident that CLES can provide a statistically reliable and valid measure of students' perceptions toward AR constructivist learning

environment. In addition, the instrument was developed in the Thai Language, made it possible for students to fully understand the entire instrument.

### ACKNOWLEDGEMENT

I would first like to thank my thesis of the Master of Science Education, Faculty of Education; Advisor Prof. Dr. Panatda Tansupho, and Dr. Wandee Rakrai; Faculty of Science and Technology, Rajabhat Mahasarakham University.

I also thank to the 315 secondary students in 7 schools in secondary educational school level under the Secondary Educational Service Area Offices throughout of Northeast Region of Thailand were used to assess students' perceptions of their classroom learning environment inventories in the 21st century in augmented reality technology (AR) classes. The door to Prof. Santiboon was always open whenever I ran into a trouble spot or had a question about my research or writing. He consistently allowed this paper to be my own work, but steered me in the right the direction whenever he thought I needed it.

### REFERENCES

- Schuettel, P. (2017). *The concise fintech compendium*. Fribourg: School of Management Fribourg/Switzerland.
- Steuer, J. (2016). *Defining virtual reality: Dimensions determining telepresence Achieved*. Retrieved on 24 May 2016 at the Wayback Machine. Department of Communication, Stanford University. 15 October 1993.
- Kaasinen, E., Aromaa, S., & Rauhala, V. (2015). *Augmented reality based knowledge sharing solutions for field service personnel*. Retrieved from <https://ercim-news.ercim.eu/en103/special/augmented-reality-based-knowledge-sharing-solutions-for-field-service-personnel>
- Chen, B. X. (2009). *If you're not seeing data, you're not seeing*. Retrieved from <https://www.wired.com/2009/08/augmented-reality/>
- Huang, Z., Hui, P., Peylo, C., and Chatzopoulos, D. (2013). *Mobile augmented reality survey: a bottom-up approach*. Retrieved from <https://arxiv.org/abs/1309.4413>
- Rosenberg, L.B. (1992). *The use of virtual fixtures as perceptual overlays to enhance operator performance in remote environments*. Technical Report AL-TR-0089, USAF Armstrong Laboratory, Wright-Patterson AFB OH, 1992.
- Stewart-Smith, H. (2012). *Education with augmented reality: AR textbooks released in Japan*. Retrieved from <http://study.com/academy/lesson/achievement-motivation-theory-definition-quiz.html>
- Lubrecht, A. (2012). *Augmented reality for education*. The Digital Union, The Ohio State University 24 April 2012.
- Kaufmann, H. (2013). *Collaborative augmented reality for education archived*. Retrieved on 5 November 2013 at the Wayback Machine. Institute of Software Technology and Interactive Systems, Vienna University of Technology.
- TRoesner, F., Kohn, T., Denning, T., Calo, R., & Newell, B. C. (2015). Augmented Reality. Proceedings of the 2014 ACM International Joint Conference on Pervasive and Ubiquitous Computing Adjunct Publication – UbiComp '14 Adjunct (2014). The University of Utah. Ubicomp. Web. 18 Aug. 2015.
- Fraser, B. J. & Tobin, K. (1991). Combining qualitative and quantitative methods in classroom environment research, in B.J. Fraser & H.J. Walberg (eds.), *Educational Environments: Evaluation, Antecedents and Consequences*, Pergamon, London, pp. 271-292.
- Taylor, P. C., Fraser, B. J. & Fisher, D. L. (1997). Monitoring constructivist classroom learning environments. *International Journal of Educational Research* 27, pp. 293-302.
- Guilford, J. P. (1950). *Creativity*. *American Psychologist*, 5, pp. 444-454.
- Guilford, J. P. (1980). Some changes in the structure of intellect model. *Educational and Psychological Measurement* 48: pp. 1-4.
- Chanthala, C., Santiboon, T., & Ponkham, K. (2017). Instructional designing the STEM education model for fostering creative thinking abilities in physics laboratory environment classes. *International Journal of Education and Practice*. 2017, Volume 5, Issue 11; pp. 259 – 272.

## SOME THOUGHTS OF LOOKING BACK THE PROCESS OF RENOVATION IN GENERAL EDUCATION

Bui Ngoc Nhan

*Deputy Head of General Educational Division  
Department of Training and Education, Quang Binh, Viet Nam  
Corresponding author-E-mail address: buingocnhan@quangbinh.edu.vn  
Tel. 0084 932 366 132*

### ABSTRACT

This article points the process of renovation in general education through changing curriculum, textbooks, testing and assessment and deployment of the new school model. Through the experience of education renovation process, what has been done and what has not been done, the author proposes some recommendations of the advocacy, the preparation and the situation evaluation in education renovation, which helps the renovation gets valuable results.

**KEY WORDS:** General Education, process of renovation, renew curriculum, textbooks, examinations, new school, recommendations.

## INTRODUCTION

Education and training play an essential role in the preservation, development and continuation of human civilization. In the era of scientific and technological revolution nowadays, education and training are becoming the main motive force for the developmental acceleration and considered as a determining factor for the success or failure of a nation in international competitions and for the success of each individual in their life. Thus, the Government and people of every nation highly appreciate the role of education and training

Nowadays, education is the first priority in the national policy in Viet Nam. Resolution No 29-NQ/TW dated 4/11/2013 by The Central Committee's 8th shows the determination of fundamental and comprehensive renovation education [1].

In recent years, the whole education system had been deployed many solutions include changing curriculum textbook, organizing teaching activities, testing and assessment. During the education renovation process, there are many debates between the old and the new, the progressive and the backward, the theory and the practice. Although having gained certain achievements, the process has still shown weakness.

The objective of the current study was to share some thoughts on looking back the process of renovation education in a recent year.

## MATERIALS AND METHODS

This study aims to review and compare the results of the process of renovation education. In fact, there are several research conducted on methods of renovation in Viet Nam. The way of approaching this problem has collected the data from the national literature, then comparing results between a recent year and previous year. Variables on the data file included renew curriculum, renew textbook, testing and assessment and new school model from 2007 to 2017.

## RESULTS

10 years ago when the “Two no” movement (Say no to negative examinations and getting awards just for show in education) was launched, the high school graduation rate was 66.2% in 2007, 75.96% in 2008. The rate was increased 92.93% in 10 years later, approximated with the rate before the movement. (Fig.1)

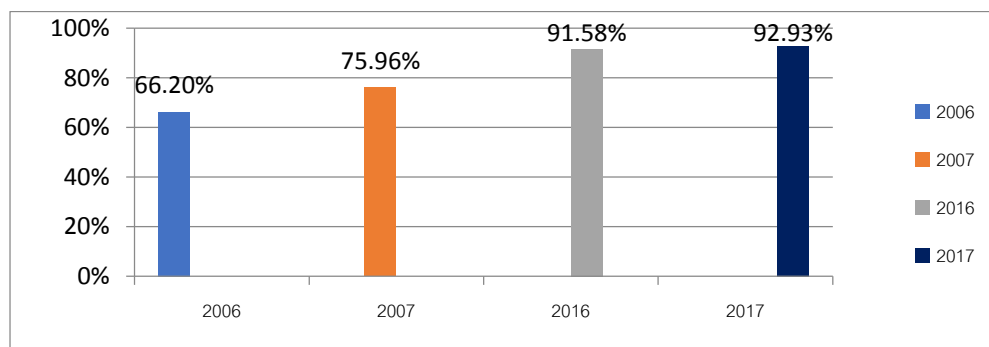


Fig.1. The rate of high school graduate students when the renovation was applied.

Fig.2 shows the increasing of the number of 10 marks texts. In 2017, the form of graduation examination was changed, it was different from the past. The number in 2017 was increased 10 times than the number in 2015 and 61 times than the number in 2016.

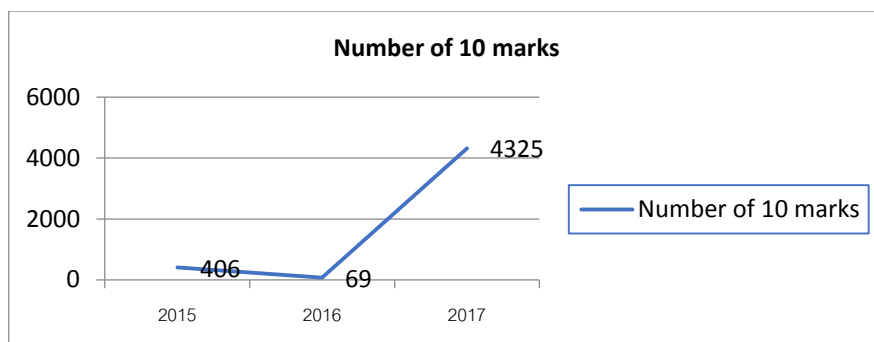


Fig.2. The changing of a number of 10 marks texts when applied a new form of testing in 2017.

Table 1 compares the number of schools, classes and students took part in the new school model during the latest three school years in Quang Binh province. There was a rise in 2016 -2017, the number of classes and students increased 1.5 times than 2015 – 2016. The number went down in 2017 – 2018, both the number of schools, classes and students slumped 2 times than 2016 – 2017.

School year	2015-2016	2016-2017	2017-2018
Number of schools	22	22	9
Number of classes	59	94	40
Number of students	1914	3176	1289

Table 1. The number of schools, classes and students took part in the new school model in Quang Binh.

## CONCLUSIONS AND DISCUSSION

Resolution No. 40/2000/NQ-QH on renovating programs and textbooks with the expectation of renovating teaching methods, creating a great change in education. Accordingly, education and training have implemented many training programs, seminars on content, methodology, teaching techniques, and application of information technology in teaching for management staff and teachers at all levels and also testing solutions, evaluations, and contests were changed [3].

Thanks to the support of facilities and information technology, the management has made many improvements, educational activities schools were also diversified. However, the learning method of students was still lacking in positive, self-reliant and creative activities, which were mostly understood, listened and recorded [7]. Teaching methods of teachers were mainly taught, crammed with knowledge, they depended on textbooks, less creative, lack flexibility and lack of motivation to overcome difficulties. The revolution in teaching methodology with learner-centered orientation has been implemented for many years with many forms and contents, but due to different perceptions and conditions of implementation, the result is not as expected. The high school graduation exams are extremely important because of it's grand impact on teaching. Renew high school graduation exam included changing the structure of the test, choosing the combination of subjects and setting up different exam boards and supervision. In the process of teaching, test matrices have been carried out, evaluation based on the level of awareness, reinforce application skills but the creativity of students has not been promoted. Students have lacked self-awareness during the examination. The results of high school graduation are still high, many schools are nearly 100%. 10 years ago when the "Two no" movement (Say no to negative examinations and getting awards just for show in education) was launched, the high school graduation rate was 66.2% in 2007, 75,96% in 2008. That results were quite honest because many positive activities were deployed, examiner made their mission without pressure from parents and social. On the other hand, because of the rate of graduation dropped sharply, many universities and colleagues were established for students, who weren't graduated. The education system must hold additional examinations, the "Two no" movement has been disabled. The rate of graduation returns to the previous years, 91, 58% in 2016, 92,93% in 2017.

After changing the form of high school graduation examination in 2017, the abnormal increasing of the students who got 10 scores caused a lot of debate. There were 4.325 students get 10 marks, increased 10 times than the number of students in 2015 and 61 times than the number in 2016. This means that the new form of testing and assessment have been applied and framed for the following years, there are still many issues not be assured by the abnormal results.

The new school model (VNEN) in primary school is an international model education. It was adopted successfully by many countries. The new school model focuses on promoting the individual capacity of each student, not behaving in the same way to students, encourage the student when they had good results, support their strength, evaluation students based on requirements of education, not compare this student to another student [2]. During teaching process, student's activity is central, teachers are the guide, manage and maintain an opened environment. Students set their own progress and steps for the learning process. Students are encouraged participate to in learning activities, especially in group work and self-study, so that they can explore and acquire new knowledge and skills so as to develop important qualities and abilities such as: self-confidence, independent thinking, critical thinking ability and creative thinking, problem solving ability, cooperation. The assessment of student's qualities was also made in the new school model [2], [6].

Realizing the advantages of this model, especially for the formation and development of qualities and pupil capacity, Ministry of Education and Training has deployed this model in grade 6 at 24 schools in 6 provinces of Lao Cai, Ha Giang, Hoa Binh, Khanh Hoa, Dak Lak and Kon Tum, it was found to be very effective in the school year 2015-2016. In Quang Binh, there were 22 schools with 59 classes and 1,914 students in 2015 – 2016, in 2016 – 2017, there were 22 schools with 94 classes and 3,176 students participated in this model. In the school year 2017-2018, according to the survey of public opinion, some localities did not enroll in the new school model but returned to the traditional school model. Quang Binh has only 9 enrollment schools a total of 40 classes with 1,289 students.

In fact, the new school model poses many challenges such as: The number of students in the class is so crowded that it hinders the activities of teachers, especially in urban schools; the pedagogical work of teachers is limited both in general knowledge and the skill of solve problem; Most parents do not understand clearly the meaning of the new school model, they only concerned in score. Another very important issue is the lack of policy to incentive teachers so that teachers frustrated, lack of motivation to overcome difficulties. All of these factors have become a great barrier to the deployment and diffusion of the new school model.

With the determination to innovate education, the education systems have tried to carry out many tasks and have achieved certain successes in recent years but there are still many shortcomings, the results have not yet as expected [4], [5]. Concentrating on building main schools in main areas where have better conditions, on the other hand, the government should build the policy in difficult areas. Intensifying the propaganda about the renewal of education to social in order to make use of the contributions and supports of scientists and politician and making people understand that education reform is an important need of our country. Develop a more long-term education development strategy, the process of education reform is continuous, the quality of human resources is extremely important so that the training teachers needs renew quickly to satisfy the social requirements.

## REFERENCES

- Dang Tu An 2015. *The new school model in Viet Nam from a partical and theoretical point of view*. Viet Nam Education Publishing, Ha Noi.
- Do Huong Tra et al (2014). *Integrative teaching develops student's competency- Part 1*, University of Education Publishing, Ha Noi.
- Ministry of Training and Educcation, 2017. *Training materials for managers and teachers on teaching methods and guiding students methods in self- study physics*.
- Ministry of Training and Educcation, 2014. *Training materials Teaching and testing, assessment of learning outcomes in the direction of developing student's capacity in Physics*.
- Resolution NO 29-NQ/TW by Central Committee 8th on the fundamental and comprehensive renovation of education.
- Thai Duy Tuyen (2010). *Traditional and inovation teaching methods*, University of Education Publishing, Ha Noi.
- Vietnam – Belgium project, 2010. *Teaching and learning positively- Some teaching methods and techniques*, University of Education Publishing, Ha Noi.



**CONTINUOUS FOSTERING-THE METHOD TO SUSTAINABLY DEVELOP THE MANAGEMENT OFFICIALS OF HIGH SCHOOLS IN THE NORTHERN MOUNTAINOUS AREA VIETNAM**

Hoang Van Duong, Ph.D

*Lao Cai Pedagogical College*

*Corresponding Phone: 0978494396. Email: hoangduonglc711@gmail.com*

**ABSTRACT**

At present, the management officials of high schools of the provinces in the Northern mountainous area of Vietnam is limited in foreign language, IT, management knowledge and skills. Therefore, it is required to strengthen the training of management officials. From the research on the reality of high school management officials in this area, we suggest the procedure of training knowledge and skills which the management officials are still weak in, to improve their capacity and meet the requirements of school management in the social conditions with numerous changes.

**KEYWORDS** : fostering management officials, high schools, Northern mountainous area of Vietnam



## INTRODUCTION

Regarding the evaluation of the educational situation of the provinces in the Northern mountainous area, at the regional briefing conference of the Departments of Education and Training, it is considered that: the management officials of high schools are still weak in foreign languages and informatics; the ability to analyze, forecast, plan and consult policy are limited; most have not been trained in educational management system, lack professional qualifications and capacity. The management officials also agreed that the quality of education in the area was low due to weak school management. In order to improve the quality of education in the area, it is necessary to have a synchronous solution in which fostering and improving the professional and management capacity of high school management officials is the key and decisive solution. In this article, we assess the current status of foreign language, computer skills and management capacity of high school management officials in the Northern mountainous provinces and propose continuous training process so that they can have adequate title standards and management capacity.

## MATERIALS AND METHODS

To assess the reality of high school management officials in the Northern mountainous provinces, we used categorized random sampling method and conducted the survey in 2015. Particularly, we have chosen 6 provinces as the representatives (the Northwest region consists of Lao Cai, Yen Bai, Son La and the Northeast consists of Ha Giang, Phu Tho, Lang Son). These provinces have the specific characteristics of the region's geography and socio-economic development. In each province, 5 schools were chosen from the developed area and the undeveloped area. The sample size in the survey was 696 individuals, which is large enough to obtain a highly-accurate research result. The objects of the survey included 246 officials from management offices and 450 teachers, heads of the professions, leaders of the unions and leaders of the high schools. In addition to the survey data, we also discussed with the management officials and used the statistical data of the Department of Education and Training.

The survey questionnaire consisted of 5 criteria in professional competence and 13 criteria in management capacity in accordance with the standards for principals [1] and some qualitative questions. In each criterion, there are some indicators which must be implemented by the management officials in commanding and managing the activities of the schools. The survey questionnaires were evaluated as very good, good, average and weak. After processing the survey forms, we built up statistical tables and analyzed the data to make the assessment of the training level and capacity of the management officials. The questionnaires were evaluated at the following levels: Good, Fair, Average and Weak. The corresponding scores are 4,3,2,1 and the grade point averages of each level are: Good  $3.25 \leq \bar{X} \leq 4$ ; Fair  $2.5 \leq \bar{X} \leq 3.24$ ; Average  $1.75 \leq \bar{X} \leq 2.49$ ; Weak  $1 \leq \bar{X} \leq 1.74$ . In addition to survey data, we also discussed with the managers and use statistical data of the Departments of Education and Training.

## RESULTS

### 1. The reality of the management officials of high schools in the Northern mountainous area of Vietnam

\* In terms of the training level of foreign language, IT and management work

To correctly evaluate the training level of the management officials of high schools in the Northern mountainous area provinces, we used the figures provided by the Departments of Education and Training to build the statistical table below:

Table 1: Statistics of the training level of foreign language, IT and management work of the management officials in high schools

No.	Province	Total	IT level A and higher		Foreign language level A and higher		Certificate in Education Management	
			$\Sigma$	%	$\Sigma$	%	$\Sigma$	%
1	Yen Bai	80	73	91.3	59	73.75	72	90
2	Lao Cai	97	97	100	80	82.5	85	87.6
3	Son La	108	108	100	77	71.5	92	85.3
4	Ha Giang	102	102	100	71	69.6	78	76.5
5	Lang Son	79	79	100	79	100	64	81.2
6	Phu Tho	137	137	100	137	100	137	100
	Total	603	596	98.8	503	83.4	528	87.5

(Source: Figures provided by the Departments of Education and Training)

Of the 603 high school management officials in the six provinces, the number of officials with certificates of foreign languages, IT, and management was quite high and there were differences between provinces. Considering the types of certificates issued we find that most management officials did not have a foreign language certificate according to the six-level framework of Vietnam and information technology certificate according to the standard of using information technology pursuant to Circular no. 03/2014/BTTTT. Learning more about the studying and taking examination of these types of certificates, we have discussed with the officials at the management agencies and found that: there were many difficulties that the management officials of secondary schools in mountainous areas had to face in the study and examination of four skills of foreign language - listening, speaking, reading and writing; several management officials have not studied and taken the examination of IT certificates because the localities have not yet required them to; the content of management training still focused on theory and was not close to the reality of highland.

\* Evaluation of pedagogical professional capacity

After processing the survey forms, we have built up the following statistical table:

Table 2: Statistical figures of the pedagogical professional capacity of the management officials in high schools

No.	Criteria/Evaluation	Good	Fair	Average	Weak	$\Sigma$	$\bar{X}$	Rank
1	Understanding common education program	537	252	84	3	2355	3.38	2
2	Professional capacity	377	248	56	15	2379	3.42	1
3	Pedagogical professional competence	254	325	74	43	2182	3.14	3
4	Self-learning, creativity	251	285	109	51	2128	3.06	4
5	Foreign language and IT capacity	215	263	146	72	2013	2.89	5
	Total						3.18	

Statistical data show that professional capacity of high school management board in the Northern mountainous provinces was quite good with the average score  $\bar{X}$  of 3.18. There was a pretty large difference between the criteria assessed. The criterion "Professional level" is at Good level ( $\bar{X} = 3.42$ ), "pedagogical profession" is at Fair level ( $\bar{X} = 3.14$ ). These two criteria are closely related: the officials with good qualifications also have good teaching ability and vice versa. However, the assessment scores of these two criteria showed a large difference and are ranked at two different levels, suggesting that amongst the constituents of professional level, pedagogical profession is the factor that needs to be focused on and must be continuously nourished. The criteria of "self-learning and creativity" and "foreign language capability", "application of information technology" have lower scores and is ranked at fair level, with statistical data showing a relatively large rate of weak level. This is an important practical basis for the managing levels to develop plans for training foreign languages, IT, and innovative thinking skills for the management officials in high school to meet the standards prescribed.

\* Evaluation of management capacity. After processing the survey forms, we have built up the following statistical table:

Table 3: Statistical figures of the management capacity of the management officials in high schools

No.	Criteria/Evaluation	Good	Fair	Average	Weak	$\Sigma$	$\bar{X}$	Rank
1	Analyzing and Forecasting	199	221	179	97	1914	2.75	11
2	Strategic vision	179	223	191	103	1870	2.69	12
3	Design and implementation orientation	201	230	175	90	1934	2.78	10
4	Assertiveness and innovative spirit	173	206	202	115	1829	2.63	13
5	Planning for activities	215	250	145	86	1986	2.85	7
6	Organizational structure and team development	214	240	162	80	1980	2.84	8
7	Management of teaching activities	309	324	49	14	2320	3.33	1
8	Management of school finance and property	220	270	139	67	2035	2.92	5
9	Development of educational environment	207	280	130	79	2007	2.88	6
10	Administration	222	280	135	57	2055	2.95	4
11	Management of emulation and commendation work	272	310	73	41	2205	3.17	2
12	Information system building	204	245	167	80	1965	2.82	9
13	Examination and Evaluation	226	275	133	62	2057	2.96	3
	Total						2.86	

The data shows that the "management capacity" of high school management officials was rated at fair level, with the average score  $\bar{X} = 2.86$ . There were large differences between criteria. This result can lead to a confirmation that the management team is still capable to fulfill the assigned task but not at high level. The criteria "Management of teaching activities" was at a good level ( $\bar{X} = 3.3$ ). Discussions with management officials at the Departments of Education and Training helped to figure out that they had directed teaching contents that were close to highland high school students and actively foster weak students. Criteria under "Management" capability section such as emulation, commendation, evaluation, administrative, financial and property management were highly evaluated.

Criteria under "Leadership" capability section such as analyzing and forecasting; strategic vision; design and implementation orientation; assertiveness and innovative spirit; planning for activities; organizational structure and team development had lower scores than the overall average and were lower than the scores of the criteria under Management capability section. The survey results of the leadership capacity criteria showed relatively high average and weak rates. To better understand the leadership and management capacity of high school management officials, we had discussed with some management officials of the Department of Education and Training and of the schools. These officials agreed that the current management team has performed quite well in terms of management but they had few innovative ideas, and the ability to analyze, forecast and strategically planning was still limited. This is the practical basis for the Departments of Education and Training to continue to develop training plans in order to improve leadership capacity for management officials.

## 2. Fostering high school management officials in Northern mountainous provinces

### \* Concept

"High school management official team" includes the head (s) and vice head (s) who make up a force taking responsibilities before the management agency for the school management duty to educate students for a full development according to high school education orientation in the operation of the national education system. [3]

"High school management official fostering" is enhancing the team's current competence to meet the work's requirements held in various forms and levels but directed to a defined criterion. [3]

According to the writer Cao Thi Ha, "Continuous fostering" is the formation of continuous fostering programs through thinking activities designed for enhancing personal attribute, comprehension, knowledge and competence [8].

### \* Viewpoints and requirements for training management officials

Fostering is considered as an important step in the official task. Due to the efficiency of this task, the fostering contents must be practical, close to the reality, and the organization form and method must be appropriate. [4],[6]. There are many viewpoints of fostering. According to the Decree no.18/2010/ND-CP of the Government, "Fostering is an activity equipping, updating, enhancing knowledge and working competence"[2]. According to some scientists' viewpoints, "Fostering is essentially "reinforcing" updated knowledge on the

basis of" nourishing "existing ones to make them more developed and valuable to enhance the system of knowledge, skills, professional competence, and enriches the knowledge and raise the efficiency of labor. The above situation shows that high school management officials in the provinces of the Northern mountainous area have met the standards of training by grade level and have been trained in management profession, computer skills and foreign languages at a certain level. In order to improve the capacity of the management officials to meet the requirements of education innovation, it is a must to regularly update knowledge and skills during their working time.

In the context of the technology revolution 4.0 and fundamental and complete innovation of education and training pursuant to Resolution no. 29 - NQ/TW, there have been several changes in high schools in the Northern mountainous area, which requires the management team to be trained and fostered in terms of knowledge and skills so as to increase their leadership and management capacity [5]. This issue requires efforts from both sides: from the management levels and the management officials themselves to continuously self-train and supplement new knowledge and skills. The contents of fostering might be new knowledge and skills necessary for management or new research results compared to the previous ones. They can also be trained in working methods, foreign languages and IT. The training content must be practical and close to reality, with diversified forms of organization and suitable training and fostering methods for each training subject.

**\* Steps in management officials training process**

Based on the above requirements and the current situation of high school management officials in the Northern mountainous provinces, we propose the following training process for high school management officials:

**Step 1: Determining the demand for training**

The current situation has shown that it is necessary to continue to train high school management officials in terms of: foreign languages, IT, knowledge and skills for school management. It is required to focus on weak skills such as analyzing and forecasting, planning for activities, strategic vision, design and implementation orientation, organizational structure and team development, development of educational environment, information system building and examination and evaluation; training in accordance with the educational demand of the locality.

In determining the demand for training, it is required to point out the number of qualified and unqualified principal and vice principal, and their rank for each criterion. The officials with several criteria ranked weak and average need immediate training so that they can achieve higher standards in the short term. For good-ranked and fair-ranked officials, it is still necessary to provide regular training so that they can reach the excellent level of standards.

**Step 2: Develop training plan**

Based on the assessment of management officials according to the standards and the level of satisfaction of the work requirements, the above survey result and the assessment of the current situation of the officials, the Department of Education and Training will classify high school management officials into different ranking levels (highly qualified, qualified with some unqualified standards, unqualified) according to the standards prescribed in the conditions for appointment and according to unqualified knowledge and skills, to establish overall plan training plan (which is usually a 5-year plan). Based on the annual overall plan, the Department of Education and Training will build training plans to: update modern management knowledge and skills; improve knowledge and skills in accordance with the standards, especially focus on the weak skills of the management officials; provide training according to the practical educational requirements of the localities; foster informatics and foreign language skills. The overall planning process and the annual plan must be concentrated on so that each management officials of all high schools can receive training continuously and must participate in all the classes in each appointment term.

The plan must clearly define the objectives, requirements, contents, modes of training, participants, time of implementation, place of organization, funding and the coordination of the agencies and prepare necessary conditions to facilitate the participation of the management officials.

**Step 3: Organization of fostering**

- Regarding appointing officials to attend fostering: based on evaluating the annual classification of officials, the officials appointed to attend fostering must be in the same group of subject to ensure the quality and efficiency of the courses. The fostering courses are divided according to subject groups: not eligible, eligible at a low standard; updating knowledge and skills; fostering informatics and foreign language.

- Regarding the form of fostering: Based on various conditions of each locality, the Departments of Education and Training are required to choose a suitable form of fostering: self-fostering, self-study with instruction, study at training locations, study at the locality, online study, distance study, fostering with a direct supervisors at the workplace, class-based study, group-based study, holding workshops according to locality, visiting for study, combining many different forms. In which, self-fostering is a basic form having the best

efficiency because through researches, the managers can be acutely aware of studied issues. They can learn from experience for themselves and improve their drawbacks.

Besides the forms above, the fostering through actual works in working positions has good results because it is a direct way of fostering. In the school, the management officials take full responsibility for organization and management of all activities. The arrangement of officials having experiences in working fields (for the Vice principal), along with setting out high requirements and specific instruction is efficient training methods. To enhance the capacity of officials through experiences in working positions, the schools should make specific plans for annual implementation and the whole term of office. This work comes along with the self-study and self-fostering of management officials because if they work well in many working positions, they can know how to manage the school when being appointed.

- Regarding the fostering contents: Evaluation of the real situation and determination of fostering need have shown the knowledge and skills necessary to foster management officials of high schools. The contents regarding foreign language and informatics are based on the level which needs to be achieved in the condition of official appointments at the locality so that the training locations use the foreign language program according to the six-level framework of Vietnam and informatics program according to the Circular no.3 of Vietnam to organize training and exam for certificate issuance. For the managing knowledge and skills, the program for fostering management officials according to the Decision no.382 of the Ministry of Education and Training shall be used to organize fostering. [7]

In addition to the special subjects according to the programs above, to foster the contents suitable to the local education requirements, the training locations need to build the special subjects or modules of knowledge complying with specific requirements of each locality in the Northern mountainous area to foster the management officials of high schools. These modules shall be built according to the close process: (1) Determining the requirements based on the results of investigation and research and the problems set out for management officials of high schools meeting education renovation; (2) Comparing the requirements with knowledge modules in current fostering program to define the contents which need to be supplemented; (3) defining knowledge modules corresponding with the capacity of the management officials; (4) Building the fostering special subjects and the draft of lecture for special subjects.

- Regarding the methods of fostering: Combining the method of choosing the learners as the center and the principal that self-fostering is essential, the best method is that the teacher instructs the learners so that they can study by themselves, master the knowledge, and intensify discussion. Besides, they can solve specific situations, share and discuss directly, study through real experiences. Based on these foundations, the procedure for study organization includes the following steps:

- + Giving learners instructions to study contents in the materials
- + Management officials study materials by themselves and make report on topics instructed by the lecturers
- + Organizing for management officials to discuss on main contents in the materials and make a report on research results of each topic.
- + Management officials summarize unclear contents in the process of study, and the contents which have not been unified when being discussed.
- + Lecturer give answers for unclear contents of learners.

- Regarding examination, evaluation, and certificate issuance: Inspection and evaluation are the most difficult step. We must choose different forms and methods of evaluation for various courses. The most important thing is to truly evaluate the change of management officials after fostering. There are some modes of evaluation: frequent evaluation in the process of fostering, unscheduled evaluation, evaluation at the end of the course, evaluation of the results compared with the output standard. On the other hand, it is possible to evaluate the skills before and after the course, evaluate by getting feedbacks, evaluation the change of managing activities in the school.

To get an exact evaluation, the question system must be objective, exact, and scientific. The time of evaluation should be reasonable. The evaluator must be serious and combine many modes of evaluation. The fostering courses for management officials are not only to enhance their capacity but also to complete the standard of the title. Therefore, it is necessary to issue a certificate for capacity and study process confirmation. The training locations need to build the regulation of combining frequent evaluation results with final examination or report for a foundation of certificate issuance. The certificates are valid according to regulations and used as a foundation for managing levels to appoint officials. If the certificate expires and the management official continues to work as a manager, they must attend a fostering course to supplement knowledge and skills, and get a new certificate.

\* Summary and evaluation of carrying out fostering plan



This mission can be carried out annually according to stage. The course shall end according to plan. Through the summary and evaluation, it is possible to evaluate whether the courses' results are satisfactory or not. Besides, the drawbacks of content preparation, program, methods, and organizational form can be realized to draw experience and adjust the direction and organization of implementation. Especially, based on the fostering results, the Departments of Education and Training continue to build the plan of fostering weak knowledge and skills for management officials.

### 3. Experiment of fostering skills

- Objective: In order to verify the efficiency of fostering some skills for management officials of high schools in the area of Northern provinces.
- Hypothesis: If the process of fostering above is applied to fostering of some special subjects, the quality of the force of high school management officials in Northern mountainous provinces shall be enhanced.
- Prototype: Concurrently carrying out on the focus group and the test group in Lao Cai. The focus group includes 6 high schools of Bao Thang and Muong Khuong district. The test group includes 6 schools of Van Ban and Si Mai Cai district. The two groups must ensure the same conditions regarding quantity, structure, quality, and working area.

Table 4: Experimented object

No.	Group	Total	Female	Ethnic group	Title		Training level		Ranking according to standard			Examination result	
					Principal	Vice principal	M.A.	B.A.	Excellent	Fair	Average	Good teacher	Good management officials
1	Focus group	21	5	2	6	15	5	16	5	12	4	3	3
2	Test group	20	5	2	6	14	5	15	4	12	4	3	3
	Total	41	10	4	12	29	10	31	9	24	8	6	6

- Organizing experiment
  - Step 1: Evaluating the management official force of the focus group and test group at the same time.
  - Step 2: The focus group is not fostered; the test group is fostered 8 skills above. The mode of self-study is based on 5 steps stated on the part of methods.
  - Step 3: After 2 year (2015-2016), check the management capacity of management officials of high schools to conclude the fostering efficiency.
- Criterion and rating scale:
  - Assessment criterion: 8 skills of the principals. The survey result asserts that the management official force of high schools in the Northern mountainous area is still weak.
  - Rating scale: Good, fair, average, weak (4 levels)
- Experiment results:
  - The skills of high school management officials in the two groups after experiment are different. In the focus group, the basic skills still remain the fair level (compared to previous results,  $\Delta = 0.02$ ). Only the skills of "Making activity plan" and "Organizing the apparatus and developing the force" have changed. In the test group, the results have many changes with a good level, deviation  $\Delta = 0.5$ .
  - Comparing the skills before and after the experiment, it is shown that there are some changes in the targets. Before experiment, 8 skills are evaluated at fair level; after the experiment, they are evaluated at a good level. The skills: "Analysis and forecast" and "Organizing the apparatus and developing the force" have the deviation  $\Delta = 0.63$ . The skills "Strategic vision" and "design of orientation and carrying out" and "Assertiveness and innovative spirits" have the deviation  $\Delta = 0.7$ .
- Experiment conclusion: the evaluation result of 8 management skills of management officials in the focus group and test group through two times of evaluation (before and after experiment) leads to the conclusion that the skill fostering through self-study according to 5 steps in the part of methods is efficient in enhancing the quality of high school management official force in Northern mountainous provinces.

### CONCLUSIONS AND DISCUSSION

High school management official force plays a key role in enhancing education quality in Northern mountainous provinces. To satisfy the demand for Vietnamese education innovation and the change of the society in the 4.0 technology age, it is required to foster the High school management official force to help them fully complete the standard of title and enhance management capacity for school activities.

From evaluating the real situation of High school management official force in Northern mountainous province, based on the concepts and viewpoints on fostering, we set out a process for fostering management official force with the following steps: determining the need, making plan, organizing fostering and inspection and evaluation tasks. Organizing experiment to foster skills for high school management team using self-learning form helped the management officials to improve their level, which asserts the possibility and efficiency of the fostering mission according to the process above. This process can be used as a reference for management agencies in the localities and training locations in the process of fostering organization for school management officials. In the process of application, the managers should research and choose a suitable method to enhance the quality of education management mission in particular and enhance education quality in general.

We have two questions for discussion with the researchers:

- How is the real situation of high school management official force in your country? What solutions have you used to develop this management official force?
- In your opinion, are the above solutions possible and can they be applied to the sustainable development of high school management official force in your country?

### REFERENCES

- [1] Ministry of Education and Training (2009), *Circular No. 29/2009/TT-BGDDT* dated October, 22nd, 2009 regulating the standard of the principal of secondary schools, high schools, and common schools with multiple training levels.
- [2] Government (2010), *Decree no.18/2010/ND-CP* dated May 05th, 2010 on Training and Refresher Training of Civil Servants
- [3] Hoang Van Duong (2016), Administration of management officials of high schools in Northern mountainous area to conform to educational reformation
- [4] Communist Party of Vietnam, Central Executive Committee (1997). *Resolution of the 3rd Conference (The 8th National Party Congress)* on strategy for officials in the period of industrialization and modernization, Ha Noi National Political Publishing House.
- [5] Communist Party of Vietnam, Central Executive Committee (2013). *The Resolution No. 29 - NQ/TW* dated November 4th, 2013 on the fundamental and comprehensive innovation of education.
- [6] Ho Chi Minh (1974), *Regarding the issue of officials*, Ha Noi Truth Publishing House.
- [7] Tran Ngoc Giao (2016), *High school management*, Vietnam Education Publishing House.
- [8] Multiple Authors (2017), *Fostering teachers and management officials to satisfy the demand for high school education innovation (Summary Record of the national scientific seminar)*, Thai Nguyen University Press.



## COMPARISON OF TYPE OF STORY RELATED TO HUMAN-FAIRY MARRIAGE OF TALES IN FOLK STORIES INDONESIA

*Ph.D. student Nguyen Minh Thu Tel: 0948829519*

*Ph.D. student specialized in Folk Literature at Hanoi University of Education.*

*Corresponding Email: divathu.nguyen@gmail.com.*

### ABSTRACT

This study attempts an analysis of the similarities and differences of an intrinsic structure, the patterns of intrinsic structure, and their influence on the fairy tales. The research samples consisted of 15 fairy tales. The study finds that the plots consist of: a male character, who wandering in a jungle, accidentally comes across a lake where fairies are bathing. He steals a fairy's shawl and forces her to marry him. The fairy finds her shawl that is stolen and she finally goes back to heaven. The following tales are built on such structure: Arya Menak (East Java), Jaka Tarub (Central Java), Telaga Bidadari (South Kalimantan), Raja Omas dan Bidadari (Simalungun), Oheo (Southeast Sulawesi), Lahilote (Gorontalo), Datu Pulut (South Kalimantan), Bulalo lo Limbutu (Gorontalo), Mahligai Keloyang (Riau), Putri Mambang Linau (Riau), Tumatenden (Minahasa, North Sulawesi), The Legend of Pattuattu Dance (West Sulawesi), Rajapala (Bali), Polopadang and deatanna (Toraja), Legend Horn Bills (Borneo Island). The similarity among some fairy tales seems to have occurred because of the mutual correlation among them and the context of dissemination.

**KEYWORDS:** fairy tale, similarities, differences, a male character, Indonesia

## INTRODUCTION

According to Wellek and Warren (111), the history of comparative literature study begins from studies on oral literature, folklore and its migration, that is, how and when it comes into the more artistic literary writing. In this terminology, comparative literature is encompassing the study of relationship between two or more literature. Furthermore, Darma (2007) says that comparative literature is drawn by the awareness that literature is not singular but pluralistic in nature. According to Block (Saman 95), the study of effect is the important study within comparative literature. Block says that the effect can be elaborated into several parts, such as (1) part of the art or creative art, use of past as an inspiration, (2) the authors' relationship and relevancies factor, (3) an accidental element, (4) as the source of the creation process, and (5) an aesthetic interaction that is not easily seen by the eyes. Based on the background mentioned above, this article will discuss the similarities and differences found in some fairy tales in Indonesia. Those similarities and differences are reviewed from the intrinsic point of view, thus repeated similarities will eventually form the pattern of the fairy tales.

## MATERIALS AND METHODS

In this research we have applied the following method:

Sorting Statistics: We researched 15 folk tales in Indonesian folklore collections and folk culture pages in different Indonesian islands with the same content about the marriage between man and fairy.

Methods of classification: We have selected 15 copies and then compare them basing on criteria such as Findings and Discussion, Character (Male Character, Fairy Character), The Fairies and Their Children, Setting. Using comparative method is to compare two phenomena with similar signs in order to highlight the characteristics and attributes of the phenomenon through the other phenomena. Comparative features highlight the type of story and the culture hidden deep in the story.

### Review of related literature

#### Intrinsic Structure of Fairy Tales

In order to comprehend a story, an interpretation toward its elements is needed. Bacon (244) asserts that in the attempt to understand a novel (in this case, a folklore), which illustrates complete action from a unique world, the elements of the story needs to be described in terms of its plot, setting, and character. Plot according to Stanton is a pattern that contains a sequence of events; but each event is only connected in cause and effect, an event which is caused or cause other events (Nurgiyantoro 113). The occurrences in a plot are usually cause and effect. The first occurrence causes the second one, and so on. On the other hand, the time-orderly occurrence cannot be defined as plot. Setting defines the general circumstance, giving a concrete and concise illustration to a story. Setting provides readers with realistic pictures, so that they are able to operate their imagination in the manner that the author wants to. Nurgiyantoro (185) stated that setting can be divided into three main elements, namely the place, time and social. Setting of place shows the location where the events are recounted in a fiction. The place element used may be some places with a specific name, particular initial, may be a specific location without clear information. Setting of time relates to the time when an event occurs in literature. A matter of time usually associated with a factual, time related to historical events. Knowledge of reader about the incident is used by the reader to understand the story. Social setting related to the behavior of social life in a place which is told in fiction. Characterization is often equated with the character and disposition, and it shows the placement of certain characters with certain characteristic in a story. Characterization present a clear picture of someone featured in a story. This view seems to put characterization as an important part in constructing a story. The characters in the story do not only serve to play the story, but also serve to convey ideas, motives, plots, and themes (Jones 33). The characters are the people appeared in a work of narrative or drama. That is why the characters occupy a strategic position as a carrier and transmitter of messages, mandate, moral, or something deliberately to convey to the reader (Abram 34).

### Methods

The Indonesian fairy tales which will be analyzed in this study are the following: Arya Menak (East Java), Jaka Tarub (Central Java), Telaga Bidadari (South Kalimantan), Raja Omas dan Bidadari (Simalungun), Oheo (Southeast Sulawesi), Lahilote (Gorontalo), Datu Pulut (South Kalimantan), Bulalo lo Limbutu (Gorontalo), Mahligai Kelayang (Riau), Putri Mambang Linau (Riau), Tumatenden (Minahasa, North Sulawesi), Rajapala (Bali). These fairy tales are selected as the samples of the study as the twelve are the only existing Indonesian fairy tales. The elements to analyze the fairy tales are plot, setting, and character. Thus, the similarities and differences of structure will also be elaborated from those three elements.

Findings and Discussion

## Plot

### Similarities

Related to the fairy tales, the plot begins with the introduction of a male character that wanders into the wood. Some of the characters in different stories simply take a walk, others are doing something related to their respective job, such as catching birds, looking for firewood, gardening, and looking for a break in their journey. The male figure then finds a lake where fairies take a bath. The beauty of the fairy figure leads him to steal a shawl or wing of the fairy. This makes the fairy who loses her shawl unable to return to heaven. With this condition, she is forced to accept the marriage proposal of the man who stole her shawl. Before her marriage, she offers some requirements that must be made by the male character. The climax stage of the plot is that those requirements are violated by the male; so it becomes the cause of the fairy's finding her shawl. Finally, the fairy goes back to heaven, leaving her husband and her children.

### Differences

The differences of storyline are found in certain parts of the plot. Generally it is on the climax part when the fairy finds the shawl. In Arya Menak, Arya Menak violated fairy's agreement that prohibits him to open the lid of the pot so that the fairy could not cook with a grain of rice. Formerly she was cooking rice with just one grain, but when her power was gone, the supply of rice in the barn was empty. Arya Menak hid the fairy's shawl under a heap of rice and consequently the fairy finds her shawl back. This story has a similar climax with Jaka Tarub fairy tale. In Lahilote fairy tale, the fairy found her shawl when she took some rice at the bran; therefore, she was back to heaven with her children. The climax stage of Raja Omas dan Bidadari reaches when the fairy tries to find her clothes. Raja Omas did not predict that his wife still had an intention of returning to heaven. The fairy tried to take her children from him, but she often failed. In Oheo the climax comes when Oheo would not keep the promise that has been agreed upon when they get married. He promised to wipe up his child when it would defecate. Oheo was working when he asked his wife to wipe up his child's feces. Anawangulari was sad since he broke the promise and inadvertently she saw the shawl.

The climax of Putri Mambang Linau tale occurs when Bujang Enok asked his wife Putri Mambang Linau to dance before the King. In fact, before hand, Putri Mambang Linau had asked her husband not to ask herself to dance. But Bujang Enok who was very loyal to the King still asked her to dance. The climax of Mahligai Keloyang tale also occurs when Datuk Sakti broke his promise. He promised not to tell people the identity of his wife. However, Datuk Sakti who was very proud of his wife unintentionally told his wife's identity to others. The climax of and Datuk Pulut and Telaga Bidadari tale is when the fairy found her shawl in the granary. However in Telaga Bidadari, she discovered it accidentally when she chased away the black hens that were spoiling rice. The climax of Bulalo la Limbutu occurs when Mbui Bungale was fighting with some of people who wanted to steal mimelula inscription placed on the edge of lake. In Rajapala the climax occurs when a fairy named Ken Sulasih asked her shawl to Rajapala since he had promised to return it when they have children. In Tumantenden the climax occurs when Mamanua found a bug and accidentally three pieces of Lumalundung hair were taken off. As a result, blood raced down her head. Therefore, Lumalundung took her shawl and went back to heaven. Thus, in conclusion, there are differences in terms of the plot as follows:

- a. The fairy returns to heaven and separates like the plots in Arya Menak and Nawangwulan, Jaka Tarub, Putri Mambang Linau, and Mahligai Keloyang, Rajapala.
- b. The fairy was back to heaven, but her family was not willing to accept her. So she was transformed into saringgon (howling wind) like in Raja Omas dan Bidadari.
- c. The fairy returned to heaven and her husband followed her and this occurs in Oheo, Lahilote, and Tumantenden fairy tales. Oheo followed his wife to heaven and then they came back to earth and lived on earth forever. Lahilote also followed his wife to heaven and lived in heaven with his wife and his son. However, after Lahilote has gray hair, he returned to the earth while his wife and his son stayed in heaven. Mamanua and his son met his wife and lived forever in heaven.
- d. The fairy did not return to heaven as she continued her life on earth, namely Bulalo La Limbutu fairy tale.
- e. The fairy returned to heaven, but she was back to earth at the time of breastfeeding her child, such as in Datu Pulut and Telaga Bidadari fairy tale.

### Character

There are three main characters in the fairy tales, namely, a young unmarried man, a beautiful, young woman coming from the heaven, and a child born from the marriage of the man and the woman. However, not all tales mention the latter character.

## Similarities

### Male Character

The main characters of fairy tales consist of a male character who stole fairy's shawl and fairy character as the targeted theft.

### Fairy Character

The fairy character is illustrated as a young and beautiful heavenly woman having wings (or shawl). The beautiful lady loses her shawl as it is stolen by a man when she is taking a bath with her sisters in a lake.

### Differences

#### Male Character

Male characters consist of two groups of society, namely lower social class and upper social class. Lower social class characters can be found in the Jaka Tarub, Arya Menak, Oheo, Lahilote, Putri Mambang Linau, Datu Pulut and Rajapala fairy tales. In several fairy tales such as Jaka Tarub, Datu Pulut, and Rajapala, the male character is usually a poor young man who commonly hunts birds with blown bamboo equipment. For examples, Arya Menak was a young man who liked to wander into the woods; Oheo was also a young farmer who would open a sugar cane plantation on the edge of the forest. Lahilote living on the edge of the forest was a polahi who did not get along and communicate with people since he has power that could harm people. Bujang Enok in Putri Mambang Linau was a poor and lonely man who worked to get firewood in the forest. The upper social class can be found in Telaga Bidadari, Raja Omas dan Bidadari, Tumatenden, and Mahligai Keloyang fairy tale. In Telaga Bidadari fairy tale, Awang Sukma who titled datu was a district ruler. Raja Omas in the story of Raja Omas dan Bidadari came from the royal family. However, his stepmother who hated Raja Omas washed him away to a river then he was found by a poor old woman. A powerful Datuk Sakti in Mahligai Keloyang fairy tale was a district ruler who traveled in order to monitor his region. Mamanua in Tumatenden fairy tale was a rich man. Bulalo La Limbutu fairy tale has a different male character. The man coming from the sky (Jilumoto) was walking in the forest when he met the fairy who was bathing in a lake.

Table 1. The Table of Man Character

No	Title	Upper class / Rich	Lower class / Poor	Occupation
1	Arya Menak		√	Fond of wandering
2	Jaka Tarub		√	Dove catcher
3	Oheo		√	Open farmland cane
4	Lahilote		√	Polahi has black magic
5	Telaga Bidadari	√		A Leader (Datu)
6	Datu Pulut		√	Bird catcher
7	Mahligai Keloyang	√ (Datu Skati)		A leader
8	Mambang Linau Princess		√ (Bujang Enok)	Firewood seeker
9	Bulalo lo Limutu	X	X	Come from heaven
10	Raja Omas dan Bidadari	√		Son of the king (Tapper cane)
11	Tumatenden	√		The rich man
12	Raja Pala		√	Bird catcher
13	Lengend Horn Bills		√	Bird catcher
14	The Legend of Pattuddu Dance	√		Raja
15	Polopadang and Deatanna		√	Farmer

## Fairy Character

The fairy character is generally the youngest daughter such as in Telaga Bidadari, Raja Omas dan Bidadari, Arya Menak, Lahilote, Oheo, and Tumatenden, The Legend of Pattuddu Dance. Two fairy tales, Putri Mambang Linau and Datu Palut, marked the shawl as an orange one. Mahligai Keloyang, Jaka Tarub and Rajapala fairytales did not mention whether the fairy who lost her shawl was the youngest or the oldest fairy. Bulalo la Limbutu fairy tale indicates that the fairy who has lost her shawl was the oldest fairy.

The fairy bathing in the lake was commonly not alone. Most of the fairy tales stated that the fairy was bathing with her 7 sisters. According to 15 kinds of fairy tales being analyzed, there are 9 fairy tales mentioned that information (see table). However, Tumatenden fairy tale mentioned that there were 9 fairies who were bathing in the lake. Two other fairy tales used the word a lot or a numbers of such as in Jaka Tarub and Mahligai Keloyang fairy tale.

Table 2. The Fairy Character Profile

No	Title	The numbers of fairy who are bathing in the lake	The status of fairy
1	Arya Menak	7 fairies	The youngest
2	Jaka Tarub	A lot	No explanation
3	Oheo	7 fairies	The youngest
4	Lahilote	7 fairies	The youngest
5	Telaga Bidadari	7 fairies	The youngest
6	Datu Pulut	7 fairies	Having orange shawl
7	Mahligai Keloyang	A numbers of	No explanation
8	Mambang Linau Princess	7 fairies	Having orange shawl
9	Bulalo lo Limutu	7 fairies	The eldest
10	Raja Omas dan Bidadari	7 fairies	The youngest
11	Tumatenden	9 fairies	The youngest
12	Raja Pala	7 fairies	No explanation
13	Lengend Horn Bills	1 fairies	No explanation
14	The Legend of Pattuddu Dance	7 fairies	The youngest
15	Polopadang and Deatanna	1 fairies	No explanation

### The Fairies and their Children

Nine fairy tales stated that the marriage between human and fairy produced a child (see Table 3). While the characteristic of the child in the Bulalo La Limbutu fairy tale was different with others since the child was the embodiment of mustika stone. Mahligai Keloyang fairy tales specified that there were two children, a son and a daughter. Arya Menak and Putri Mambang Linau fairy tales did not tell further.

Children born by a fairy were living on earth when the fairy was back to heaven as in Jaka Tarub, Oheo, Telaga Bidadari, Datu Pulut, Mahligai Keloyang, Raja Omas dan Bidadari, and Rajapala; however, it is different with Bulalo La Limbutu fairy tale. In this fairy tale, the husband, wife and child came from heaven to live on earth. Thus, eight fairy tales indicated that the children of fairy lived on earth.

On the contrary in Lahilote and Tumatenden fairy tales, the children lived in heaven. However Arya Menak and Putri Mambang Linau fairy tales did not explained about it.

Tumatenden, Oheo and Lahilote fairy tales reflect different things. The children and the husband followed the fairy to heaven; however, there are some differences in characteristics. In Tumatenden, the husband and child lived in heaven after they came to heaven and met the fairy.

On the contrary in Oheo, Oheo and his child who met an fairy in heaven had to return to earth with the fairy since man could not live in fairyland. Lahilote has also different pattern of plot. Lahilote and his child who successfully found and met a fairy in heaven lived happily there until sometime Lahilote has gray hair. Lahilote must return to earth himself while his wife and his child remained in heaven.

Table 3. Child Fairy with Human Marriage Results.

No	Title	Child	Sex	The place where children live
1	Arya Menak	X	X	X
2	Jaka Tarub	1 child	Female (Nawangsih)	On earth
3	Oheo	1 child	No explanation	On earth (Oheo and his child come to heaven but they return to earth)

No	Title	Child	Sex	The place where children live
4	Lahilote	1 child	Male (Uti)	On earth (Lahilote and his child meet an fairy to heaven and his child live in heaven)
5	Telaga Bidadari	1 child	Female (Kumalasari)	On earth (Datu Awang calls afairy, his wife, to breastfeeding their child; 7 candle nuts on a basket are shaken with the sound of flute)
6	Datu Pulut	1 child	Female	On earth (the place where the fairy breastfeeding her child should be prepared by Datu Pulut: a swing under the tree, and Datu Pulut is not allowed to come closer)
7	Mahligai Kelayang	2 children	Male and Female	On earth
8	Mambang Linau Princess	X	X	X
9	Bulalo lo Limutu	1 child	Female	On earth
10	Raja Omas dan Bidadari	1 child	No explanation	On earth. The fairy is failed to bring her child to heaven.
11	Tumatenden	1 child	Male	On earth
12	Raja Pala	1 child	Male	The family lives in heaven
13	Lengend Horn Bills	1 child	Male	On earth
14	The Legend of Pattuddu Dance	1 child	Male	On earth
15	Polopadang and Deatanna	1 child	Male	On earth

#### Setting

##### Similarities

The place where the male character and the fairy meet is set in a lake where the fairy and her sisters are taking a bath.

##### Differences

The difference in setting occurs sometimes with the bathing in the lake. Nine fairy tales that stated the fairies were bathing in the lake during the day are Jaka Tarub, Oheo, Lahilote, Telaga Bidadari, Datu Pulut, Putri Mambang Linau, Bulalo La Limbutu, Raja Omas dan Bidadari, Rajapalaand Tumatenden fairy tale. Arya Menak, Lahilote and Mahligai Kelayang fairy tale implied that the fairies were bathing in the lake when there was a full moon. However, most fairy tales specified the fairies were bathing at day time.

##### Pattern Found in the Setting

From the discussion, it is revealed that all the fairy tales contain a very high level of similarity, thus making them interrelated with one another. Furthermore, there are similarities in terms of the motives behind the stories due to close original place where the stories first came up in the society. The closeness can be found, for instance, in the story of Arya Menak and Jaka Tarub. Both stories tell the reader/listener about the same rule applied to the male character, that is, opening up the pan cover. This similarity might have come up as both stories came from two very close provinces, namely, Jawa Tengah Province and Jawa Timur Province. Both provinces serve as the border to one another.

The tales of Oheo, Lahilote, and Tumatenden greatly influence one another as the three stories tell us about the man's attempt to bring back the child to his mother who happens to be a fairy living in the heaven. The character Lahilote asks a help from a rattan tree in order to give him power to fly up to the heaven. Even after arriving at heaven, Lahilote needs to pass several requirements before meeting his wife. Here Lahilote receives helps from ants, the king of snake, and fireflies. The character Oheo in the Oheo story is also helped by a rattan tree. As he arrives at heaven, he is given some other requirements to satisfy before he is able to meet the fairy. Then Oheo is helped by a group of wild boars, mice, sparrows, doves, quails, a fly, a cat, and a firefly.

The story applies to Tumatenden in which Mamanua, the main character, asks for help from a black tree, rattan, wild boar, fish, and eel in order to bring him to heaven. The three stories contain a lot of similarities



as they come from three closely related regions, namely, Gorontalo Province (Lahilote; previously Gorontalo is a part of Sulawesi Utara Province), Sulawesi Tenggara Province (Oheo), and Sulawesi Utara Province (Tumatenden). All the three provinces are located in the same island, that is, Sulawesi Island. Meanwhile, the stories of Datu Pulut and Putri Mambang Linau have a great influence as the fairy who loses her shawl is the one wearing pink shawl. Datu Pulut comes from Kalimantan Selatan Province, while Putri Mambang Linau is from Riau Islands Province. The provinces are located in different islands. However, according to the earliest geographical map, it is seen that these two provinces were close with each other. This leads to the distribution of stories very quickly. The two stories are connected with a same ending, that is, the fairy goes back to the earth to breastfeed her baby.

### CONCLUSIONS AND DISCUSSION

Through this paper we aim to find out the similarities and differences in the inner structure of the Man-Fairy-type marriage itself. At the same time, to recognize the harmony in the diversity of cultural relations among different ethnics of different islands in Indonesia.

We have two questions to discuss with the researchers:

Question 1: Why is the Man-Fairy type marriage popular in Indonesia?

Question 2: Compare Man-Fairy type marriage tales with those of other ASEAN countries?

### REFERENCES

- Abrams, M.H. (1981). *A Glossary of Literature Terms*. New York: Holt, Rinehard, and Winston.
- Bacon, Wallace A. (1972). *The Art of Interpretation*. New York: Holt, Rinehard, and Winston.
- Bottoms, J.C. (1965) "Some Malay Historical Sources: A Bibliographical Note". in Soedjatmoko (ed).
- Endraswara, Suwardi. (2011). *Metodologi Penelitian Sastra Bandingan*. Jakarta: Bukupop.
- Damono, Sapardi Djoko. (2009). *Sastra Bandingan: Pengantar Ringkas*. Depok: Editum.
- Darma, Budi. (2007). "Sastra Bandingan Menuju Masa Depan". Proceedings of Seminar Kesusasteraan Bandingan Antarbangsa 7—9 Juni 2007. *Kuala Lumpur: Persatuan Kesusasteraan Bandingan Malaysia*.
- Djamaris, Edwar. (1990). *Menggali Khazanah Sastra Klasik*. Jakarta: Balai Pustaka.
- Fang, Liaw Yock. (2011). *Sejarah Kesusasteraan Melayu Klasik*. Jakarta: Yayasan Obor.
- Jones, Edward H. (1968). *Outlines of Literature: Short Stories, Novels, and Poems*. New York: The Macmillan Company.
- Miller, Allan, "The Swan-Maiden Revisited: Religious Significance of Divine-Wife Folktales with Special Reference to Japan". Miami University, Oxford, Ohio.
- Saman, Sahlan Mohd. (1994). "Gejala Pengaruh dalam Disiplin Kesusasteraan Bandingan" in Kesusasteraan Bandingan Suatu Disiplin. Kuala Lumpur: Dewan Bahasa dan Pustaka.
- Stith Thompson (1958), *Motif - index of folk-literature*, Indiana University press; Blomington and Indianapolis.
- Tim Penulis AdiCita Grup (2008), *366 cerita rakyat Nusantara* (2008), Penerbit Adicita Karya Nusa.
- Wellek, Rene dan Austin Warren. (1989). *Teori Kesusasteraan*. (Melani Budianta, Trans.). Jakarta: Gramedia.
- AR., MB. Rahimsyah. (2004) *Kumpulan Cerita, Legenda, Dongeng Rakyat Nusantara*. Jakarta: Bintang Indonesia.
- Aziddin, Yustan. "Dongeng Telaga Bidadari". <http://dongeng.org/category/biografi>.
- Clara, Amanda. (2008). *Cerita Rakyat dari Sabang sampai Merauke*. Yogyakarta: Pustaka Widyatama. Proyek Penelitian dan Pencatatan Kebudayaan Daerah Pusat Penelitian Sejarah dan Budaya Depdikbud.1977/1978. Cerita Rakyat Daerah Sulawesi Tenggara.
- Suwondo, Bambang. (1982). *Cerita Rakyat Daerah Istimewa Yogyakarta*. Jakarta: Depdikbud <http://indonesianfolklore.blogspot.com>



## SI LA PEOPLE'S FORK SONG AN ORIGINAL FORM OF LANGUAGE ART

Prof. Dr. Vu Anh Tuan, Hanoi National University of Education  
Dr. Dang Thi Oanh, Laocai Teacher Training College  
Bachelor. Nguyen Van Thuy, Laocai Teacher Training College

*Address: Hanoi National University of Education, Xuan Thuy, Cau Giay, Ha Noi.*

*Corresponding Email: [dooanhdang@gmail.com](mailto:dooanhdang@gmail.com) Tel: 0912668358*

*Address: Department of Academic Affairs –Scientific Research*

*Corresponding Email: [dooanhdang@gmail.com](mailto:dooanhdang@gmail.com) Tel: 0902101685*

*Address: Office of Student Affairs*

*Corresponding Email: [dooanhdang@gmail.com](mailto:dooanhdang@gmail.com) Tel: 0914824290*

### ABSTRACT

Si La people is one of minority people that have few members residing at the Northern mountainous area of Vietnam. The people have a rich and original folk song treasure. At first, we found that besides the originality and richness of the reflected content, the folk songs contain a style of art which is original, different and charming of Si La people's cultural character: This is a rustic, sincere and warm but so subtle and deep soul, loving nature, loving people and being unyielding to rise up in life.

**KEYWORDS:** folk songs, Si La, art of words, unique

## INTRODUCTION

Currently, Si La people's population in Vietnam is about 1000 people, residing in many mountain villages: Nam Xin village (Muong Nhe District, Dien Bien Province), Seo Hai and Xi Thau Chay village (Muong Te District, Lai Chau Province). This people usually lives on high and remote mountainous area. Their custom is shifting farming and nomadic living. They grow *oryza montana* to support their living. From 1955 backwards, they still used style of cultivation called "pierce hole, adapt seed". The custom is original and contains many ancient characters. Si La people don't have their own writing, so cultural heritages and folk art is transferred orally and instructed directly in the family.

Si La folk song is one of intangible cultural heritages of this people. Since 1960, there have been several researches on studying and introducing about folk culture of Si La people. However, in those researches, the folk songs have been mentioned as a point, an aspect or an illustration with very small ideas of about some pages. It can be said that until now, researches on the folk songs of this people is still a blank. Currently, the cultural heritages of this people are extremely lost for many reasons. It is very difficult for us to collect. On the one hand, the people reside in the high and remote mountainous area, which causes many difficulties for the traffic. On the other hand, the people are self-contained and afraid of approaching...

## OBJECTIVE AND METHODOLOGY

**Objective:** Study and introduce generally about the culture of Si La people; analyze and indicate values of content and originality and feature of the art of Si La folk songs.

**Methodology:** In this article, we use field research method to villages, where Si La people live to collect information, record their songs and interview the artists about their cultural values from the songs; we also use analytical and comparative methodology to indicate original values of art and content of Si La folk songs; Translating from Si La to Vietnamese and English.

## RESULT AND DISCUSSION

After studying folk songs of Si La people, we found that they have an original, various and novel linguistic artistic style. It makes readers feel a clear, pure and pristine linguistic artistic thinking and the stirring rustic, sincere and warm soul and sentiment of Si La people.

### 1. Using language which is original and charming of Si La people's cultural character

Talking about novelty and originality of Si La folk songs, we first have to talk about using language and image which is original and charming of the people's cultural character. For example, there is lullaby which is dulcet, gentle and full of love and ardent dream of the Si La grandmothers, mothers and sisters to babies in the folk songs. However, the feeling was described by words, images and sounds which are definitely rustic, simple and charming of the people's character: they hope the babies to grow up quickly like "the chit of zingiber zerumbet"; to live a long life and be strong like "iron-wood old tree"; to be tough like "the rock"; right when they were children, they could overcome all difficulties to grow up:

"...Oh my dear grandson of mine...

Though not be carried in the arms, just grow up quickly...

Like the chit of the big zingiber zerumbet...

You will live a long life like the iron-wood old tree...

Be strong like the rock..."

How hard-working the parents are when they work all days and nights to raise their children up is also expressed by sincere, rustic and not flowery words:

"...I change your diapers ten times a day...

I eat nothing...

Even nice vegetables...

Even a little of vegetables..."

In the production labor folk songs, praising words to encourage everybody to work enthusiastically to make material wealth for life; and lessons of experience about manufacture, planting, caring and harvesting... are concluded and reflected by natural things and events which are familiar to daily life of Si La people: Experience of hearing balm-cricket cry ("xá... xá...") to realize season to do farming on the branches of the trees, sound of hawk squawk ("phí khu í lư") and "the flowers are dyed color of blooming golden rice". Experience of selecting forestry land to do farming is concluded from observing "the red foot francolin" in the old forest, scratching up the termite nest in fine-grained soil (nice soil); and sleeping in the forest is as "sleep like a flock of Colobus Waldron eat leaves" (sleep on trees) to avoid dangerous animals...

Not only the production labor folk songs but also the songs of customs and habits such as making new house, wedding, funeral and migration to find a new land; taboos and arguments of the people; feelings and missing of the old village and parents, siblings and relatives... are reflected rustically and sincerely by things and events in natural environment – where Si La people live:

“...Missing the thin-winged black bee flies around to suck pistil. That’s it...  
Missing the bird carries grass to make a nest on the old roof. That’s it...  
Also missing the sound of the muntjac at the other side of the mountain foreruns sunny and rainy day...  
Flowers bloom blazing red forerunning farming season is coming... That’s it...  
Missing the sound of the cuckoo on the forest at the end of the village foreruns bean planting season is coming...”

The complaint folk songs are about distress of orphaned and unhappy people who have to live lonely with no relatives. They only can express their feeling to nature, trees, sounds of animals and birds, sounds of squirrels move from a branch to another branch and sounds of streams and waterfalls:

“...Hey squirrel! Hey balm-cricket! Please be sad together with me...

Hey bird! Please wipe tears together with me...

Hey squirrel! Please wipe tears together with me...

Now, I go to many places to have fun together with birds and balm-cricket...

To find the happiness from sounds of every species...

I try to be happy together with sounds of them...

I only can be happy together with those sounds of them... That’s it...”

The love songs are the most special: They are not only heartfelt, simple and modest but also passionate and peremptory. The restless feeling as sitting on a fire of the Si La men and women is described like a leaf flips over in the wind:

“...I feel restless that I don’t know why... That’s it...

Like the wind flows, making the leaf flips over...

The leaf flips over... That’s it...

Go and see the leaf flips over...

The leaf flips over as the wind flows... That’s it...”

In marriage customs of ethnic minorities in the Northwest, in the first time of meeting, the women usually keep a distance from the men by lowering their condition in sayings. This is a way to show humility, shyness, hesitation and delicateness of the women. However, the way the Si La women compare themselves is so strange. They compare the scent on their bodies to the smell of “garlic”, “skunk” and “mouse” and their voice to “wild flower” – even “thin-winged bee” doesn’t want to come:

“...No one cares about such the kind of people like me. That’s it...

Like sim flower in the forest in blooming season. That’s it...

Beautiful flower, fragrant flower, that’s not like that. That’s it...

Even thin-winged bee doesn’t want to come. That’s it...

It’s not fragrant, like a garlic (smell). That’s it...

Smell mouse, I am like a smell mouse. That’s it...

Skunk, I am like a skunk. That’s it...”

Like other people, Si La people believe that becoming wives and husbands because of the fate, marrying to each other because of allowance of parents. Unfinished love because of prohibition of parents usually occurs in traditional marriage customs of this people. To resist this prohibition, men and women compare it to another unreasonable thing in life: “cutting the belly of the tick” (the tick is tiny like the top of the toothpick, so we can’t cut its belly) or “well simmer 3 stones chocking the stove” (impossible thing) :

“... I cut the cut the belly so you must know how to cut... that’s it...

Parents say do not allow...

The stove has 3 stones

Do you know how to cook three stones?

Parents say do not allow...”

This is the opposite way of saying the boy Si La to express the contrary to nature, which can not happen (like: "When the loach give birth the banyan tree/ Sturnidae give birth under water I will married you" by the Kinh) to persuade the girl not to obey the parents' prohibition, but to accept their love.

## 2. The usage of interjection with thick density

In addition to using unique visual language, the folk songs of the Si La ethnic group are special in the use of the word exclamation. The phrases: “like this, that’s it, actually...” is repeated many times in most poetry

lines, folk songs. With the thick density appears make a difference, unique in folk style of this ethnic group; which make the tone of these folk songs become soft, close, earnest, sincere, humble as confessions. Learning about the use of this word from the perspective of ethnic culture, we find that beside the rhythmic, friendly effect of the lyrics it also reflects the cultural characteristics of the people, reflecting the soul and personality of the Si La. They live in upland, remote place, low-population, peaceful, tolerant, non-competitive and they are affectionate people.

### CONCLUSION

It can be said that folk songs of Si La are the voice of their soul, thoughts and feelings: pure, simple, honest, unique, with simple dreams. The lyrics are like the underground water in the silent, tirelessly gripping thousands of tombs at the foot of the mountain; rankling as the birds call the partner when the sun light is coming; Be honest, be straightforward like a tree growing in the jungle. The lyrics are sad but not grief, causing the reader to imagine people, personality of Si La, rustic, sincere but solid, persistent as rock in mountain, diligent as the honey bees, the ants retrieve the food... are working hard day and night to build a happy life for themselves and for everyone.

For various reasons, folk songs of Si La have been lost. The collection for preservation and introduction, researching to show the content – art value contained in the Si La folk songs is important and necessary. This will contribute to the cultural preservation and transmission of the ethnic minorities that the Party and State of Vietnam have been implementing.

### REFERENCES

- [1] Khong Dien (editor) (2001), “*Si La ethnic group in Vietnam*”, Ethnic Culture Publishing House, Hanoi.
- [2]. Do Thi Tac (editor), Hu Co Xuan (2017), “*Si La Folk songs*”, Ethnic Culture Publishing House, Hanoi.
- [3]. Do Binh Tri (1999), “*The poetical characteristics of folk literature*”, Education Publishing House, Hanoi

**IMPROVING MATHEMATICAL MODELING COMPETENCE FOR STUDENTS AT  
PEDAGOGICAL COLLEGES TO MEET THE REQUIREMENT OF THE NEW GENERAL  
EDUCATION CURRICULUM IN VIETNAM**

*Pham Xuan Chung*  
*Pham Nguyen Hong Ngu*

**ABSTRACT**

Mathematical modeling competence is one of the most componential competence of the Mathematical Competence that the new Mathematics curriculum aims to constitute and develop for students. In this report, we propose our conceptions, basing on the study of the mathematical modeling competence of some authors. Consequently, some solutions to improve the mathematical modeling competence of students who are studying at Mathematics pedagogical colleges in Vietnam will be proposed.

**Keyword:** Mathematical modeling, mathematical modeling competence, improving mathematical modeling competence for pedagogical students.

## INTRODUCTION

Goal of the new general educational curriculum in Vietnam is to develop basic competence that high school students have established at their primary and secondary levels and at the same time, the capacity of workers is also formed. Particularly mathematical education develops students' general abilities and Mathematical competencies with core components including thinking abilities and mathematical reasoning, mathematical modeling competence, capacity math problem solving, mathematical communication skills, the ability of using math tools and means. These competencies are implemented in many subjects, but mathematics plays a pivotal role.[1]

Many educational organizations such as CCSSM (The Common Core State Standards in Mathematics of the United States, 2010), OECD (Organization for Economic Cooperation and Development, 2009), SIAM (Society for Industrial and Applied Mathematics, 2006), ESM (Education Standards in Mathematics of the Germany, 2003), researchers such as Blum & Niss (1991), Kaiser (2013), etc in their study (see [5], [7], [8], [11], [14], etc) define the mathematical modeling competence as the central competence of the mathematical competence that students need to achieve.

We can not require teachers in the future to give their students something we have not been able to do for them in the training process. So, when studying at universities, students in Mathematics Education should be trained in mathematical modeling and practice skills in modeling in learning as well as in life. Therefore, it is necessary to have more researches on mathematical modeling, mathematical modeling competence and the teaching of mathematical modeling in the universities of Mathematical pedagogy. This issue has attracted great interest of educators around the world as in [6], [8], [9], [13], [15], [16], etc.

In Vietnam, refer research documents on modeling as in [2], [3], [4], etc. We recognize that the current training program for students in Mathematics pedagogical colleges in Vietnamese has not changed, adjusted for the purpose of fostering modeling competence for students - future teachers.

In this paper, basing on the above research, we perform personal views on mathematical modeling, mathematical modeling competence, Mathematical modeling teaching competence of Mathematics students and propose some solutions to improve the competence of teaching Mathematical Modeling for students in Mathematics pedagogical colleges in Vietnam.

## Content

### 1. Mathematical Modeling Competence

#### 1.1. Competence

At present, there are many different views on competence. Blomhoj & Jensen (2006) argues that competence is the someone's insightful readiness to act in response to the challenges of a given situation, [14]. German psychologist Weinert (2001) supposes that competence is a specialized system of abilities, proficiencies, or the skills that are necessary to achieve a specific goal [8].

The OECD said that competence is the ability of an individual to meet complex requirements and successfully perform tasks in a particular context [12]. The German Mathematical Education Standards (ESM) describes competence as what students are able to achieve in a specific class for a particular grade. [16]

In Vietnam, the education dictionary has defined that: Competence is the ability to be formed or developed to allow a person to succeed in a physical, mental or occupational activity. Competence is reflected in the ability to perform an activity, perform a task. Psychologists argues that competence is the synthesis of individual psychological characteristics and attributes that are consistent with the specific requirements of a given activity to ensure that the activity is highly effective. [2]

In the new general educational program in Vietnam, competence is understood to be personal attributes that are formed and developed through the availability of material and the process of learning, training, enabling people to mobilize Knowledge, skills and other personal attributes such as excitement, beliefs, wills, ect for successful implementation a certain type of activity, achieving desired results in specific conditions. [1, p 32]

From the above scholar's perspective, we think that it is possible to understand that competence is sum up one's knowledge, skills, attitudes toward a goal, accomplishing a task (possibly learning situations or in real life situations).

#### 1.2. Mathematical modeling

Mathematical Modeling is one of the central competence that most educational programs of the world consider as in the ESM of Germany, CCSSM in the US, Singapore, etc. In the curriculum of Singapore:

Mathematical modeling is the expression and perfection of a mathematical model to represent and solve a practical problem. Through mathematical modeling, students learn how to use a variety of data representations, select and apply mathematical methods and tools to solve real-world problems [5]. In the United States Mathematical Model (CCSSM), modeling Mathematical is defined as the process of selecting and using appropriate math and statistics to analyze empirical situations, understand them better, and improve decision [13]. In the German ESM, mathematical modeling is described as the process of transferring between the real world and mathematics. Tran Vui says that mathematical modeling is the whole process of transforming practical problems into mathematical problems and vice versa, along with everything involved in that process [3].

### 1.3. Mathematical Modeling Process

In the Singapore curriculum, the mathematical modeling process consists of four steps [5]:

- Mathematisation is a process of transforming the real problem into a mathematical problem by expressing a mathematical model. This requires the learner to understand the problem, to explain the given information, to make assumptions to simplify for the problem to be solved, to determine the appropriate mathematical concepts. To perform, set up the prize model.
  - Working with Mathematics: It is the learner's choice and use of tools and methods suitable to solve a pure problem. It is possible to use software or handheld computers to solve complex long-form Mathematics.
  - Interpretation: The learner interprets the mathematical solution within the context of the original problem.
  - Reflection: The learner reconsiders the hypothesis and the limitations of the model of mathematical methods and tools used to solve the problem, from which to improve the model if not appropriate.
- In the CCSSM program of the United States [9], a six-stage modeling process is proposed as follows:
- Identifying variables in the situation and selecting those that represent essential features.
  - Formulating a model by creating and selecting geometric, graphical, tabular, algebraic or statistical representations that describe relationships between the variables.
  - Analyzing and performing operations on these relationships to draw conclusions.
  - Interpreting the results of the mathematics in terms of the original situation.
  - Validating the conclusion by comparing them with the situation and then either improving the model or, if the solution is acceptable.
  - Reporting on the conclusions and the reasoning behind them. Choices, assumptions and approximation are and present throughout.

OECD in its Pisa assessment [12], provides a five-step modeling process as follows:

- Starting from a problem set in practice, refactoring is by streamlined, idealized to be a realistic simulation model.
- Organize simulations based on mathematical concepts.
- Problem solved in mathematical environment to be a mathematical result.
- This result is translated back to the original situation.
- The resulting suitability must be checked, in case the solution is not satisfactory, the process must be repeated.

### 1.4. Mathematical modeling competence

Mathematical Modeling competence is one of the elementary competencies that students need to be fostered in the mathematical competence in learning mathematical.

Among eight specific mathematical competence of the work of Niss (1999) and his Danish colleagues, the modeling competence involved modeling the field or context modeled; transformed reality into mathematical structures; explain mathematical models in a practical sense, work with a mathematical model, make the model satisfactory, reflect, analyze and give its critique and its results; communicate about the model and its results (including the limitations of such results); supervise and regulate the mathematical modeling process [11].

Kaiser (2005) argued that modeling competency involves in solving at least partly a real-world based problem containing mathematics through a mathematical description developed by the individual learn; Reflects on the modeling process by activating meta - knowledge about modeling process; Insight into the connections between mathematics and reality; Insight into the subjectivity of mathematical modeling i.e. the dependence of modeling process on the aims and the available mathematical tools and pupils competences, social competences such as the ability to work in a group, and to communicate about and via mathematics. [10]



The OECD (2003) argued that modeling competence involves modeling the field or context that is modeled, transforming reality into mathematical structures, explaining mathematical models in a practical sense, work with a mathematical model, make the mathematical model satisfactory, reflect, analyze, and give its critique and its results; Communicate about the model and its results (including the limitations of the results) and monitor and control the modeling process [12].

In our view, the mathematical modeling competence of high school students includes practical understanding, mathematical connections to realities, problem solving in mathematics and practice, logical reasoning and reasoning; social interaction.

To form and foster this capacity for high school students, future teachers must have the competence to teach modeling. In the CCSSM study in the United States, it has been shown that many teachers in practice do not know how to teach students to use mathematical knowledge to solve problems arising in their lives; So they have researched on the issue of educating and training teachers to provide instructional support.

## **2. Improving mathematical modeling competence for pedagogical students**

### **2.1. Researches on training and fostering teachers to meet the teaching of mathematical modeling in the world**

Teachers play an important role in fostering mathematical modeling for students and learning through mathematical modeling. In 1994 Blum pointed out the gap between the development of mathematical education in modeling and the teaching of mathematics. After more than 20 years, Kaiser (2013) pointed out that these gaps still exist.[8]

Kaiser (Germany) (2005) in his report [10] suggested that in order to foster awareness of mathematical modeling and competence development to realize that process, the absolute need to transfer this capacity for future teachers in the learning process. He implemented the project "Mathematical Modeling in Schools from 2001 to 2004 with 3 courses for students at Hubg University in Germany on mathematical models in financial risk management, medical insurance, optimum location for rescue aircraft, radio treatment for cancer patients, etc., and obtained positive results such as: Most of the participants were satisfied despite of the long courses and complex activities, modeling capabilities can be formed in medium-level students, students are aware of the connection between mathematics lessons to the real world, life Everyday, the teaching experience of students is enhanced, the student appreciates learning through model, through group discussions, student orientation i tend to study techniques to apply mathematical knowledge to various fields.

Thomas Linge (2001) of the Gothenburg University of Gothenburg argued that in order to teach mathematical modeling, teachers must have math and computing tools in which teachers must understand and use technology to explain modeling results rather than just algorithms. He and his associates have held advanced technical courses for pedagogical students in the field of swimming, gas. Students are encouraged to use software such as Sketchpad, Excel, and PC logo to model and solve problems that arise and result in technology proficiency that students can master. Price models are good quickly.

In his study, Ok - Ki - Kang [13] pointed out that the process of teaching mathematical modeling in high school is highly influenced by the concept, the teacher 's ability to model activities. Help students demonstrate - test - correct their thinking in the direction of efficiency. It is therefore necessary to have future research into the development of knowledge, capabilities related to modeling activities of in-service teachers or pedagogical students.

Teachers now face with many difficulties in modeling teaching due to their practical knowledge of modeling contexts and the face of open teaching situations. However, the training of pedagogical students or in-service teachers has not ensured modeling is emphasized in the daily lessons [8]. Current research focuses on the study of student modeling but does not focus on the study of modeling instructional capacity for pedagogy or in-service teachers [16].

Ferri in his study [16], based on the findings of many earlier researchers, suggested that pedagogical knowledge of the teacher (PCK) is essential for the teaching and application of modeling. Accordingly, teachers should have the ability to teach modeling with four dimensions as follows:

- Theoretical dimension (modeling cycle, aims and perspectives of modeling, types of modeling tasks).
- Task dimension (multiple solutions of modeling tasks, cognitive analyses of modeling tasks, development of modeling tasks).
- Instruction dimension (Planning lesson with modeling tasks, carrying out lessons with modeling tasks, interventions, support and feedback).

- Diagnostic dimension (recognising the phases in modeling process, recognising difficulties and mistakes, marking modeling tasks).

And to train pedagogical students into mathematical modeling teachers John. A. Pelesko [8], argues that it is necessary to equip students with the programs such as "Mathematical Thinking," "Observation Thinking," "Transformational Thinking," during university education.

## **2.2. Application in Vietnam**

### **2.2.1 The requirement for the mathematical modeling competence of student in Mathematics pedagogical colleges in Viet Nam.**

In Vietnam, pedagogical students will be teachers directly involved in the training of high school under the renewal program in the future. A current first-year undergraduate student (2017), will graduate in 2020, the time when the new curriculum will be applied nationwide. Therefore, in order to find a job, the student must meet the requirements of the new high school math curriculum goal. However, at present, there is no empirical research on modeling training or modeling teaching capacity for pedagogical students.

In our point of view, we believe that every student who has been studying Mathematical sciences needs to equip himself with knowledge and skills in mathematical modeling so that he can do well with his roles, the teacher of mathematics.

- First of all, students should equip themselves with knowledge about practical life, the relationship between mathematics and reality, the application of mathematics in economic life, society. As a result, teaching situations that require students to use modeling to form the habit of modeling students will be constructed.

- Second, students need to equip themselves with basic knowledge of both advanced mathematics and elementary mathematics, especially mathematical representations, models, symbols, tables, logic rules of mathematics. Without the knowledge of mathematics, students will not be oriented to choose the right Math tool in the modeling process.

- Third, students need to form and nurture their problem solving capacity. Solving problems means being able to solve common problems in life or problems in Math, or in doing Math. The reason is that, in teaching, the teacher to be will face countless unknown situations; especially teaching mathematical modeling.

- Fourth, students need to practice the ability of discussion, social communication for themselves. The practice of communication skills not only helps students to speak their thoughts and opinions fluently but also connects the ideas of different students in the class.

### **2.2.2. Some solutions to improve the mathematical modeling competence for students in Mathematics pedagogical colleges in Vietnam**

We should have innovative approaches in teacher training institutions in order to help students have good preparations to meet the new educational requirements, we propose some solutions to improve the Modeling Mathematical competence for Students in Pedagogical Colleges in Vietnam: First and foremost is the change of contents, current programs and curriculum in Mathematics pedagogical colleges.

All training colleges are currently training mathematics students based on the available curriculum framework which has been constructed before the new comprehensive curriculum. To the basic mathematical knowledge, the main point is not consistent with the purpose of education innovation, focuses on the academy and neglects the integration with practice flexibly. Therefore, teachers of mathematics should participate in the improving and developing the program, propose addition or subtraction of inappropriate modules, to help students become familiar with mathematical modeling.

For example, the training program at mathematics pedagogical colleges in the early years includes the main modules: Mathematical Analysis, Linear Algebra, Algebraic approaches to abstract concepts, scholarly without connecting to Mathematical knowledge in high school. In the innovation of the pedagogical colleges program, we can integrate this academic knowledge with practical knowledge. By learning this knowledge, we can help students understand the connection between mathematics and practice.

Secondly, changing the perceptions, the teaching methods of the teaching staff. Mathematics lectures of teachers training colleges need to improve their competence of Mathematics modeling, problem solving skills and apply these skills into their lessons. Changing from teaching passively to actively, students are able to build their own mathematical knowledge and concepts to form the problem solving capacity of mathematics.

Thirdly, organizing activities for students to experiment directly, do research on mathematical modeling competence. Through the extra-curricular activities, students can experience the mathematical modeling process to understand the process and the tools needed to implement. Linking with businesses to help students have the opportunity to learn and evaluate the use of mathematics by business agencies. Students will be able to visit technical facilities, thereby creating the skills to see the emergence of mathematics in these production facilities to forming the knowledge of experience. By doing, the competence of Mathematical modeling from the practical mathematic exercises will be formed.

Fourthly, the solutions in the innovation of testing and assessment have to link the mathematics with reality. Currently in Vietnam, Assessment of students in Mathematics pedagogical colleges is mainly based on the lecturers together with about 10-12 weeks of high school teachers' assessment in their internship period. Therefore, It is hard for novices to meet the requirements of a high school Mathematics teacher. In order to train a new teacher in the future, We believe that we need a more thorough assessment of well-qualified, experienced teachers in upper secondary schools; Mathematics students need more time to work, more practical experience with the school curriculum, before becoming a real teacher. Moreover, the assessment forms of advanced Math subject at the colleges should also be changed from paper-based assessment to problem solving, group work, presentations, etc.

### CONCLUSIONS

In this paper, we have summarized the researches on the improving of mathematical modeling for high school students; researches on the competence to teach mathematical modeling for pedagogical students and for teachers who are teaching; with many specific ways of individual authors in different countries. Most of these studies highly appreciate the role, the necessity of understanding the modeling of teachers in forming, improving modeling competence for students. Therefore, an urgent task for educational administrators and scientists in Vietnam to meet the requirements of improving Mathematics education at all levels of higher education in the future is to promote more the study of mathematical modeling competence in such aspects as the study of concretization of the Mathematical modeling competence of students, especially students in Mathematics pedagogical colleges should apply the results in the world that is suitable the teaching conditions in Vietnam to put into textbooks, university curriculum, ect. This is a very heavy task, which needs the support from the government, educational organizations and the whole society.

### REFERENCE

- [1] Ministry of Education and Training of the Viet Nam (July 2017), *General Education Program - General Program*.
- [2]. Nguyen Thi Minh Phuong (2011), *Mathematical Modeling in Advanced Quantitative Capabilities of 15-Year-Old Students*, Master Thesis of Hue University.
- [3]. Trần Vui (2017), *From theory to practice in mathematical education*, Hue University Press.
- [4]. Trần Vui (2014), *Problem Solving in Mathematics Teaching*, Hue University Press.
- [5]. Berinderjeet Kaur Jaguthsing Dindyal (2010), *Mathematical applications and modelling*, Yearbook 2010 Association of Mathematics Education, (p249 - 256).
- [6]. David J. Carrejo, Jill Marshall (2007), *What is Mathematical Modeling? Exploring Prospective Teacher's Use of Experiments to connect Mathematics to the study of Motion*, Mathematics Education Research Journal, Vol. 19, NO. 1 (p 45 - 76)
- [7]. Henry O. Pollak (2011), *Introduction What is Mathematical Modeling*, Journal of Mathematics Education at Teachers College, Vol 2, No1.
- [8]. Cai, J., Cirillo, M., Pelesko, J. A., Borromeo Ferri, R., Borba, M., Geiger, V., et al. (2014), *Mathematical modeling in school education: Mathematical, cognitive, curricular, instructional, and teacher education perspectives*. In P. Liljedahl, C. Nicol, S. Oesterle, & D. Allan (Eds.), *Proceedings of the 38th conference of the international group for the psychology of mathematics education and the 36th conference of the North American chapter of the psychology of mathematics education* (p. 1). Vancouver: PME.
- [9]. June L. Gaston & Barbara A. Lawrence (2015), *Supporting Teacher's Learning about Mathematical Modeling*, Journal of Mathematics Research; Vol. 7, No. 4 (p 1 - 11)
- [10]. Kaiser G. (2005), *Mathematical Modelling in school – Examples and Experiences*, In H- W. Hene & G. Kaiser, *Mathematikunterricht in Spannungsfeld von evolution and evaluation*, p 99 – 108.

- [11]. Niss M. (2003), *Mathematical competencies and the learning of Mathematics*: the Danish KOM project, IMFUFA, Roskilde University, Denmark.
- [12]. OECD (2009), *Pisa 2009 Assessment Framework, Key Competencies in reading, mathematics and science*.
- [13]. Ok – Ki Kang (2012), *Teaching Mathematical Modeling in school Mathematics*, 12<sup>th</sup> International Congress on Mathematical Education.
- [14]. Tomas Hojgaard Jensen (2007), *Assessing Mathematical Modeling Competency*, Mathematical Modelling (ICTMA 12) Education, Engineering and Economics (p 141 - 148).
- [15]. Thomas Lingefjard, Mikael Holmquist (2001), *Mathematical Modeling and Technology in Teacher Education – Visions and Reality*, Modeling and Mathematics Education, ICTMA 9: Applications in science and technology (p205 - 215).
- [16]. Rita Borromeo Ferri (2014), *Mathematical Modeling – The Teacher's Responsibility*, Proceedings from the Teachers College Mathematical modeling Oktoberfest (p26- 31).

## THE ALGEBRAIC SETS IN THE GENERAL MATHEMATICS AND TEACHING THEM

Le Thi Mai Huong

*Smartedu Education Centrer, Institute for Research and Dvelopment of New Technoloies, Viet Nam*  
*Corresponding Email: lemaihuong251@gmail.com*

### ABSTRACT

Most of the pictures in general mathematics are algebraic sets, therefore the knowledge of algebraic set is essential to teach them better. In this report, we will present about them and about the Zariski topology and some methods to teach algebraic sets.

**KEYWORDS:** General Mathematics, algebraic sets, Zariski topology, teaching.

## INTRODUCTION

The Straight line, plane, circle, hyperbola, parabola, ellipse, sphere, Paraboloid hyperbolic (face saddle), paraboloid elliptic, hyperboloid of one sheet, hyperboloid of two sheets,... are very important figures in general mathematics (see [4]). They appear in Geometry, Algebra, Analyze and Probability and Statistic. In this paper, we will indicate that almost these figures are algebraic sets and present the methods to teach them. We also introduce topological space, Zariski algebraic set and Zariski topology. Our paper has 2 parts: 1. Zariski algebraic set and 2. Methods of Teaching Algebraic Set in General Mathematics of Viet Nam.

## MATERIALS AND METHODS

For materials, we use frequently the supplementary tools such as computers to design pictures, questionnaires to ask students about their understanding of algebraic sets, field surveys and referral systems as papers, books for reference. And we use, for methods, the method of analysis, synthesis, survey and evaluation results for research.

## RESULTS

### I. Zariski Algebraic Set

We need the definitions following.

#### 1.1 Polynomial

Let  $R$  be the field of a real number and  $f(x) := f(x_1, x_2, \dots, x_n)$  be a polynomial of  $n$  variables or indeterminates  $x_1, x_2, \dots, x_n$ , that means  $f(x)$  has the form

$$f = \sum_{r_1 + r_2 + \dots + r_n \leq d} \lambda_{r_1, r_2, \dots, r_n} x_1^{r_1} x_2^{r_2} \dots x_n^{r_n}; \quad \lambda_{r_1, r_2, \dots, r_n} \in R \text{ call the coefficients. They are}$$

constants. If all coefficients  $\lambda_{r_1, r_2, \dots, r_n} = 0$ ,  $f(x)$  is called the zero polynomial and denoted by  $f(x) = 0$ .

For example,  $n = 1$ ,  $f(x) = \lambda_m x^m + \lambda_{m-1} x^{m-1} + \dots + \lambda_1 x + \lambda_0$ ;

$n = 2$ ,  $g(x, y) = ax^2 + bx - y + d$ ;  $a, b, c \in R$ . Then  $f(x)$  and  $g(x, y)$  are polynomials.

Denote by  $R[x] := R[x_1, x_2, \dots, x_n] = \{f(x) = f(x_1, x_2, \dots, x_n); f \text{ is a polynomial}\}$ . It called the ring of polynomial (see [3], [5], [6]).

The  $n$ -dimensional affine space over  $R$  is defined as the set  $R^n$ . The elements of  $R^n$  are called points.  $R^1$  is called the affine line, and  $R^2$  is called the affine plane.

Let  $f \in R[x_1, x_2, \dots, x_n]$ . A point  $P = (a_1, a_2, \dots, a_n)$  is a root or zero of  $f$  if and only

$$f(P) = f(a_1, a_2, \dots, a_n) = 0$$

#### 1.2. Algebraic Set

A subset  $V \subseteq R^n$  is called an affine algebraic set or an algebraic set or Zariski algebraic set if and only if there is a set of the polynomial  $S \subseteq R[x_1, x_2, \dots, x_n]$ . Such that

$$V = V(S) = \{P \in R^n; f(P) = 0 \text{ for all } f \in S\}. V \text{ is called the root set of the set } S \text{ (see [2], [5], [6]).}$$

**1.2.1. Proposition:** *The following sets are the algebraic sets:*

1/ The empty set  $\emptyset$ ;

2/  $R^n$ ;

3/ Any single point  $P$  in  $R^n$  is an algebraic set.

**Proof:** Because the empty set  $\emptyset$  is the root set of the polynomial  $x^2 + 1 = 0$  and  $\mathbb{R}^n$  is the root set of the zero polynomial 0; The point  $P = (a_1, a_2, \dots, a_n)$  is the root set of  $n$  polynomials of the form  $f_i(x) = x_i - a_i; i = 1, 2, \dots, n$ .

**1.2.2.Theorem:** The collection  $T$  of all Zariski algebraic sets in  $\mathbb{R}^n$  establishes a topology on  $\mathbb{R}^n$ . That means, this collection  $T$  satisfies three conditions following (see [1], [2]):

- (1)  $\emptyset, \mathbb{R}^n \in T$
- (2)  $A_1, A_2 \in T \Rightarrow A_1 \cup A_2 \in T$ ;
- (3)  $A_i \in T (i \in I) \Rightarrow \bigcap_{i \in I} A_i \in T$

**Proof:** By The Proposition 1.2.1.  $\emptyset, \mathbb{R}^n$  are Zariski algebraic sets, then  $\emptyset, \mathbb{R}^n \in T$ . Suppose

$A_1, A_2 \in T$ . By the definition of Zariski algebraic set, exist  $S_1, S_2 \subseteq \mathbb{R}[x_1, x_2, \dots, x_n]$  such that  $A_1, A_2$  are alternately the root sets of  $S_1, S_2$ . Denote by  $S_1 S_2 = \{g_1 g_2; g_1 \in S_1 \text{ and } g_2 \in S_2\}$ . Then  $A_1 \cup A_2$  is the root set of  $S_1 S_2$ . Therefore  $A_1 \cup A_2$  a Zariski algebraic set.

Final, suppose  $A_i$  is the root set of  $S_i, i \in I$ . Then  $\bigcap_{i \in I} A_i$  is a root set of  $\bigcup_{i \in I} S_i$ , hence  $\bigcap_{i \in I} A_i$  is a Zariski algebraic set.

**1.2.3.Theorem:** The Straight line, plane, circle, hyperbola, parabola, ellipse, sphere, paraboloid hyperbolic (face saddle), paraboloid elliptic, hyperboloid of one sheet, hyperboloid of two sheets are the algebraic sets.

**Proof:** Denote by :

$$f_1(x, y) = ax + by + c; a, b, c \in \mathbb{R}; a^2 + b^2 \neq 0;$$

$$f_2(x, y, z) = ax + by + cz + d; a, b, c, d \in \mathbb{R}; a^2 + b^2 + c^2 \neq 0;$$

$$f_3(x, y) = (x-a)^2 + (y-b)^2 - r^2; a, b, r \in \mathbb{R}; r > 0;$$

$$f_4(x, y) = \frac{x^2}{a^2} - \frac{y^2}{b^2} - 1; a, b \in \mathbb{R}; a, b > 0$$

$$f_5(x, y) = ax^2 + bx - y + d; a, b, c \in \mathbb{R};$$

$$f_6(x, y) = \frac{x^2}{a^2} + \frac{y^2}{b^2} - 1; a, b \in \mathbb{R}; a, b > 0$$

$$f_7(x, y, z) = (x-a)^2 + (y-b)^2 + (z-c)^2 - r^2; a, b, c, r \in \mathbb{R}; r > 0;$$

$$f_8(x, y, z) = \frac{x^2}{a^2} - \frac{y^2}{b^2} - 2z; a, b \in \mathbb{R}; a, b > 0;$$

$$f_9(x, y, z) = \frac{x^2}{a^2} + \frac{y^2}{b^2} - 2z; a, b \in \mathbb{R}; a, b > 0$$

$$f_{10}(x, y, z) = \frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} - 1; a, b, c \in \mathbb{R}; a, b, c > 0;$$

$$f_{11}(x, y, z) = \frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} + 1; a, b, c \in \mathbb{R}; a, b, c > 0.$$



Then, the Straight line, plane, circle, hyperbola, parabola, ellipse, sphere, Paraboloid hyperbolic (face saddle), paraboloid elliptic, hyperboloid of one sheet, hyperboloid of two sheets are alternately the root set of the polynomials  $f_i$ ,  $i = 1, 2, \dots, 10$  and 11.

**1.2.4.Theorem:** A subset  $V \subseteq \mathbb{R}$  is a Zaraski algebraic set if and only if  $V$  is the empty set or  $V = \mathbb{R}$  or  $V$  is a finite set.

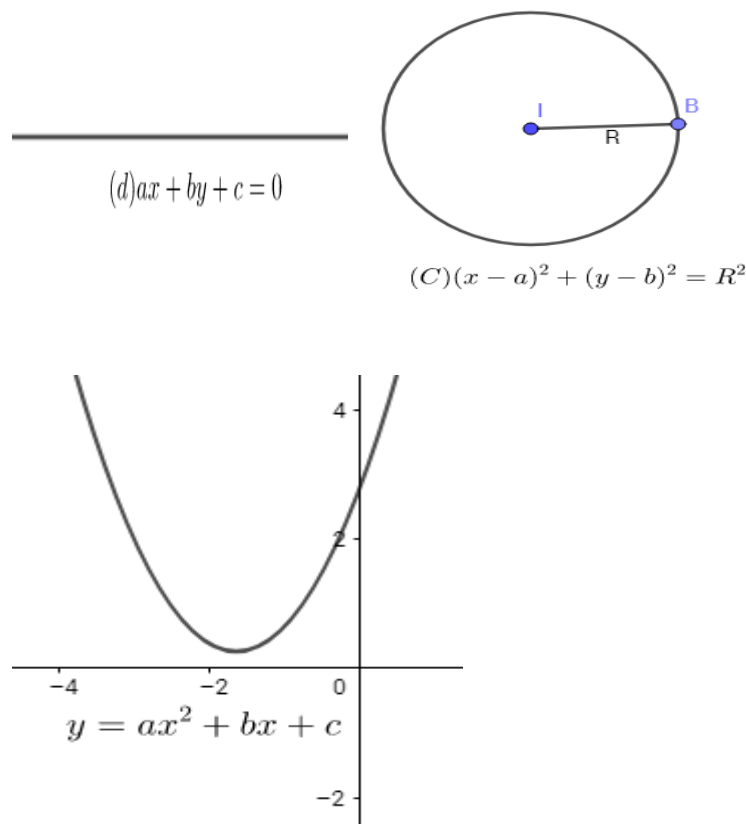
**Proof:** Because all polynomial  $f(x)$  of one indeterminate has only finite the root. Hence if  $V$  is a Zariski algebraic set, that means  $V$  is the root set of polynomials, therefore if  $V$  is not  $\emptyset$  or  $\mathbb{R}^n$ , then  $V$  is a finite set.

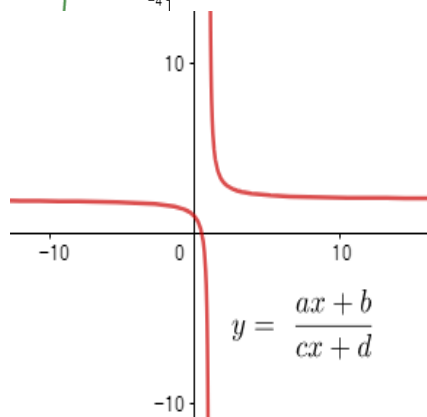
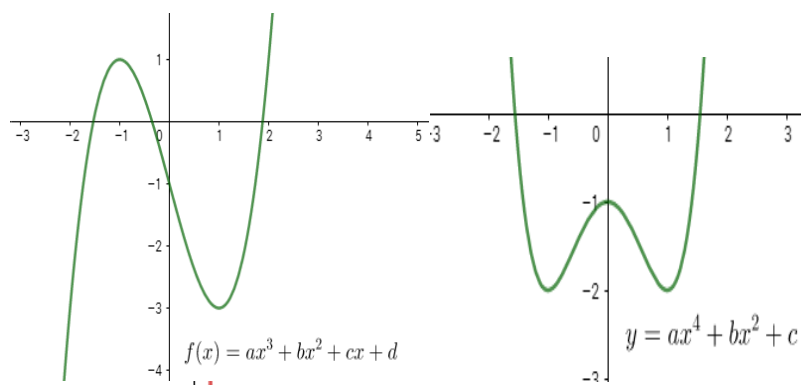
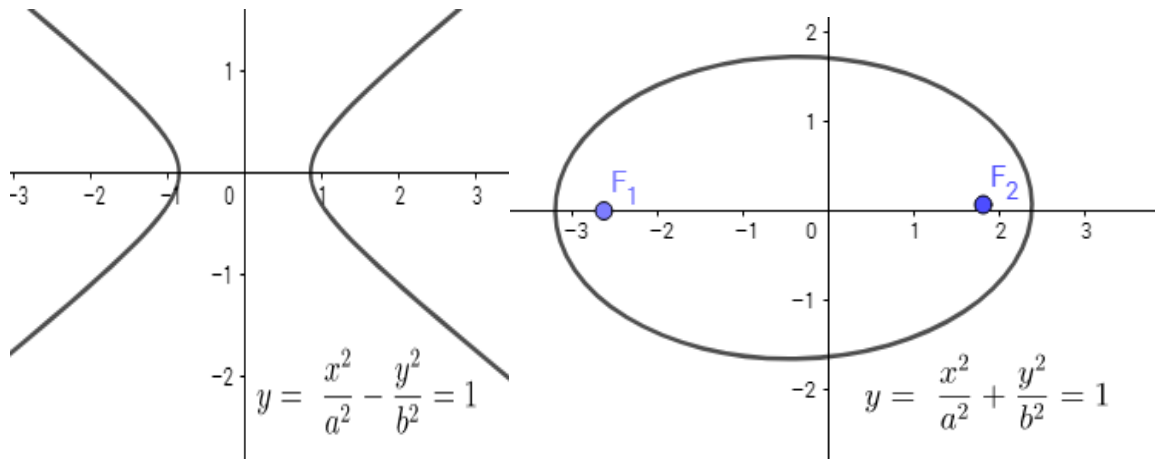
## II. Methods of Teaching Algebraic Set in General Mathematics of Viet Nam

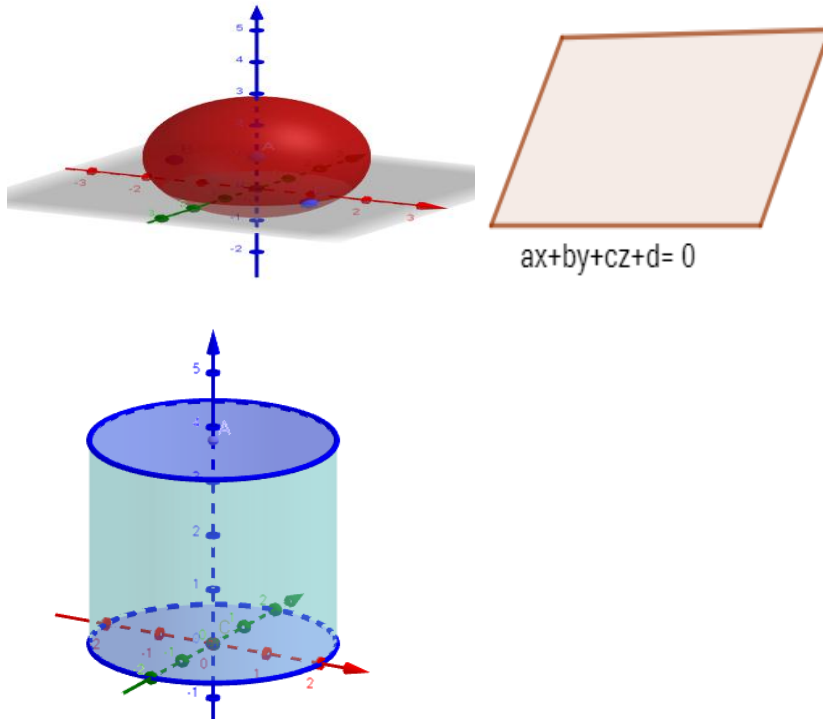
### 2.1 Use geometry to teach algebra set

We use methods drawing the figures and intersecting and asymptote to teach algebraic set.

**2.1.1. Draw the figures:** Drawing the figures, for example, the figures gave in Theorem 1.2.3, we have as following







### 2.1.2. The method of intersecting

In Vietnamese mathematics textbook, the algebraic set appears and occupy positions in the geometric program. Many mathematical problems of correspondence among the figures refer to the algebraic set.

Problem 1: In the plane, consider the relative position between the two lines

$$d_1: a_1x + b_1y + c_1 = 0, d_2: a_2x + b_2y + c_2 = 0$$

Solution: We have  $f_1(x,y)$  and  $f_2(x,y)$  are solution of two variable polynomials  $x, y$

$$\begin{cases} f_1(x,y) = a_1x + b_1y + c_1 \\ f_2(x,y) = a_2x + b_2y + c_2 \end{cases} (*)$$

consider the relative position between the two lines that mean, we solution of the polynomial of two variables  $x, y$

$$\text{- If } (*) \text{ has one solution } \Leftrightarrow d_1 \text{ intersecting } d_2: \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} \neq 0 \Leftrightarrow \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$$

$$\text{- If } (*) \text{ hasn't solution } \Leftrightarrow d_1 // d_2$$

$$\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = 0 \text{ and } \begin{vmatrix} b_1 & c_1 \\ b_2 & c_2 \end{vmatrix} \neq 0 \text{ or } \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = 0 \text{ and } \begin{vmatrix} c_1 & a_1 \\ c_2 & a_2 \end{vmatrix} \neq 0$$

$$\text{Therefore: } \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

$$\text{- If } (*) \text{ has infinitely many solutions } d_1 \equiv d_2$$

$$\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = \begin{vmatrix} b_1 & c_1 \\ b_2 & c_2 \end{vmatrix} = \begin{vmatrix} c_1 & a_1 \\ c_2 & a_2 \end{vmatrix} = 0 \Leftrightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\text{Example 1: } d_2: x + (m-1)y + m-3 = 0$$

Find m to two lines: intersection, coincidental, parallel

We have (I)  $\begin{cases} d_1 : (2m-1)x + y + 3 = 0 \\ d_2 : x + (m-1)y - 3 = 0 \end{cases}$

- $d_1$  : intersecting  $d_2$  if (I) has one solution  $\frac{2m-1}{1} \neq \frac{1}{m-1} \Leftrightarrow m \neq 0$  và  $m \neq \frac{3}{2}$
- $d_1 \equiv d_2$  if (I) has infinitely many solutions  $\frac{2m-1}{1} = \frac{1}{m-1} = \frac{3}{m-3} \Leftrightarrow m = 0$
- $d_1 // d_2$  if (I) hasn't the solution  $\frac{2m-1}{1} = \frac{1}{m-1} \neq \frac{3}{m-3} \Leftrightarrow m = \frac{3}{2}$

Similarly: In the space, have two plane

$$(P_1) : A_1x + B_1y + C_1z + D_1 = 0$$

$$(P_2) : A_2x + B_2y + C_2z + D_2 = 0$$

- $(P_1)$  intersecting  $(P_2) \Leftrightarrow A_1 : B_1 : C_1 \neq A_2 : B_2 : C_2$
- $(P_1) // (P_2) \Leftrightarrow \frac{A_1}{A_2} = \frac{B_1}{B_2} = \frac{C_1}{C_2} \neq \frac{D_1}{D_2}$
- $(P_1) \equiv (P_2) \Leftrightarrow \frac{A_1}{A_2} = \frac{B_1}{B_2} = \frac{C_1}{C_2} = \frac{D_1}{D_2}$

Problem 2: Consider the relative position between a line  $ax + by + c = 0$  and a circle

$(x-a)^2 + (y-b)^2 = R^2$ . That means, we have a solution of the polynomial of two variables  $x, y$ .

Example 2: Find  $m$  to consider the relationship (d):  $3x - y + m = 0$  and (c)  $x^2 + y^2 - 4x + 6y + 3 = 0$ .

We have (I)  $\begin{cases} x^2 + y^2 - 4x + 6y + 3 = 0 \\ 3x - y + m = 0 \end{cases}$

- d intersecting (C) if (I) has two solutions :  $-19 < m < 1$
- d contacts (c) if (I) has one solution  $m = 1, m = -19$
- d and (c) are not intersection if (I) hasn't the solution:  $m < -19$  hay  $m > 1$

Similarly: In the space, consider the relationship  $d : \begin{cases} x = 2t \\ y = 1 - t \\ z = 3 + t \end{cases}$  and (P)  $x + y + z - 10 = 0$ .

That means we find solution  $t$ :  $2t + 1 - t + 3 - 10 = 0 \Leftrightarrow t = 3$ . Therefore, (d) and (P) have one point common.

Problem 3: Consider the relationship of the funtions.

Example 3: Find  $m$  to (d):  $y = -x + m$  intersecting the funtion (C)  $y = \frac{x}{x-1}$  at two distinct points

We find the intersection:  $-x + m = \frac{x}{x-1} \Leftrightarrow f(x) = x^2 - (m-2)x - m = 0$  ( $x \neq -1$ )

(d) intersecting the funtion (C) at two distinct points  $\begin{cases} \Delta = (m+2)^2 > 0 \\ f(-1) = -1 \neq 0 \end{cases} \Leftrightarrow m \neq -2$

Example 4: Find  $m$  to  $y = -1$  intersecting at four distinct points and the  $x$ - coordinate of the points are less than 2.

We have:  $x^4 - (3m+2)x^2 + 3m = -1$

$$\Leftrightarrow x^4 - (3m+2)x^2 + 3m+1 = 0 \Leftrightarrow \begin{cases} x=1, x=-1 \\ x^2 = 3m+1 \end{cases} \quad (*)$$

$y = -1$  intersecting at four distinct points the  $x$ - coordinate of the points are less than 2 if and only if equations (\*) have two distinct solutions and  $x \neq 1, x \neq -1, x < 2$ .

$$\Leftrightarrow \begin{cases} 0 < 3m+1 < 4 \\ 3m+1 \neq 1 \end{cases} \Leftrightarrow \begin{cases} -\frac{1}{3} < m < 1 \\ m \neq 0 \end{cases}$$

Example 5: Find  $m$  to a line  $y = -x + 3$  intersecting (c) at three distinct points.

We have:  $x^3 - 3(m+1)x^2 + mx + 3 = -x + 3 \Leftrightarrow x[x^2 - 3(m+1)x + m+1] = 0$

$$\Leftrightarrow \begin{cases} x=0 \\ f(x) = x^2 - 3(m+1)x + m+1 = 0 \end{cases}$$

a line  $y = -x + 3$  intersecting (c)  $y = x^3 - 3(m+1)x^2 + mx + 3$  at three distinct points if  $f(x)$  has two distinct points and  $x \neq 0$

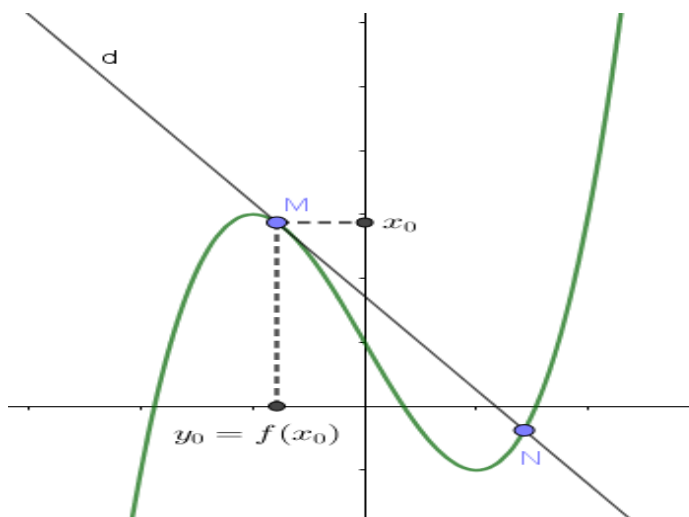
$$\begin{cases} \Delta = 9(m+1)^2 - 4(m+1) > 0 \\ f(0) = m+1 \neq 0 \end{cases} \Leftrightarrow \begin{cases} m < -1 \\ m > -\frac{5}{9} \end{cases}$$

**Comment:** Any problem of the relationship between lines in general mathematics can be used algebraically to solve. The distribution of algebraic sets will be an algebraic set.

The solution to these problems is to use algebra. It then uses algebraic sets to study any geometry in general mathematics.

## 2.2. Tangent function:

**2.2.1. Definition:** Assume that the function  $y = f(x)$  has a graph that is denoted by (C), a line tangent to (C) at the point called tangent of (C) at point M



In this definition, tangent is essentially the intersection of two sets of algebraic terms "d in contact with (C)": d in contact with (C) at point M and cut (C) at point N.

Point  $M(x_0, y_0)$  is called contact points (tangent points) of tangents and graphs. Since point M is a graph of the function  $y = f(x)$  so  $y_0 = f(x_0)$ .

In the general mathematics, we assume that the tangent of tangents at the principal point is the derivative of the function  $y = f(x)$  at the point  $x_0$ . So we get the tangential equation:  $y - y_0 = f'(x)(x - x_0)$ .

## 2.2 Asymptote

### 2.2.1. Vertical asymptotes

The line  $(d)x = x_0$  is a *vertical asymptote* of the graph of the function  $y = f(x)$  if at least one of the following statements is true

$$\lim_{x \rightarrow x_0^-} f(x) = +\infty \text{ or } \lim_{x \rightarrow x_0^+} f(x) = +\infty \text{ or } \lim_{x \rightarrow x_0^-} f(x) = -\infty \text{ or } \lim_{x \rightarrow x_0^+} f(x) = -\infty.$$

### 2.2.2. Horizontal asymptotes

The line  $(d)y = y_0$  is a horizontal asymptote of the graph of the function  $y = f(x)$  if  $\lim_{x \rightarrow +\infty} f(x) = y_0$  or  $\lim_{x \rightarrow -\infty} f(x) = y_0$ .

### 2.2.3. Oblique asymptotes

The line  $(d)y = ax + b$  ( $a \neq 0$ ) is an oblique asymptote of the graph of the function

$$y = f(x) \text{ if } \lim_{x \rightarrow +\infty} [f(x) - (ax + b)] = 0 \text{ or } \lim_{x \rightarrow -\infty} [f(x) - (ax + b)] = 0.$$

## CONCLUSION

All pictures and more than half of the problems of general mathematics are algebraic sets, although the algebraic set is not taught explicitly, so the teacher needs knowledge of algebraic set and algebraic geometry to teach general mathematics, they will be deeper.

## ACKNOWLEDGEMENTS

I would like to take this opportunity to express my gratitude to Rajabhat Maha Sarakham University, Thailand for kindly inviting us and allowing us to present my research results at Conference ICSSS 2017 organized by this University. I thank so much of the referees for contributing their valuable suggestion and ideas to our article and I thank so much also Assoc. Prof. Dr Nguyen Huynh Phan who taught me Algebraic Geometry and guided and advised to complete this paper.

## REFERENCES

- [1] Doan Quynh – Hoang Xuan Sinh (1987): *What is Topology?* (in Vietnamese). Publishing house of Education, Ha Noi.
- [2] J.L Keli (2017): *General topology*, Published by Dover Publications Inc.
- [3] Justin R. Smith: *Introduction to Algebraic Geometry*; Justin Smith's home page: <http://www.five-dimensions.org> Email: justinsmithauthor@gmail.com, c 2014. Justin R. Smith. All rights reserved. ISBN-13: 978-1503381537 (CreateSpace-Assigned) ISBN-10: 150338153.
- [4] Ministry of Education and Training: *General mathematics textbook class 10, 11, 12*
- [5] Ngo Viet Trung (2012): *Introduction to commutative algebra and algebraic geometry* (in Vietnamese), Vietnam national University, Ha Noi.
- [6] Nguyen Huynh Phan: *Introduction to Algebraic Geometry* (in Vietnamese). Master's degree lecture, Major in Geometry and Topology. Institute for Research and Development of New Technologies, 2012.

## HELPNG EFL LEARNING ACHIEVE EFFECTIVE SPEACKING

Mananya Potiracha

*Faculty of Liberal Arts and Science, Nakhon Phanom University  
167 Moo8, Narachakwai Subdistric, Muang District, Nakhon Panom 48000  
Thailand*

*Author for correspondence, e-mail: mananya-po@hotmail.com*

### ABSTRACT

From EFL learners' point of view, speaking seems to be the most difficult skill to achieve. Learners at every level from primary to tertiary level and adult learners struggle with effectively speaking. Their problems relate to several aspects of English language, for example, grammar and pronunciation. Providing dedicated activities and tasks in classroom as well as using technology provide learners to practice and achieve their speaking.

**KEYWORDS:** Effective speaking, Speaking technique, Speaking tasks, Speaking activities, Improving pronunciation, Improving intonation



## INTRODUCTION

Thailand has been implemented English language in education system for decades. The emphasis on the foreign language learning is important for globalization. Foreign language serves as an important tool for communication, education, seeking knowledge, livelihood, and creating understanding of cultures and visions for the world community [1].

In Thailand, English has been established as a first foreign language, but recently, the Ministry of Education aimed to reform education to enable learners to communicate and work effectively in English as well as Chinese and other languages [2]. In contrary, the English proficiency of Thai students is low. According to EF English Proficiency Index in 2017 [3], the ability of English of Thais is ranked at 15 out of 20 countries in Asia and 53 out of 80 countries worldwide. It is commonly known that Thai students do not usually use English in daily life. Nonetheless, Thais need to urgently improve their English skill.

According to the launch of AEC (Asean Economics Community) offered the opportunity of eight fields of professions allowed to free movement throughout the region. The eight fields are accountancy, engineering, surveying, architecture, nursing, medical services, dental services and tourism. Prime Minister Prayut Chan-o-cha encouraged people to pay more attention on capacity to communicate in English, he called on people to increase their skill in order to compete in AEC labor market, as they will have tougher competition with neighboring countries, said Sansern Kaewkamnerd government spokesman [4].

English is a foreign language that has been taught for several decades in Thai education, but the English proficiency of Thais is considered low. It is necessary for Thais to be aware of the importance of English. In order to communicate with people from other countries, especially in the ASEAN community. To communicate with other people all over the world, helping students to achieve effective speaking is urgent and necessary. The focus of this article is on improving pronunciation, stress and intonation for EFL learners which consists of activities and tasks in classroom and also using technology to practice speaking outside the classroom to help learners to use the language to succeed communicating.

### Who are English as a Foreign Language Learners?

There are several terms of learners who learn English used by National Council of Teachers of English [5] to describe different type of learners.

1. ELL (English Language Learner) who is an active learner of the English language who may benefits from various types of support programs. This term is mainly use in the U.S. to describe K-12 students.

2. ESL (English as a Second Language) formerly used to designate ELL students; this term increasingly refers to a program of instruction designed to support the ELL. It is still used to refer multilingual students in higher education.

3. EFL students described as non-native-English- speaking who are learning English in a country where English is not a primary language.

As an English language is taught as a foreign language in Thailand, which its official language is Thai. Thus, English learners in Thailand are considered as EFL learners as well.

### What Are the Characteristics of Speaking?

There are two important characteristics of speaking. First, speaking happens in real time: usually the person you are talking to is waiting for you to speak right then. Second, when you speak, you cannot edit or revise what you say, as you can when you are waiting. Speaking is the productive aural/oral skill which consists of producing systematic verbal utterances to convey meaning [6]. Its form and meaning are dependent on the context in which it occurs, including the participants themselves, their collective experiences, the physical environment, and the purposes for speaking [7].

### Skill for Effective English Speaking

To speak effectively in another language, we need a variety of tools. Conversation is a complex activity. It can cause difficulties either for the speaker or listener:

1. As a speaker you may not remember the exact word or expression for what you want to say. In this case, you need communication strategies, which finding another way of expressing the meaning in a different form.
2. As a listener, you may not understand or hear the speaker, so you have to signal the speaker and negotiating to resolve the problem between you and a speaker. It is referred as conversational repair [8].

### **Challenges and Difficulties for EFL Learners in Speaking**

Richards [9] addresses that the mastery of speaking skills in English is priority for many second and foreign language learners. Learners frequently evaluate their success in language learning also their English course on the basis of how well they feel they have improved in their spoken language proficiency. The aim of English education is to provide learners sufficient understanding of language and be able to read and write it. If they cannot speak English, the aim has not been completely achieved [10]. Constantly, the teacher should carefully think about what problems considered the obstacles that learners have to overcome in order to achieve effective speaking.

At every level of English language learning from primary to tertiary level as well as in adult learning, there are challenges that students have to cope with. Also, in many parts of the world, students find speaking as their greatest challenge in classroom. Copeland [11] studied the challenges of teaching young learners from teachers in five different countries which consist of Colombia, Italy, South Korea, Tanzania, and the United Arab Emirates. The results revealed that in Colombia, the greatest challenge of students is speaking which need to be developed. Students need to be helped to improve their pronunciation and avoid Colombian accent when they speak. So, challenges and difficulties occurred at every level of learners.

### **Challenges and Difficulties Faced by Young Learners**

For young learners, according to the study of Al Hosni [12], the difficulties in speaking that those learners had were linguistics difficulties, mother tongue use, and inhibition. For linguistics difficulties students could not find appropriate vocabulary when they speak even they wanted to speak; moreover, students had insufficient vocabulary. In class they discussed in mother tongue because they did not know how to say it in English. Another reason was inhibition which students were worried to make mistakes.

### **Challenges and Difficulties for Secondary and Tertiary Learners**

For high school learners in Vietnam, the majority of students thought the problems that they had were; they spoke only little or not at all in class; they were worried to make mistakes; they could not think of anything to say; and they often used Vietnamese in class [13]. For vocational students who studied in private vocational school in Bangkok, Thailand, they have faced problems in speaking. Such as students found it difficult to speak with the correct intonation, they experienced frustration when practicing speaking with a student whose English ability was lower than their level [14]. At tertiary level, university students at basic level it leads to frustration, implementing speaking strategies is to support and enhance students' oral participation. The speaking strategies implemented are fillers, circumlocution, asking for clarification, and expressing not understanding. After using these strategies, the result showed that students showed more confidence to perform communicating and expressing confidently [15].

Also, speaking English for adult learners is not easy task, even though they had studied English language before. The study of Paakki [10] addressed the difficulties in speaking English of Finnish and Japanese adult learners. They perceived speaking English as difficult. For example, their previous education was grammar oriented, a fear of error, a lack of practice.

### **Classroom Speaking Activities and Tasks**

To help students to overcome their difficulties in speaking. There must be activities to practice and tasks to achieve. To give students opportunities to speak in class, teacher should concern about appropriate activities and tasks for them; however, before getting students to speak, motivating them to participate is a challenging task to figure out students' obstacles of speaking, teacher needs to be certain that they not feel pressured or inadequate. Teacher should observe students' information in order to know reasons that keep them being shy or quiet. Sometimes teacher needs to wait until the students are ready to speak after the silent period. To encourage students to speak up, there should be topics that relate to them, and they feel the desire to share their stories with their teacher [16].

As a teacher, helping students to overcome the struggles in speaking is crucial. They are the number of suitable activities and tasks to be employed in classroom. Examples of activities used in the classroom are role play, simulations, asking and giving questions, and brainstorming. Using these activities give students chance to get students to speak. For instance, role play activities give students chance to speak as they pretend to have social roles. Furthermore, teachers can give information to students of who they are or what they think or feel [17]. Nunan [6] states that besides these activities, tasks can be used in communicative classroom to active the learning of students including problem solving, listening to authentic audio/video material, discussions and

information gaps. He also suggests the example of a task that engages students in speaking practice is information gap tasks which two or more students have access to different information and they have to share the information in order to complete the task. Information gap tasks are popular because; they work well with students who are at post beginner to advanced; students participate actively; all students have to take part if the task is to work; they work well with mixed level groups.

### **Improve Pronunciation of EFL Learners**

For EFL learners, apart from learning to use communication and speaking strategies, to develop their pronunciation is also essential to help them succeed effective speaking. Pronunciation is crucial in speaking in order to have intelligible conversation. Nation and Newton [18] states that developing pronunciation is an important mechanism involved in the working memory called phonological loop which is brain repeating a word or a phrase to itself in order to keep it in working memory or to help it move to long term memory.

The unrealistic idea of learners should sound and speak like native speakers is fast disappearing [19]. It is more important for learners of English to achieve:

- intelligibility (the speaker produces sound patterns that are recognizable as English)
- comprehensibility (the listener is able to understand the meaning of what is said)
- interpretability (the listener is able to understand the purpose of what is said)

For teachers, activities that can be adopted to teach speaking. For example, breathing techniques to improve pronunciation of intermediate students. Focusing on how breath control contributes to good pronunciation which are:

- breathing capacity and control
- awareness of the role of breath
- tongue and lip position movement

The presentation sequence:

Step 1 begin with stretching and deep breathing exercise

Step 2, demonstrate the sound of voiceless consonants including *p, t, f, k, s, sh, th, tsh*

Step 3, students undertake limbering -up exercise for moving parts of their mouth. Preparing students for connect speech. For example, the sound of the “t” which is the long t as *t t t t* (“get out”)

Step 4, using tongue twister e.g. I want a proper cup of coffee in a proper copper coffee pot

The focus is on the mechanics of articulation, providing students with an awareness of the breath capacity and control needed in English, and the positioning of the tongue, lips and jaw for accurate pronunciation of certain sounds.

Brown and Nation [20] give simple suggestions for correcting pronunciation.

1) Say “What” and see if learner is capable for self- correction.  
2) Give the correct form for learner to copy. If learner cannot copy after two or three attempts. Some explanation and guidance are needed.

3) Explain how to make the correct form if necessary, what is wrong with error. For example, make the /th/ sound as in “then,” say “Put your tongue between your teeth and make a long sound.”

Manurung [21] implemented contextual internet-based instructional materials in an EFL class in Indonesia. The purpose of the using these materials was to improve students’ speaking skill. This technique helped students to improve their speaking and overcome the problems they have had.

Prior to students are able to speak proper English they need to hear language spoken correctly. In the classroom, when students use language correctly, it needs to be repeated and reinforced by the teacher. When they use the language incorrectly, teacher should talk about the idea of them using correct grammar and pronunciation.

Moreover, teacher should give them opportunity to choose they own topics to discuss in class. The example of activity which used in class: 9/11 photographs which can be found on the website: <http://911.navexpress.com> [22].

Teacher selected picture from photo from website, showed the picture to students then asked students questions as listed below:

- What items do you see in this photo?

- Who are the people in this photo?
- Where are they?
- How are they dressed?
- Why are dressed the way they are?
- Why are they in the photo?
- What emotions are expressed in their faces?
- What has happened to them?

This exercise had students to have oral discuss in whole group which every student expresses the idea to the rest of the group. After finishing activity, students will be able to discuss their thought about the story of the photo. During activities teachers must provide support for students to get the task successfully done. Richards [9] points out factors which can be varied as to increase or decrease level of fluency include:

- Participation: Whether the activity is completed individually or with other learners.
- Procedures: The number of procedures involved in completing an activity.
- Resources: The materials and other resources provided for the learners to use while completing an activity.
- Order: The sequencing of an activity in relation to previous tasks.
- Product: The outcome or outcomes students produce, such as a written product or an oral one.

The activities that teachers use in the classroom need to be identified and selected by teachers to aim at giving students a chance to speak. Teachers must support students' learning throughout the activity to help them achieve the task. Teachers should also be careful not to overload a speaking lesson with other new material such as numerous vocabulary or grammatical structures. This can distract learners from the primary speaking goals of the lesson [7].

### Improve Stress and Intonation for EFL Learners

Languages can be classified according to whether they are stress-timed or syllable-timed. It used to be thought that in a stress-timed language (like English) the stresses were equal distances apart even though the number of syllables between each stress was not the same [18]. Word stress is important in English speaking in order to make listener understand what you are saying. Mistakes in word stress are a common cause of misunderstanding in English. Here are the reasons:

- Stressing the wrong syllable in a word can make the word very difficult to hear and understand
- Even if the speaker can be understood, mistakes with word stress can make the listener feel irritated, or perhaps even amused, and could prevent good communication from taking place.

When we stress syllables in words, we use a combination of different features. Experiment now with the word 'computer'. Say it out loud. Listen to yourself. The second syllable of the three is stressed. What are you doing so that the listener can hear that stress?

A stressed syllable combines five features:

1. **It is l-o-n-g-e-r** - com p-u-ter
2. **It is LOUDER** - comPUTer
3. **It has a change in pitch** from the syllables coming before and afterwards. The pitch of a stressed syllable is usually higher.
4. **It is said more clearly** -The vowel sound is purer. Compare the first and last vowel sounds with the stress Stressed sounds
5. **It uses larger facial movements** - Look in the mirror when you say the word. Look at your jaw and lips in particular [23].

Nation and Newton [18] suggest a technique to teach word stress using the following steps:

- The teacher taps the stress pattern of a word, with a hard tap for the stressed syllables and soft for the others. The learners say the word
- When the teacher provides a model, she can make the stressed syllable longer than usual and the unstressed ones very short. • When the learners say a word, they make a gesture to go with the stressed part of the word. This gesture can be a hand movement.

- The teacher says a sentence and she stops before a word that gives the learners problems with the stress. Instead of saying the word she taps the stress pattern on the table. The learners must guess the word by listening to the context and stress pattern, and then say it.

“Very well, I’ll come tap TAP tap tap.” (immediately)

- If the learners need extra help to guess the word the first letter can be given.
- The learners are given a list of words. The teacher reads them and the learners underline the stressed syllables.
- The learners are given a list of words and they put them in groups according to their stress pattern. The teacher can give them some model words to represent each stress pattern. When practicing stress, the teacher can present words with the same stress pattern for practice.

Intonation is feature of pronunciation and common to all languages. Other features of pronunciation include stress, rhythm, connected speech and accent. As with these other features, intonation is about how we say something rather than what we say. At its simplest, intonation could be described as 'the music of speech'. A change or variation in this music (or pitch) can affect the meaning of what we say. For learners, there are ways to improve your intonations. To be aware of intonation is the best way to improve it. Listening carefully to the conversation and noticing how other speakers use intonation to express themselves. Another way is record your own voice. You can try record a dialogue with a friend then listen to your own intonation. The advantage of recording is you can always rewind, listen again and try a new version. Recordings are an excellent way to keep track of your progress. They clearly show how you have improved over time [24]

### Improve Speaking Fluency Using 4-3-2 Technique

In real life, when we speak, we need to keep up with the conversation or it will move on and your response will be irrelevant.

It is common experience that when speaking another language, we are aware of greater time pressure than speaking in our own language. One of number of ways to practice speaking under time pressure is a technique called 4-3-2 to increase your fluency. Process of this technique as following:

1. Find a text (e.g. a newspaper article). Read it and make notes, on a separate piece of paper, of the main points. Put the article away, but keep your notes.
2. Record yourself giving an oral summary based on your notes. Allow yourself four minutes.
3. Replay and listen; monitor your performance - are there any words you need to look at again in the article? Do you need to check their pronunciation (sound and stress) in the dictionary? If so, do that.
4. Rewind. Make a second recording, but this time give yourself only three minutes.
5. Repeat Step 3.
6. Make a final recording, summarizing the text in two minutes.

Although this technique it is very artificial, but it has the advantage of making you talk about important and maximum information into the shortest time [8].

Mohaved and Karkia [25] implemented this technique in the classroom of Iranian English learners which it showed that 4-3-2 technique improved students’ speaking skill was apparently effective. The students were evaluated their speaking fluency by end of the term.

### Using Technology to Help Learners Practice Speaking Outside Classroom

Besides activities that teachers provide for their learners in classroom, there are tools that can be used outside classroom which students can benefit from.

Garry Motteram [26] editor of **Innovations in Learning Technologies for English Language Learning**, his current book for British Council, explains how technologies help learning in the classroom. He says, “Technology is very much part of the language learning throughout the world at all different level. We are as likely to find it in the primary sector as much as in adult education”. Moreover, he argued that digital technologies are ideally placed to help teachers working with learners, and learners working independently, to do the necessary “languaging” that makes their language development possible. There are a variety of ESL or EFL apps and tools that make the learning process easier for the learners for both Android and iOS. Here are some the most popular apps to learn English language [27]. I selected two of them.

#### 1. Hello-Hello English

It was built in part by the American Council on the Teaching of Foreign Languages. It uses a teaching method called Mobile Immersion to create a virtual environment that guides learners visually to develop



functional language skills. It comes with 30 conversational lessons based on real-life situations. Animated lessons, games and exercises allow students to practice speaking, writing, reading and listening skills.

## 2. SpeakingPal English Tutor

It is an interactive app that uses a mobile phone's speech recognition capability. It features a series of 5-minute mini-lessons, dialogues, interactive exercises, role-playing and language activities. Using the speech recognition technology, this app provides instant feedback on the students speaking performance and a review mode for later.

Apart from Apps that have been mentioned another application which using AI (Artificial Intelligence) is one of the innovation to help improve learners' pronunciation. In March 2016, ELSA which stands for **English Language Speech Assistant** was debuted at SXSWed Launch Competition, is an AI to help people improve their pronunciation. There is different curriculum which users can access to. When lead through a series of vocabulary words and phrases, and ELSA's algorithms analyze their speech. If ELSA detects a mispronunciation, it tells the user not only how the word should sound, but also how to move the tongue and lips to form the correct word [28] It has been used for over 40 million times by the users and it helps improve pronunciation drastically [29].

## CONCLUSIONS

As English is an important language that implemented in Thai education for several decades [1]. The launch of the ASEAN community urges Thais to focus on capacity in English communication to compete with other countries in the community [4]. Even though speaking is essential for communication, but learners find it as most difficult skill to achieve. The challenges that learners have encountered were they were afraid of making mistakes and feared of error [12-13-10]; they were frustrated when they had to practice speaking with classmates who have lower level of English than their level [14-15]. Before starting to have students to speak, teacher needs to wait until they are ready to share their stories [16]. The examples of activities and tasks that can be implemented in class for them to practice speaking are role play [17] and discussions [6].

To achieve intelligible conversation, the activities in the classroom should emphasis on pronunciation, stress, and intonation. Later, teacher can use the technique to improve students' fluency. Another alternative to practice speaking for learners is using technology is a good option to practice English outside the classroom. The Applications (Apps) can be downloaded for iOS and Android systems.

## DISCUSSION

Speaking is viewed as the most difficult skill in EFL learners' point of view. However, there are several activities and tasks to help EFL students to improve and achieve effective speaking. Activities and tasks should be implemented in the classroom to give learners opportunity to practice speaking and share what they think or how they feel. Learners should feel engaged and passionate to talk about the topics that teacher provides for them. When they reach the readiness to speak they are ready to use the language through speaking. Another technique that teachers can employ in classroom is 4-3-2 technique to improve learners' fluency. It is one of effective ways to help learners develop their speed in speaking. The result of this technique used with Iranian learners [25] found that at the end of the term their speaking was improved. As well as strategies used in classroom helps learners to be more confident when they communicate and express themselves [15]. To achieve effective speaking as intelligible speakers they need to improve their skill, for example, pronunciation and intonation which teachers can adopt technology to help teachers to work with learners and learners can work on their own. Mobile applications can be used whenever and wherever learners want. It is convenient and practical to use applications on their phones to practice speaking. There are many speaking apps which can improve learners' pronunciation. For instance, ELSA which helps learners to pronounce words and phrases correctly, makes the users improve their pronunciation dramatically [29].

To summarize, to help learners to achieve effective speaking, teachers should consider the suitable activities and tasks to help them practice. There are various activities and tasks to choose from whether teachers work with learners in classroom or learners practice speaking themselves. The activities, tasks, techniques, strategies and applications discussed in this article cover the important parts of speaking which is essential for learners to speak effectively.

## ACKNOWLEDGEMENTS

I would like to thank Mr Libbe van der Horn for helping me proofread this article and for his great support throughout this article writing and I would also like to thank my coworkers in English Language Department, Faculty of Liberal Arts and Sciences, Nakhon Phanom University for their encouragement and support.

## REFERENCES

- [1] Ministry of Education. (2008). The Basic Education Core Curriculum B.E. 2551 (A.D. 2008). The Ministry of Education. Thailand.
- [2] Ministry of Education (2008, cited in Khamprated, 2012). *The problems with the English listening and speaking of students studying at a private vocational school in Bangkok*. Master of Arts in Teaching English as Foreign Language. Srinakharinwirot University.
- [3] EF English Proficiency Index. (2017). *The world's largest ranking of countries by English skills: Introducing seventh edition*. <http://www.ef.co.th/epi/>
- [4] Bangkok Post. (2016). *Asean Community Challenges Thai English Skills*. <http://www.bangkokpost.com/learning/learning-news/813852/asean-community-challenges-thai-english-skills>
- [5] National Council of Teachers of English. (2008). *English Language Learners. A Policy Research Brief*. Illinois, USA.
- [6] Nunan, D. (2003). *Practical English Language Teaching*. The MacGrill-Hill Companies, Inc.
- [7] Florez, M, A. (1999). *Improving Adult English Learners' Speaking Skills*. National Center for ESL Literacy Education Washington DC. <http://area.dge.mec.pt/gramatica/whatspeakingis.htm>.
- [8] Lynch,T and Anderson,K. (2012).*Effective English Learning*. ELTC self-study materials. English Language Teaching Center, University of Edinburgh.[https://ed.ac.uk/files/imports/fileManager/UNIT\\_7\\_Speaking.pdf](https://ed.ac.uk/files/imports/fileManager/UNIT_7_Speaking.pdf)
- [9] Richards, J. (2017). *Helping learners Develop Grammatical Accuracy, Fluency and Complexity*. [www.cambridge.org/elt/blog/2017/10/04/accurate-fluent-and-complex-grammar/](http://www.cambridge.org/elt/blog/2017/10/04/accurate-fluent-and-complex-grammar/)
- [10] Paakki, H. (2013). *Difficulties in Speaking English and Perceptions of Accents: A comparative Study of Finnish and Japanese Adult Learners of English*. *English Language and Culture*. School of Humanities. University of Eastern Finland.
- [11] Copeland, F. (2014). *Challenges in Teaching English to Young Learners: Global Perspectives and Local Realities*.[http://research.aston.ac.uk/portal/files/19241954/Teaching\\_English\\_to\\_young\\_learners.pdf](http://research.aston.ac.uk/portal/files/19241954/Teaching_English_to_young_learners.pdf)
- [12] Al Hosni, S. (2014). *Speaking Difficulties Encountered by Young EFL Learners*. Indiana University Bloomington.
- [13] Nguyen, H.T, and Tran,N. M. (2015). Factors affecting students' speaking performance at Le Thanh Hien high school. *Asian Journal of Educational Research*, 3 (2).11-23.
- [14] Khampreted, N. (2012). *The problems with the English listening and speaking of students studying at a private vocational school in Bangkok, Thailand*. Master of Arts in Teaching English a Foreign Language. Srinakharinwirot University.
- [15] Melendez,R. A. M., Zavala, G.G.Q., and Mandez, R.F. (2014). Teaching Speaking Strategies to Beginners. *European Scientific Journal*,1.548-554.
- [16] Ostrovsky, A. (2015). *How to help students to stop struggling and start speaking*. Cambridge University Press.<http://cambridge.org/elt/blog/2015/01/05/help-students-stop-struggling-start-speaking/>
- [17] Kayi,H. (2006). Teaching Speaking: Activities to Promote Speaking in a Second Language. University of Nevada. <http://iteslj.org/Techniques/Kayi-TeachingSpeaking.html>.
- [18] Nation, I.S.P., Newton,J. (2009). *Teaching ESL/EFL Listening and Speaking*. ESL Applied Linguistics Professional Series: Routledge, New York and London.
- [19] Burns,A and Claire,S. (2003). *Clearly Speaking Pronunciation in Action for Teachers*.National Center for English Language Teaching and Research. Macquarie University, Sydney, Australia.
- [20] Brown,S.R,and Nation,P. (1997). *The Language Teacher*. <http://www.victoria.ac.nz.lals/about/...nation/1997-Brown-Speaking.pdf>



- [21] Manurung, K. (2015). Improving the speaking skill using reading contextual internet-based instructional Material in an EFL class in Indonesia. *Procedia - Social and Behavioral Sciences*, 176.44 – 51.
- [22] Narowski, M.L.L. (2009). *Using Art to Encourage Effective Speaking and Writing Skills with ESL students*. Yale-New Haven Teachers Institute. Yale University.  
<http://teachersintitute.yale.edu/curriculum/units/2009/1/09.01.08.x.html>
- [23] *British Council*. (2015). Word Stress. <https://www.teachingenglish.org.uk/article/word-stress>
- [24] Muniem, F. (2015). How English learners can improve intonation <https://www.britishcouncil.org/voices-magazine/how-english-learners-can-improve-intonation>
- [25] Mohaved, R and Karkia, P. (2014). Reading/ Listening & the 4/3/2 on EFL Students' Speaking Skills. *International Journal of Linguistics*, Vol 4 (2). 55-66.
- [26] Motteram, G. (2013). *The benefits of new technology in language learning*.  
<https://britishcouncil.org/voices-magazine-the-benefits-new-technology-learning>
- [27] Koltai, A. (2013). *9 Most Popular iOS Apps to Learn English*. <https://myenglishteacher.eu/blog/9-most-popular-ios-and-android-apps-to-learn-english-language/>.
- [28] Haynes, C. (2016). The App Using Artificial Intelligence to Improve English Speaking Skills.  
<https://forbes.com/sites/chynes/2016/08/30/the-app-using-artificial-intelligence-to-improve-english-speaking-skills-#653197bale82>.
- [29] *ELSA*. (2017). ELSA teaches you to speak English fluently. <https://elsaspeak.com/home>

## DEVELOPING MATHEMATICAL COMMUNICATION OF STUDENTS THROUGH EVALUATING DEBATE IN SCIENCE IN TEACHING CONTINUOUS FUNCTION.

Phat Vinh Vuong<sup>b</sup>Trung Le Thai Bao Thien,<sup>a</sup>

<sup>a</sup> *An Giang University, 18 Ung Van Khiem, Dong Xuyen ward, Long Xuyen city, An Giang province, Viet Nam.*

<sup>b</sup> *Ho Chi Minh City University of Pedagogy, 280 An Duong Vuong, 4 ward, 5 district, Ho Chi Minh city, Viet Nam*

*Corresponding a e-mail: phatvv2012@gmail.com.*

*Corresponding b e-mail: trungltbt@hcmup.edu.vn.*

### ABSTRACT

Debate in science is one of the teaching methodologies that is widely implemented in the social science and the natural science. Designing a teaching project by applying scientific debate is the main aim of this paper in order to promote the mathematical communication of students. To achieve this aim, we will present a teaching project about continuous function by scientific debate and use a framework for evaluating the quality of students' argumentation. Analysis of the data confirms that mathematical communication skills of students can be developed when teachers organize scientific debate in teaching mathematics.

**KEYWORDS:** mathematical communication, scientific debate, continuous function, evaluating debate, argumentation.

## INTRODUCTION

At the beginning of the twenty-first century, there were some researchs about the ability of mathematical communication student's during mathematical lessons. The ability to communicate in mathematics should be practiced for students from elementary to high school. A number of studies have been published, such as "Using case studies to develop mathematical communication skills for secondary students" by Tuong Hoa Anh (2014), "Using mathematics study to develop quantitative knowledge capacity of students grade 10" by An Nguyen Thi Tan (2014), "Developing mathematical representation and mathematical communication skills for students grade 6 and grade 7 in teaching mathematics" by Binh Vu Thi (2016), "Developing mathematical communication skills for students in teaching arithmetic progression - algebra and analysis grade 11" by Minh Pham Thi Ai (2017),... In term of the scientific debate, there are several studies investigated by Trung Le Thai Bao Thien (2017), namely, "Teaching mathematics through scientific debate" and "Scientific debate situations revolve around a the epistemological obstacle of the concept of limit". These studies focus on designing of teaching situations that improve student's mathematical communication skill based on a number of theoretical obstructions. Although, there are many studies about mathematics communication and scientific debate, there is just a few of studies about the development of mathematical communication skills for students through organizing scientific arguments in teaching mathematics. This article demonstrates how to design a teaching projec base on scientific debate in teaching mathematics to help students discover new knowledge and develop student's mathematical communication skills. In addition, we will discuss about some concepts of mathematical communication, scientific debate and the relationship between them. Then, we use Osborne's framework to evaluate the quality of students' arguments.

## MATERIALS AND METHODS

In this section, we will introduce some concepts about mathematical communication and sciencetific debate. In addition, we present the rules of argument in mathematics and analytical framework used for assessing the quality of argument. Based on these concepts and methods, we organize a teaching project for continuous functions. The level of students' argumentation will be assessed using the analytical framework. The concept *communication* is derived from the Latin word *communicare*, which means "to share" or "to make common" (Cherry, 1978).

Awareness of communication has been mentioned by the standards proposed by National Council of Teachers of Mathematics (NCTM) (2000). "Communication is an essential part of mathematics and mathematics education. It is a way of sharing ideas and clarifying understanding. Though communication, ideas become objects of reflection, refinement, discussion, and amendment. The communication process also helps build meaning and permanence for ideas and makes them public" (NCTM, 2000, p.60). The NCTM (2000) stated that "Communication can support students' learning of new mathematical concepts as they act out a situation, draw, use objects, give verbal accounts and explanations, use diagrams, write, and use mathematical symbols. Misconceptions can be identified and addressed" (p.61)

According to Binh Vu Thi (2016), "*mathematical communication* is the communication between teachers and students, between students and students in the process of teaching mathematics. This process uses mathematical language as the important and essential way to receive and transmit mathematical ideas, mathematical knowledge, arguments, proofs and problem solving to achieve mathematical learning goals (p.49).

Bibby (2014) defined debate as: "Debate is a way of testing ideas by disagreeing with other people. An idea is a phrased as a motion (sometimes called a "topic" or "resolution") – a standardized statement on which the two sides will disagree. Each person involved in a debate is either for or against the motion so that an equal number of debaters are on either side. Those in favor of the motion are referred to as the "Affirmative" and those against it called the "Negative" " (p.9).

Legrand (1993) introduced the term of debate in science (in teaching mathematics) from two views of learners. Considering on teaching in high school, he presented the two concepts as follows:

- Students will not necessarily become a professional mathematician.
- However, to learn mathematics effectively, students need to temporarily become mathematicians, (in the sense of developing the intellect to understand what they are learning, keeping the essentials learned even if we do not use this knowledge daily). To do this, the class should be organized as a scientific community. Therefore, Legrand defines: "The *scientific debate* is to organize a teaching project that expresses the two points of view" (Legrand, 1993, p.1)

After analyzing the work of Bibby and Legrand, we propose that *scientific debate* in teaching mathematics is a debate taking place in the mathematical class, where the class is organized as a scientific community. Students play the role of scientists to make statements, arguments to explain the correctness of statements through warrant and backing. The truth is established based on mathematical knowledge and justifications.

*The rules of argument in mathematics*

According to Arsac et al. (1992), in order to implement a scientific debate in the math class, we need to encourage and motivate students comply with the following mathematical debate rules:

- A mathematical statement will be either true or false;
- A counterexample enough to rebut a statement;
- In mathematics, to argue about a statement, people base on some of definitions and theorems which have been stated explicitly;
- In mathematics, one can not determine the validity of a statement by relying on the fact that the majority of those prese people believe the statement is correct;
- In mathematics, there are examples that validate a statement. However, it is still not sufficient to prove that the statement is correct;
- In mathematics, a result which is observed through drawing is not enough evident to prove that a geometrical statement is correct.

*Communicate mathematics in a scientific debate*

Radford and Demers (2004) explained the term communication in the mathematical class having a similar point of view with Legrand (2000). In this view, students need to not only use the correct syntax and mathematical conventions but also to develop their mathematical communication skills. We need to study communication in the mathematical class in specific activities such as discussion, dialogue and debate. The authors point out from the pedagogical perspective that mathematics should not be presented as a set of fixed knowledge. For students, mathematics should be an adventure (we do not know where to go), an experience or one of the ways to realize the meaning of the world around.

During mathematical lessons, learners are considered as a community of mathematicians for the purpose of scientifically debate about the topics given by the teacher. They are encouraged to make statements and realize the correct of these statements. The learners will realize true or false statements through scientific debate. This process is fundamntlly different from typical way to find the truth in science. The truth neither comes from the judgment of the teacher or the knowledge in the printed books. Students can find the truth by themselves through the argument in the class.

- First, the learners must believe in what he or she predicts;
- Next, they must develop logical arguments to convince that these predictions are reasonable;
- Finally, they have to find terms, formulas, theorems, and metaphors to convince others. (Cited by Trung Le Thai Bao Thien (2017)).

Osborne (2001) presented a framework for a quality of argument in terms of a set of five levels of argumentation as follows:

**Table 1.** *Analytical framework used for assessing the quality of argument*

Level 1	Level 1 argumentation consists of arguments that are a simple claim or a counter claim.
Level 2	Level 2 argumentation has arguments consisting of claims with either data, warrants, or backings but do not contain any rebuttals.
Level 3	Level 3 argumentation has arguments with a series of claims or counter claims with either data, warrants, or backings with the occasional weak rebuttal.
Level 4	Level 4 argumentation shows arguments with a claim with a clearly identifiable rebuttal. Such an argument may have several claims and counter claims as well but this is not necessary.
Level 5	Level 5 argumentation displays an extended argument with more than one rebuttal.

The process of teaching in the form of scientific debate

According to Arsac et al. (1992), limited to the case of considering the validity of a mathematical proposition, we can organize a scientific debate that takes place in four stages.

Stage 1: Individual work; Stage 2: Research in group; Stage 3: Debate in class; Stage 4: Institutionalization.

The situation is designed to relate to the continuous function, and sometimes the students confuse between continuity of the function and determination of the function. These situation can lead different answers to the statement. Some students will answer "True" while some students will answer "False". It is the process of debate that takes place naturally in the classroom.

The experiment was conducted in 90 minutes in a class of 40 students in Grade 12 who had learned about continuous function. Data is collected through personal work, group work and classroom debates, and record. In theorem 3, Hao Tran Van (2015): "If a function  $y = f(x)$  is continuous on a closed interval  $[a; b]$  and  $f(a).f(b) < 0$ , then equation  $f(x) = 0$  has at least one solution in the open interval  $(a; b)$ " (p.135-139).

We replace phrase "a function  $y = f(x)$  is continuous on a closed interval  $[a; b]$ " with "a function  $y = f(x)$  is defined on a closed interval  $[a; b]$ ". The statement is "If a function  $y = f(x)$  is defined on a closed interval  $[a; b]$  and  $f(a).f(b) < 0$ , then equation  $f(x) = 0$  has at least one solution in the open interval  $(a; b)$ ". This statement is true or false? Can you explain your answer?

## RESULTS

When working individually for 20 minutes, twenty-nine students answered "False", six students answered "True", and five students did not answer. Some with true answers argue that "when the function determines on a closed interval, the function is continuous on the closed interval"

When working in groups in 20 minutes, the class is divided into 10 groups with each group of 4 students. One group responded that it was "True" and made the argument.

"Nếu hàm số  $y = f(x)$  xác định trên đoạn  $[a; b]$  và  $f(a).f(b) < 0$  thì phương trình  $f(x) = 0$  có ít nhất một nghiệm nằm trong khoảng  $(a; b)$ ". Các em hãy cho biết phát biểu đó đúng hay sai? Hãy giải thích vì sao?

Nhóm 1 cho rằng nhận định sai đúng. Vì hàm số xác định trên  $[a; b]$  thì luôn liên tục trên  $[a; b]$  (không có ngoại lệ)

Seven groups responded to the statement with "False", but the argument was inaccurate:

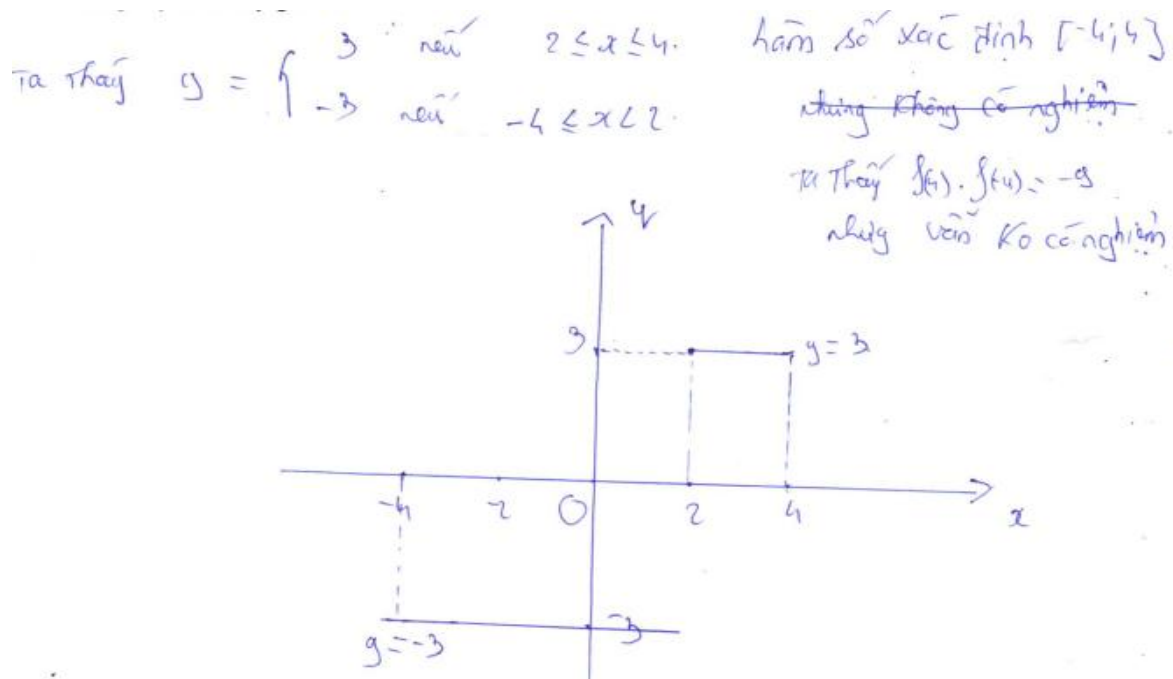
theo chúng em phát biểu trên là sai. Vì nếu hàm số  $y = f(x)$  xác định trên đoạn  $[a; b]$  là  $f(a).f(b) < 0$  thì không thể khẳng định phương trình  $f(x) = 0$  có ít nhất một nghiệm nằm trong khoảng  $(a; b)$ .

VD: cho hàm số  $y = f(x)$   $y = \frac{1}{x}$  xác định trên khoảng đoạn  $[-3; 6]$  và  $f(-3).f(6) < 0$  nhưng phương trình  $f(x) = 0$  vô nghiệm nên nhận định trên là sai

"xác định trên đoạn  $[a; b]$  thì chưa chắc "liên tục trên đoạn  $[a; b]$ "

VD:  $y = \frac{1}{x}$  gần đoạn tại  $x = 0$

Only one group answered "False" and gave counterexample:



The teacher asked the groups to record the results of each group discussion on the posters for 5 minutes, then the teacher posted the first poster on the board and started the debate in 30 minutes.

The teacher asked the groups to record the results of the group discussion on the posters for 5 minutes, then the teacher posted the first poster on the board and started the debate.

The class discussion was conducted in 30 minutes.

The first poster of group 2 thought that the statement was true.

"For example, give an equation  $x^3 + 2x - 5 = 0$  with at least one solution.

Consider the function  $f(x) = x^3 + 2x - 5 = 0$ .

We have:  $f(0) = -5$ ,  $f(2) = 7$   $\Rightarrow f(0) \cdot f(2) < 0$ .

$y = f(x)$  is a polynomial function which is continuous on the set of real numbers  $\mathbb{R}$ . Therefore, it is continuous on the segment  $[0; 2]$ . Thus the equation has at least one solution"

Teacher asked students to discuss the first poster.

Student 1: If a function satisfied the statement, it was not sufficient to conclude the truth of the statement. It needed to be proved in a general case.

Student 2: He agreed with student 1.

Student 3: To prove the statement, we had to prove all cases. In this case, you quoted a specific case that did not persuade us.

Student 4: I agree with all of their opinions, because the proof was not general.

Student 5: If you said that the statement was wrong, you had to point out an example to prove it wrong.

Student 2: Please post up the result of group 4.

"Function  $y = \begin{cases} 3 & \text{if } 2 \leq x \leq 4 \\ -3 & \text{if } -4 \leq x < 2 \end{cases}$  defined on a closed interval  $[-4; 4]$  and  $f(-4) \cdot f(4) = -9 < 0$  but it does not have solution in the open interval  $(-4; 4)$ ".

Students had no comments, so the teacher put up another poster of the group 6. The poster content is:



“Function  $y = \frac{1}{x}$  defined on a closed interval  $[-3; 6]$  and  $f(-3)f(6) < 0$  but equation  $f(x) = 0$  has no solution.

Therefore, we can explain equation  $f(x) = 0$  has at least one solution in the open interval  $(-3; 6)$ ”.

Student 1: The given function was undefined on a closed interval  $[-3; 6]$  so the first set was not defined on the segment. So this example did not convince us that the proposition statement is false.

Then the teacher summarized the content of the debate in 15 minutes.

For the poster of group 2, there was an example that validate a statement. However, it is still not sufficient to prove that the statement is correct.

The explanation of student 2 is true because he has shown a counterexample.

Function  $y = \begin{cases} 3 & \text{if } -2 \leq x \leq 4 \\ -3 & \text{if } -4 \leq x < 2 \end{cases}$  defines on a closed interval  $[-4; 4]$  and  $f(-4) \cdot f(4) < 0$  but it does not any solution on a interval  $(-4; 4)$ .

The condition of the continuous function in theorem 3 is very important and we can not ignore this condition. Therefore, when demonstrating the equation  $f(x) = 0$  has at least one solution in the open interval  $(a; b)$  which the student only considers  $f(a) \cdot f(b) < 0$  and concludes that the equation has at least one solution in the open interval  $(a; b)$  being false. When function is continuity and we connect two points on the graph it will cut the axis  $Ox$  at at least one point.

For the posters of group 6, this group showed  $f(-3) \cdot f(6) < 0$  but function  $y = \frac{1}{x}$  does not define on a closed

interval  $[-3; 6]$ . We can replace the function  $y = \frac{1}{x}$  by the function  $f(x) = \begin{cases} \frac{1}{x} & \text{if } x \neq 0 \\ 5 & \text{if } x = 0 \end{cases}$ . Although that

function defines on a closed interval  $[-3; 6]$  and  $f(-3) \cdot f(6) = -1/18 < 0$  the equation has no solution in the open interval  $(-3; 6)$ .

The level of argument of each group is shown in Table 2, each level symbolized by  $\checkmark$ .

**Table 2.** Results in each group

	Level 1	Level 2	Level 3	Level 4	Level 5
Group 1	$\checkmark$				
Group 2	$\checkmark$				
Group 3		$\checkmark$			
Group 4				$\checkmark$	
Group 5	$\checkmark$				
Group 6			$\checkmark$		
Group 7		$\checkmark$			
Group 8		$\checkmark$			
Group 9	$\checkmark$				
Group 10	$\checkmark$				

The table shows that groups 4 and 6 have reached levels 3 and 4, respectively, meaning that through discussion they have come up with arguments that selectively argue enough to prove the proposition to be false. However, there are five groups after discussing they have not yet made the argument about the proposition. This result is because the students do not understand about the rules of arguing and the logic of mathematics.

## CONCLUSION AND DISCUSSION

The main purpose of this study is to help students understand the rules of argument in mathematics, using evidence in teamwork for decision-making in science. To be able to argue effectively, students need to have



good mathematical communication skills such as listening to others presentation, presenting and explaining ideas through graphs, functions and arguments.

From this study, the results show that the mathematics project create opportunities for students to develop their mathematical communication skills through the use of well-designed small group activities. Teachers should organize activities that require learners to make decisions within the group, by explaining their ideas and justifying their statements to others. Teachers can use these activities to advance their debate skills and their mathematical knowledge. Through these activities, interpretation and evaluation skills of students can be developed in different contexts.

The research also shows that teachers can help students learn how to work in a team, how to review and evaluate evidence. If teachers define these skills to be one of their teaching goal, then can design debating skills in the teaching plan. Creating good arguments can help students progress communication skills, critical thinking, and mathematical knowledge.

## REFERENCES

- [1] An Nguyen Thi Tan. (2014). *Using mathematics study to develop quantitative knowledge capacity of students grade 10*. Ho Chi Minh City: Ph.D. thesis, Ho Chi Minh City University of Pedagogy.
- [2] Arsac, G., Chapiron, G., Colonna, A., Germain, G., Guichard, Y. & Michel Mante. (1995). (Doan Huu Hai, Le Dinh Phi, Nguyen Thanh Tam translation). *Introduction to deductive reasoning in junior high school*. Education Publishing House.
- [3] Bibby, N. (2014). *Discovering the world through debate: A practical guide to educational debate for debaters, coaches, and judges*. New York: International Debate Education Association.
- [4] Boersma, K., Goedhart, M., Jong, O. D., & Eijkelhof, H. (2005). *Research and the quality of science education*. Netherlands: Published by Springer, p.367-380.
- [5] Cherry, C. (1978). *On human communication* (Third ed.). Cambridge, MA: MIT Press.
- [6] Hao Tran Van, Tuan Vu, Nam Dao Ngoc, Tien Le Van, & Yen Vu Viet. (2014). *Algebra and Analysis grade 11*. Hanoi: Vietnam Education Publishing House.
- [7] Legrand, M. (1993). "Desbat sciencefique en cours de mathématiques". *Repères IREM*, n0 10, Topiques Editions.
- [8] Minh Pham Thi Ai. (2017). *Developing Mathematical Communication Skills for Students in Teaching Arithmetic Progression - Algebra and Analysis grade 11*. Can Tho: Master Theses, Can Tho University.
- [9] National Council of Teachers of Mathematics (NCTM). (2000). *Principles and Standards for School mathematics*. Reston, VA: Author.
- [10] Osborne, J. F., Erduran, S., Simon, S. & Monk, M. (2001). Enhancing the Quality of Argument in School Science. *School Science Review*, 82 (301), 63-70.
- [11] Radford, L. & Demers, S. (2004), *Communication et apprentissage – Repères conceptuel pratiques pour la salle de classe de mathématiques*, Imprimeur de la Reine pour l'Ontario.
- [12] Teledahl, A. (2016). *Knowledge and writing school mathematics and communication approach*. Sweden: ÖrebroUniversity .
- [13] Trung Le Thai Bao Thien. (2017). Teaching mathematics by science debate. *Scientific Journal of HCMUP*, Vol. 14 (1), 29-39.
- [14] Trung Le Thai Bao Thien. (2017). Scientific debate situations revolve around some epistemological obstacles of the concept of limit. *Proceedings of the 6th International Didactic Mathematics Conference of Ho Chi Minh University of Pedagogy*, 93-101.
- [15] Tuong Hoa Anh. (2014). *Using case studies to develop mathematical communication skills for secondary students*. Ho Chi Minh City: Ph.D. thesis, Ho Chi Minh City University of Pedagogy.
- [16] Vu Thi Binh. (2016). *Developing mathematical representation and mathematical communication skills for students grade 6 and grade 7 in teaching mathematics*. Hanoi: PhD thesis, Vietnam Academy of Education.

**RESEARCH ON SEVERAL SOLUTIONS TO IMPROVE THE EFFICIENCY OF PHYSICAL  
EDUCATION FOR UNIVERSITY STUDENTS IN DA NANG**

PhD, Dao Thi Thanh Ha

*Department of Physical Education, Da Nang University  
No.62 Ngo Sy Lien street, Lien Chieu district, Da Nang city, Viet Nam  
Viet Nam*

*Corresponding author-E-mail address: thanhha.xu@gmail.com*

**ABSTRACT**

The article will show the result of the research on some solutions to improve the efficiency of physical education for university students in Danang and the physical development of university students. Then help the students improve their health status.

**KEYWORDS:** the efficiency of physical education, solutions, students, University of Danang

## INTRADUCTION

The University of Danang was established on April 4, 1994. The University of Danang is one of three regional universities which have a wide variety of training levels and is one of 18 biggest universities in Vietnam

Besides its main function is educating human resource, as one of the biggest centers of science, economics, and technology, it also plays an important role in science researching, transfer of technology, technical council, to timely interfere in social problems in the Central of Vietnam area.

In the past 20 years, member universities are managed based on an advanced governance model of higher education; a multi-level, multidisciplinary university with creative and dynamic learning and research environment that provides training of highly-qualified human capital promoting the socio-economic development of the Central - Highlands area and the whole of Vietnam; a center of scientific research and technology transfer tackling professional and interdisciplinary issues that motivate sustainable development in the region; an important bridge in international cooperation to support the comprehensive integration of the region in the process of globalization; a member of the accreditation and ranking systems of national and international universities to develop UD as a top university in the country and the region.

The work of evaluating the efficiency quality of Physical Education at Universities of Vietnam and the University of Danang is very practical to resolve the weak points and develop the advantages, as well as to put forward solutions to help students improve their health status. Physical Education is getting more and more attention from students, there are more and more health training campaigns or sports competitions are held. As we all recognize the importance and essential of the article, we decided to study for more on the topic: the solutions to improve the efficiency of physical education for university students in Danang.

## RESEARCH MISSION AND METHOD

- Refer to the documents
- Do surveys
- Medicine and education examination
- Education practice
- Statistics

## RESEARCH RESULTS

### 1. Result of the solutions selected to improve the efficiency of physical education for university students in Danang

To have a basis in fact to select the solutions, we did an interview with professionals and education experts. They voted for the good solutions listed in the list of 10. The result of the interview is shown in the table below.

**Table1:** The result of the surveys choosing the solutions to improve the efficiency of physical education for university students in Danang ( $n=30$ )

No.	Solutions	Very necessary		Necessary		Unnecessary	
		n	%	n	%	n	%
1	Propagate and educate to raise the awareness of the importance of Physical Education	28	93.3	1	3.3	1	3.3
2	Improve teaching methods	20	66.6	6	20	4	13.3
3	Improve teaching equipment	10	33.3	12	40	8	27.7
4	Organize extra activities and sport clubs	27	90	2	6.7	1	3.3
5	Teachers training	19	63.3	9	30	2	6.7
6	Innovate teaching methods and evaluate teaching quality	27	90	2	6.7	1	3.3
7	Organize competitions and training skills courses	16	53.3	12	40	2	6.7

No.	Solutions	Very necessary		Necessary		Unnecessary	
		n	%	n	%	n	%
8	Improve teachers' quality	29	96.7	1	3.3	0	0
9	Visual methods	17	56.7	10	33.3	3	10
10	Improve and exploit teaching equipment	28	93.3	1	3.3	1	3.3

As the result of the survey above, we have decided to select 5 over 10 solutions, which are voted by 90-97% of the interviewees:

- Propagate and educate to raise the awareness of the importance of Physical Education
- Organize extra activities and sport clubs
- Innovate teaching methods and evaluate teaching quality
- Improve teachers' quality
- Improve and exploit teaching equipment

## 2. Apply the 5 selected solutions on the studies

*Solution 1:* Propagate and educate to raise the awareness of the importance of Physical Education  
Progression steps:

- a) Before studying the lessons, teachers need to educate the students about the importance and the role of Physical Education in their daily lives.
- b) Cooperate with the Youth Union to organize competitions about Physical Education on March 27 (Vietnam sports day)
- c) Propagate to improve students' awareness of the importance of Physical Education by organizing sports events or competitions.
- d) Award individual person or teams or communities who have good performances in Physical Education events
- e) Radio Broadcast every Monday, Wednesday and Friday about sports events in school as well as cite people who have good performances in sports in dispatches
- f) Cooperate with Students Union, Administration & Human Resource Department, and Training department to promote Physical Education activities on school news

*Solution 2:* Organize extra activities and sport clubs

Progression steps:

- a) Organizing extra activities with teachers' supporting
- b) Organizing training courses to the union cadre members (who are in charge of school sports events)
- c) Open Physical Education clubs with a clear regulation.

*Solution 3:* Innovate teaching methods and evaluate teaching quality

Progression steps:

- a) Research and innovate the lessons
- b) Innovate the evaluation system of teaching quality in Physical Education, following 3 standards

below:

- Theory
- Practice
- Ability

*Solution 4:* Improve teachers' quality

Progression steps:

- a) Send teachers to the training courses. Require teachers to study master and doctor certification.
- b) Organizing workshops about Physical Education
- c) Hire young, enthusiastic teachers, who have good knowledge in teaching and be active in social works
- d) Manage Physical Education extra activities

*Solution 5:* Improve and exploit teaching equipment

Progression steps:

- Buy more equipment and build more sports area for teaching and other activities
- Expand sports field and gymnasium
- Raise the fund for sports activities and events.
- Exploit fully current facilities
- Repair, upgrade and maintain material facilities

### 3. Evaluate the development of constitution of students of the University of Danang after applying some of the solutions

To get the result of the efficiency of some solutions, we have done a survey on complexion and constitution of students. The table below is the result.

**Table 2:** Constitution comparison between before and after applying the solutions on students of the University of Danang

No	Content	Male						Female					
		Before applying the solutions n=98		After applying the solutions n=98		t	P	Before applying the solutions n=83		After applying the solutions n=83		t	P
		$\bar{X}$	$\delta$	$\bar{X}$	$\delta$			$\bar{X}$	$\delta$	$\bar{X}$	$\delta$		
1	Height (cm)	167.2	4.78	169.6	6.7	1.9	>0.05	157.3	6.4	157.5	6	0.1	>0.05
2	Weight (kg)	55.54	7.08	58.32	7.0	2.5	<0.05	49.13	6.4	49.5	6	0.37	>0.05
3	Body toughness (cm)	15.05	7.05	18.53	7.0	3.0	<0.01	14.54	7.1	16.9	6.7	2.13	<0.05
4	Pressure of forehead (kg)	47.43	7.17	51.56	7.1	3.5	<0.01	33.57	6.2	36.3	5.5	2.85	<0.01
5	Sit-up (times/30s)	22.33	4.65	24.01	4.6	2.2	<0.05	15.54	5.1	17.5	4.7	2.58	<0.01
6	Jump forward (cm)	220.31	21.6	228.1	20.7	2.2	<0.05	158.7	18	166	18	2.6	<0.01
7	Run 30m (s)	6.59	1.55	6.31	1.5	1.0	>0.05	8.52	1.4	7.09	8.19	1.53	>0.05
8	Run in rhombus shape 4x10m (s)	12.31	1.98	11.56	1.9	2.3	<0.05	14.04	2	14.6	1.8	1.64	>0.05
9	Run in 5 minutes (m)	894.25	152	999.6	173	3.9	<0.01	818.5	162	894	150	3.05	<0.01

From the result in table 2, complexion standard in Height doesn't have a clear difference because the experiment period is not long enough,  $P > 0.05$ . However, the result has increased a little, for male students:  $169 \pm 6.76$ cm, for female students:  $157.5 \pm 6$ . About complexion standard in Weight, there is a clear change in male students with  $P < 0.05$ , but there is still no big change in female students.

The results of Constitution standards are as below:

- "Forehand pressure" in both male and female students are good according to the resolution 53 (experiment on male is 51.56kg, according to the resolution 53, the average is 47.5kg; experiment in female is 36.18kg, according to the resolution 53, the average is 31kg)
- In "sit-up", males perform better than the standard according to the resolution 53 (experiment 24 times, standard 17 times), females perform just right at the standard
- "Jump forward": Males perform pretty good (experiment 228cm, standard 225cm), females are close to the standard (experiment 166cm, standard 169cm)
- "Run 30m": both males and females have not reached the standard
- "Run in Diamond shape": males have reached the standard (experiment 12.06s, standard 12.4s) but females have not reached the standard

- “Run in 5 minutes”: males have made 999.57m, better than the standard 950m; females have not reached the standard

In conclusion, comparing the results in Constitution standard of male and female students before and after the experiment, the results after the experiment are all higher in all standard items with  $P < 0.05 - P < 0.01$

The result has shown the efficiency of the solutions in the constitution development of students

### Summarize:

The Research selected 5 solutions to develop the quality of Physical Education for University of Danang students, including:

- Propagate and educate to raise the awareness of the importance of Physical Education
- Organize extra activities and sport clubs
- Innovate teaching methods and evaluate teaching quality
- Improve teachers' quality
- Improve and exploit teaching equipment

We have applied these solutions in real life and they all brought good results in developing the quality of Physical Education for University of Danang students

### REFERENCES

- [1]. The Ministry of Education and Training (1993), *the distribution of physical education programs in university (Decision 931 / QD-GDTC dated 29/04/1993)*. (In Vietnamese)
- [2]. Duong Nghiep Chi (1991), *Sports Measurement*, Sports Publisher.
- [3]. Vu Cao Dam (1995), *Research Methodology, Materials for Higher Education*, Managers and Teachers of Universities and Colleges (In Vietnamese).
- [4]. *Education Development Strategy to 2025* of Da Nang university, Viet Nam.
- [5]. Nguyen Duc Van (2001), *Research statistics in sports*, Sports Publishing House, Hanoi (In Vietnamese).
- [6]. Trang web: [www.tdtt.gov.vn](http://www.tdtt.gov.vn)
- [7]. Nguyen Toan, Pham Danh Ton (2000). *The theory and method of physical education teaching*, Sports published Ha Noi

**DEVELOPING A TOOL TO EVALUATE INTERNSHIP RESULT FOR STUDENTS STUDYING  
SOCIAL WORK AT DA NANG UNIVERSITY**

***Bui Dinh Tuan, MA; Nguyen Thi Bich Hanh, MA***

*University of Education – Da Nang University*

*Address: No. 459 Ton Duc Thang Street, Lien Chieu District, Da Nang City*

*Country: Viet Nam*

*Corresponding E-mail: bdtuan@ued.udn.vn*

**ABSTRACT**

Practical activities is a decisive factor to the quality of human resources in social work. However, in many universities, tools for practice assessment have not been created, which has reduced the quality of education in social work sector and affected the quality of graduates. This research investigates 50 lecturers in the whole country who teach and guide students to practice social work. Based on that, the authors use mathematical statistics software to process data and build tool. The findings have developed the assessment tool for students with 9 output standards and 30 evaluation criteria, which enables the assessment results to be more accurate and objective. After the tool was completed, the team organized the workshop for review and revision by experts.

**KEYWORDS:** Tools, assess, outcome, practice, social work



## INTRODUCTION

Practicing plays a very important role in meeting the learning outcomes of students in social work. Determining that importance, the program of social work at each university concerns about the practice of students. The program of social work at University of Education, Da Nang University has 17 credits for practical activities, regular practice and 3 credits for final practicum. However, the problem of how to assess the internship results objectively, accurately and promote the positiveness and activeness of the students when practicing is quite difficult, especially in terms of the current lack of social work lecturers. Lecturers have taught at the university and instructed students to practice at the same time, with large numbers of students practicing in various social and local settings. In addition, many social facilities are lack of professional staff on social work as well as experience in trainee internships. The development of tool will assist staff at establishments in monitoring and evaluating students more easily and objectively.

In the context of standardizing the social work training program at the University of Education – Da Nang University, due to identifying the importance of the tool for evaluating the results of social work practicing, the authors conducted a study on how to evaluate the results of social work practice in a number of universities training social work in the country and abroad to build a set of criteria to evaluate the internship results for students, meeting the output standards of social work at the university. The scope of this article is to share some results of the research *"Research to develop tools for evaluating the results of practice and internship for students studying social work at the University of Education, Da Nang University"*.

## RESULTS OF PRACTICAL RESEARCH AND DEVELOPMENT OF TOOL

The research team conducted a survey on the status of evaluation for students at 10 social work training universities in the country and 50 lecturers at universities who have experience in teaching and guiding students. The authors submitted online questionnaires to 50 social work lecturers and conducted depth interviews with 20 lecturers representing for lecturers teaching social work in the country.

### The number of students is supervised by the instructor during each internship

The survey found that 46% of the respondents said they instructed 10 to 20 students, 3.6% of them said they supervised more than 40 students. As the result of the research, many lecturers have taught and supervised a large number of students at the same time. The lecturers only came to the establishment one or two times during the trainee's internship as checkers periodically, not a supervisors. The work of the training is assigned to staff at establishment. However, most social institutions in our country are currently not well-trained in social work in general as well as supervising social work in order to supervise students. Some staffs are not aware of the purpose and contents of the traineeship, so they only need students to do the following things: clean up the labors, help with the work of the facility...., Therefore, that the lecturers at the same time must guide the practice of too many students, while taking on teaching at the university affects the quality of social work practicing.

*Table 1: Number of students in each course*

Number of students	Ratio
Under 10 students	18.5%
From 10 to 20 students	46.0%
From 20 to 30 students	26.5%
From 30 to 40 students	6.4%
Above 40 students	3.6%
Total	100%

### Practice time of students at the establishment

According to the survey, 34% of respondents said that the time spent on internships was less than one month, 42% of them answered the practice time is from 1 to 2 months.. With the number of credit hours for internships, most colleges have from 3 to 4 credits, and internships vary from 2 to 3 months.

### The way lecturers supervise students

The results of the survey, the way of supervise that most lecturers choose is meeting students once a week, with 67.2% of respondents. 48.3% of respondents said that they assigning staffs to manage and instruct students, lecturers just come and examine monthly or mid-term basis. Some lecturers said that they had to teach in many classes at the university and supervise students. They did not have enough time so they needed to coordinate with the establishments.

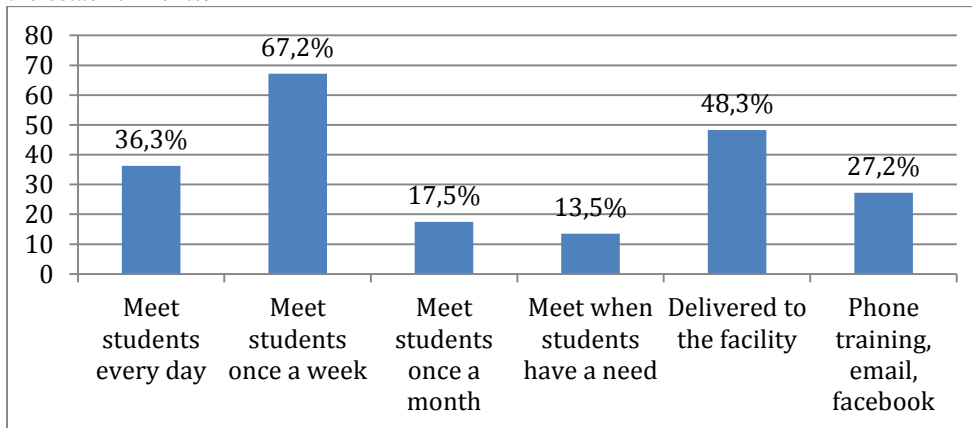


Chart 1: Way to organize the supervising for students

The fact that the lecturers supervise many students at different courses at one time led them to not follow closely with the students. Lecturers do not have much time to work with each student but have to conduct group training. They said that in the current situation, the way to train trainees once a week basis is suitable for lecturers as well as for social institutions, because most of the establishments lack staff trained in social work, some of them have been converted to social work or refresher courses to improve their understanding of social work. However, it is not sufficient to provide independent training for students. So it is necessary to cooperate with lecturers to effectively train students. Each training institution needs to have solutions to improve the capacity of the establishment trainers as well as reduce pressure on lecturers.

### Evaluation of the internship results for students

Results of the survey on evaluation of students' internship results showed that 84.6% of the respondents chose the assessment based on the student's internship report and diary, 12.6% of lecturers use the toolkit to evaluate student internship results. As can be seen from Chart 2, most of the lecturers chose to evaluate the student's report and student's diary. Many teachers said that this method is not accurate, not really objective, teachers rely on their feelings to evaluate students, especially in the condition that the lecturers do not regularly go to establishment to supervise students, such assessment is still limited.

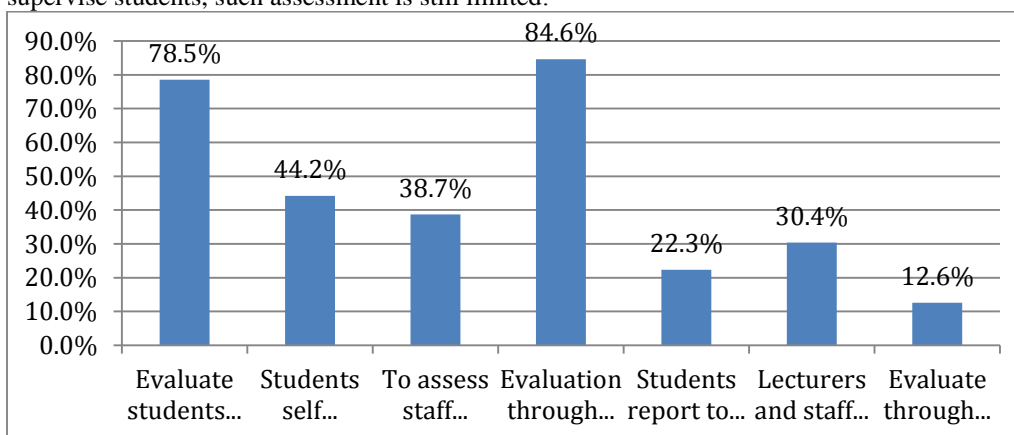


Chart 2: Way to evaluate students of lecturers

Based on the research results, the authors develop a tool for evaluating internship results for the students of social work at the University of Education, Da Nang University. The program of social work training at the University of Education - Da Nang University was built based on the output standards of the social work. Based on the output standards of social work, professional team build the standard matrix for the social work training at the university and the output standards for each module. The internship module is implemented at the end of each training course, so it is necessary to meet 9 criteria for the social work sector with 30 criteria as follows: [4]

### EVALUATION REPORT FOR INTERNSHIP RESULT ON SOCIAL WORK

(For supervisors at establishment)

General information: Name of student, name of supervisors, establishment, name of lecturer, date of assessment

Instruction: Evaluation report on social work is written by the supervisor on the last day of the internship. Supervisor circles the appropriate score.

Scoring: 0 points: Do not complete → 5 points: Excellent completion

*Objective 1: See yourself as a professional social worker and act according to professional standards. This includes:*

a) Good performance of internal regulations (compliance with time and regulations)	0	1	2	3	4	5
b) Attend enough pre-internships meetings at university and the first meeting at the establishment before the internship	0	1	2	3	4	5
c) Develop a concrete, detailed practice plan	0	1	2	3	4	5
d) Demonstrate professional behavior, appearance, and communication.	0	1	2	3	4	5
e) Compliance with ethical standards in social work practice.	0	1	2	3	4	5
f) Use supervising and counseling to guide professional assessments and behaviors.	0	1	2	3	4	5

*Objective 2: Effectively deal with diversity and differences in practice. This includes:*

a) Admit each client has his own characteristics, personal life, personal experience and respect for the individual characteristics.	0	1	2	3	4	5
b) Self-awareness and control of behavior, not giving opinions that are biased, do not apply personal experience to the process of helping the client.	0	1	2	3	4	5
c) Assessing that the individual characteristics of each client is a result of many influences: age, gender, ethnicity, economics, health, life experiences, marriage.	0	1	2	3	4	5
d) Express yourself as a learner and engage the client system as experts in their experience.	0	1	2	3	4	5

*Objective 3: Promoting Human Rights and Economic and Social Justice. This includes:*

a) Apply your knowledge of socio-economic justice to advocate for human rights.	0	1	2	3	4	5
b) Engage in the practice of promoting economic and social justice.	0	1	2	3	4	5

*Objective 4: Engage in practice based on research and practice-based research. This includes:*

a) Use practical experience as a basis for research and scientific investigation.	0	1	2	3	4	5
---	---	---	---	---	---	---

b) Participate in critical analysis in research methods and results.	0	1	2	3	4	5
c) Use and disseminate research results as a basis and improve practices, policies, and service delivery.	0	1	2	3	4	5
<i>Objective 5: Engage in policy practice. This includes:</i>						
a) Evaluating how social and economic welfare policies affect the delivery and assessment of social services.	0	1	2	3	4	5
b) Advocacy for human rights and economic, political and social justice.	0	1	2	3	4	5
c) Analyze and promote policies that promote human rights and economic, political and social justice.	0	1	2	3	4	5
<i>Objective 6: Engage the participation of individuals, families, groups, organizations and communities. This includes:</i>						
a) Apply knowledge about human behavior and social environment to interact with client systems	0	1	2	3	4	5
b) Use empathy, self-regulation and interpersonal skills to effectively engage the client system.	0	1	2	3	4	5
<i>Objective 7: Assess individuals, families, groups, organizations and communities. This includes:</i>						
a) Collect, organize, analyze and interpret information from client systems.	0	1	2	3	4	5
b) Establish goals and objectives based on a peer review of the strengths, needs and challenges of the client system.	0	1	2	3	4	5
c) Select appropriate intervention strategies based on evaluation, research knowledge, values and priorities of the client system.	0	1	2	3	4	5
<i>Object 8: Intervene with individuals, families, groups, organizations and communities. This includes:</i>						
a) Implement interventions to achieve internship goals and improve the ability of client systems.	0	1	2	3	4	5
b) Applying knowledge of human behavior and social environment, people in the environment, and other multidisciplinary framework in interventions with clients.	0	1	2	3	4	5
c) Use interdisciplinary co-operation when appropriate to achieve useful apprenticeship results.	0	1	2	3	4	5
<i>Objective 9: Evaluate practice with individuals, families, groups, organizations and communities. This includes:</i>						
a) Select and use appropriate methods to evaluate the results.	0	1	2	3	4	5
b) Analyze, monitor and evaluate the interventions and outcomes critically	0	1	2	3	4	5
c) Apply the results of the evaluation to improve the effectiveness of the practice.	0	1	2	3	4	5
d) Facilitate the transfer and end process effectively to develop the set objectives.	0	1	2	3	4	5
Total score of the assessor	Total score: /150					

### Results of the essay

The necessary level of toolk in assessment of internship results:

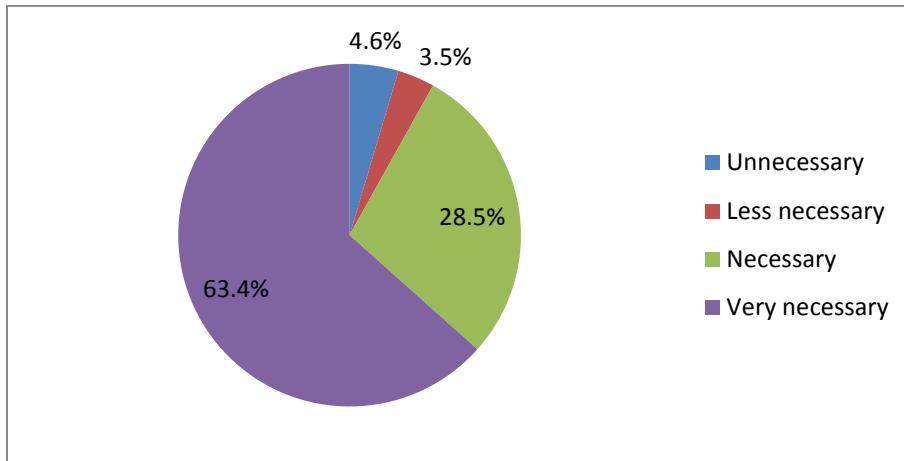


Chart 3: The necessary level of the tools

The results of the survey on the necessity of the tool used in the evaluation of internship results for students in social work showed that 63.4% of respondents said that this tool is very necessary in evaluating the results of the internship. Experts said that the use of tool to evaluate student internship results is very important and necessary in the context of training social work in our country today. It gradually affirmed the professionalism in training as well as the practice of social work. The capacity of students is assessed accurately, objectively. In the context of staff at establishment / community had to do a lot of work at the same time and have to supervise the students, at times, the number of students was so high that the supervising and evaluating are difficult. The preparation of the assessment tool will help the staff to monitor and evaluate students better.

### The reliability of the tool for evaluating the results of social work practice.

The survey result of reliability of the toolkit shows that:

On the rigour of the toolkit, 55.5% of respondents agreed on the rigour of the toolkit, 33.6% of experts agreed fully on the rigour of the toolkit for evaluating student internship results. Experts said that the toolkit is relatively clear about the evaluation criteria. Tool users are not confused, easy to use.

In terms of the logic of the tool, 44.5% of the respondents agreed on the logic of the tool, 45.5% experts fully agreed on the logic of the tool. Some experts said that the evaluation criteria of the tool were built on the basis of the output matrix of the training sector and the course output and were logical. Each criterion is the specific objective of each output standard that students need to achieve.

Table 2: Evaluation of Experts for Tool Reliability

Level	Disagree	Agree partly	Agree	Totally agree
Content				
Rigour	2.5%	8.4%	55.5%	33.6%
Logic	3.2%	6.8%	44.5%	45.5%
Accuracy	6.9%	12.5%	38.7%	41.9%
Objectivity	3.5%	6.6%	56.4%	33.5%
Posibility	3.8%	9.5%	51.5%	35.2%
Comprehensiveness	4.2%	12.8%	38.5%	44.5%

In term of the accuracy of the tools, 41.9% of the respondents said that the tools were totally accurate in evaluating the student's internship results, 38.7% of respondents agree on the accuracy of the toolkit. Some argue that the identifying of criteria for assessing students will properly reflect their abilities, but the evaluators also need to be objective and explicit when using the tool, not be governed by a particular reason.

In term of the objectiveness of the tool, 33.5% of the respondents fully agreed on the objectiveness of the tool, 56.4% of them agreed that the tool is objective. Ms. L.T.T.M said that "For a long time, we have evaluated subjectively, students who win the hearts of lecturers are often more advantageous in their assessment. The use of tools for evaluation will be more objective. But the set of criteria should be clear, not much content in the same criteria".

In terms of the possibility of the tool, the results of the survey were 35.2% of respondents saying that the tool for evaluating the internship result is totally possible, 51.5% of respondents agreed on the possibility of the tool. Experts said using the output standards to build tools to evaluate students is totally possible. For a long time, establishment officials have been confused by the appraisal of students, especially when there is a large number of students. Therefore, it is very convenient and fully implemented to build up the assessment table for supervisors at establishments.

In terms of the comprehensive of the tools, 44.5% of the respondents fully agreed on the comprehensiveness of the tools, 38.5% of them agreeing on the comprehensive. Experts said that with 30 evaluation criteria, the tool has reflected three aspects: knowledge, attitude and skills of students.

At present, the development of output standards of each university is not unifying. Each university builds a model, depending on the conditions, the strength of the school, the socioeconomic conditions of each locality. Universities will have different output standards of disciplines and subjects.

Therefore, the time of practice, the way of organizing as well as the supervising for the students of each university is not unifying, which has a great impact on the quality of training as well as the capacity of students when graduating.

### **Assess the effectiveness of the internship assessment tool**

The results of the experts on the effectiveness of the tools show that: 96% of them think that the tools will help lecturers to be more convenient in the supervising. Most of the social work training universities now have internships at the establishments and the community, the supervising is mainly done by the lecturers, some universities have large training size with the large number of students and face the difficulty of organizing internship for students.

*Table 3: The effectiveness of the tools*

Content	Ratio
Advantages for the management and supervision of the establishment	78.5%
Advantages for supervising	96.0%
Improve the quality of the internship	67.4%
Ensure output standards of discipline	74.8%
Reduce pressure for lecturers	89.2%

### **Assessing the effectiveness of the internship assessment tools for students:**

The results of the survey on the assessment of effectiveness of the use of the internship assessment tool for students, 92.5% of respondents said that the use of tool to evaluate the results of the internship will help students to be more active in their internships, 88.2% of the respondents saying that students know how to identify the objects and build internship plan, 80.5% among them said that the assessment tools helps students to develop self-study skills. Some argue that the use of assessment tool helps students to be more active in teamwork, boldly communicate with supervisors, and perform the requirements in the internship well, as well as encourages students to actively participate and compete in learning and training of the students.

Lecturers have difficulty when teaching at the university and supervising students at establishment at the same time. Lecturers do not have much time to follow closely to support the students. The supervising internship of the students should be transferred to staff at establishments/ community where students come to practice.

## CONCLUSIONS

It can be seen from the data above that a majority of social work lecturers have taught and supervised a large number of students (over 30 students per training session). This is putting pressure on the lecturer. The ways of supervising “meet student once per week (67%) and “assess students by reports and diaries” (85%) are also not very effective. The design of the tool has shown that most lecturers and experts say that it is necessary (64%). After the development of the evaluation criteria, the authors conducted a survey of domestic and foreign experts. From the results of the assay, authors adjust the tool to suit the training objectives and standards of the social work sector.

The development of a practical assessment tool will facilitate a more effective coordination between lecturers and facilitator at the facility. Students also know what to do in each specific time, from which to plan to complete the work on schedule. The assessment tool with specific criteria also helps to evaluate students' practice results more accurately and objectively, ensure equality for all students.

The research results show that many social work training universities organize for students to practice but do not have suitable, effective evaluation form. Some universities have developed evaluation criteria but do not have the scientific basis to ensure the "effectiveness and efficiency". Lecturers assess subjectively so many students are not satisfied with the results of the internship evaluation.

From the results of practical research, the authors have developed tool to evaluate the results of internship for students of social work in the University of Education, University of Da Nang. The tool is based on 9 output standards for social work at the University of Education – Da Nang university, with 30 criteria for assessing students in three areas: professional knowledge, attitudes and job skills.

The development of tool for evaluating internship results for students studying social work at the University of Education, University of Da Nang will help the supervisors assess the results of the internship students more accurately, objectively. Staff at establishments are also easy to supervise students. On the other hand, assessment tool with specific evaluation criteria also help students to be more proactive in planning and implementing internships at establishment, thus improving the quality of training social work of the university in particular and the quality of human resources in social work in the country in general.

## REFERENCE

- [1] Vu Quoc Chung, Nguyen Van Khai (2012), *Guidance document for pedagogical capacity building for teachers of high school and professional secondary education teachers*, Vietnam Education Publishing Company
- [2] Bui Thi Xuan Mai (2012), *Introduction to social work*, Labor - Social Publishing Company.
- [3] Tran Dinh Tuan (2010), *Social work from theory to practice*, National University Publishing
- [4] Training Materials (2015), Development for output standards of social work, Project (SWEEP) - Social Work Promotion Program in Vietnam.
- [5] Compton, Beulah, Burt (1999), *Social Work Process*, Cole Publishing Company.
- [6] Hepworth D.J, (1997), *Direct social work practice - theory and skills*, Brooks/Cole publishing Company.
- [7] Meekyung Han (2014), Construction program outcomes: Reviewing syllabus, San Jose State University.



**RESEARCH ON KINDGARTEN CHILDREN WITH DISORDERS DEVELOPMENT  
AND TEACHER'S SUPPORTING  
(Research at Da Nang city and Quang Ngai province)**

Dr .Nguyen Thi Hang Phuong

*Psychology-Education Department, Education University, University of Da Nang*

*Country :Viet Nam*

*Corresopnding DT :0912423719 Email :hangphuong19@gmail.com*

*\*)MA .Le Thi Phi, lethiphi63@gmail.com(*

**ABSTRACT**

Developmental disorders with kindgarten children comprise a group of psychiatric conditions originating in childhood that involve serious impairment in different areas. The narrowest concept is used in the category "Specific Disorders of Psychological Development" in the ICD-10. Developmental disorders make influence to physical, intellectual, psychological, behavior and language disorders at children. If kindergarten teacher knows characteristics of children, they can support for children better. Our research with 413 kindergarten teachers in Da Nang and Quang Ngai, there are 76.5% teachers can realize characteristics of kindgarten children with developmental disorders. This is result from project «*Improve the capacity to realize characteristics of autism spectrum disorders for kindergarten teachers in Da Nang city,*»code T2017-03-07. Based on the results of the research, we propose training programs for *kindergarten teachers* on characteristics/ identifying children with developmental disorders and the ways of supporting/ educating them in the coming time.

**KEYWORDS :** Developmental disorders ; children ; kindgarten children ; characteristics of developmental disorders ; kindergarten teachers ; supporting

## INTRODUCTION

Developmental disorders are better called neurodevelopmental disorders. Neurodevelopmental disorders are neurologically based conditions that can interfere with the acquisition, retention, or application of specific skills or sets of information. They may involve dysfunction in attention, memory, perception, language, problem-solving, or social interaction. These disorders may be mild and easily manageable with behavioral and educational interventions, or they may be more severe and affected children may require more support. Neurodevelopmental disorders include: (1) Attention-deficit/hyperactivity disorder/ (2) Autism spectrum disorders/ (3) Learning disabilities, such as dyslexia and impairments in other academic areas/ (4) Intellectual disability.

*Segen Joseph, C. (2006)* showed more trafficked boys than girls. The prevalence of developmental disorders is increasing in kindergarten children age, with the prevalence of 7% -13% of kindergarten children diagnosed with developmental disorders (*DSM-5, Karmiloff, Annette et al., 2011; Payne, Kim John et al., 2010*).

The article describes the incidence of developmental disorders in Da Nang and Quang Nam, Viet Nam and its support for kindergarten children.

*Szatmari, P., Offord, D. R., Boyle, M. H. (1989), Macey, K. D. (2005)*, Developmental disorders comprise a group of psychiatric conditions originating in childhood that involve serious impairment in different areas. There are several ways of using this term. The narrowest concept is used in the category "Specific Disorders of Psychological Development" in the ICD-10.

The International Classification of Diseases is the international "standard diagnostic tool for epidemiology, health management and clinical purposes" (ICD 10). Pervasive and specific developmental disorders F80-F89.

F80 Specific developmental disorders of speech and language

F81 Specific developmental disorders of scholastic skills

F82 Specific developmental disorder of motor function

F84 Pervasive developmental disorders

F88 Other disorders of psychological development

F89 Unspecified disorder of psychological development

Description developmental disorders

*Scahill, L., & Schwab-Stone, M. (2000), Sparrow, S. S., Cicchetti, D. V., Balla, D. A. (2005); Segen Joseph, C. (2006); Goldberg, M. R., Dill, C. A., Shin, J. Y., Nguyen, V. N. (2009)*: The term "developmental disorder" or "developmental disability" means a severe, chronic disability of an individual that:

- is attributable to a mental or physical impairment, or combination of mental and physical impairment
- is manifested before the individual attains the age of 22
- is likely to continue indefinitely

Results in substantial functional limitations in three or more of the following areas of major life activity: self-care/ receptive and expressive language/ learning/ mobility/ self-direction/ capacity for independent living/ economic self-sufficiency/ reflects the individual's need for a combination and sequence of special, interdisciplinary, or generic services, individualized support or other forms of assistance that are of lifelong or of extended duration and are individually planned and coordinated.

## MATERIALS AND METHODS

*Researchers:* 413 kindergarten teachers from Da Nang and Quang Nam, Viet Nam at 35 schools. (We can survey with 413 kindergarten teachers because they joint in the program to improve the capacity recognize children with developmental disorders of kindergarten teachers).

There are 11.62% teachers at intermediate; 48.91% teacher at college degree; 38.26% teachers at university degree; 1.21% masters. And there are 98.7% teachers are woman, 1.3% teachers are man. There are 71.19% teachers at Da Nang, and 28.81% teachers at Quang Ngai.

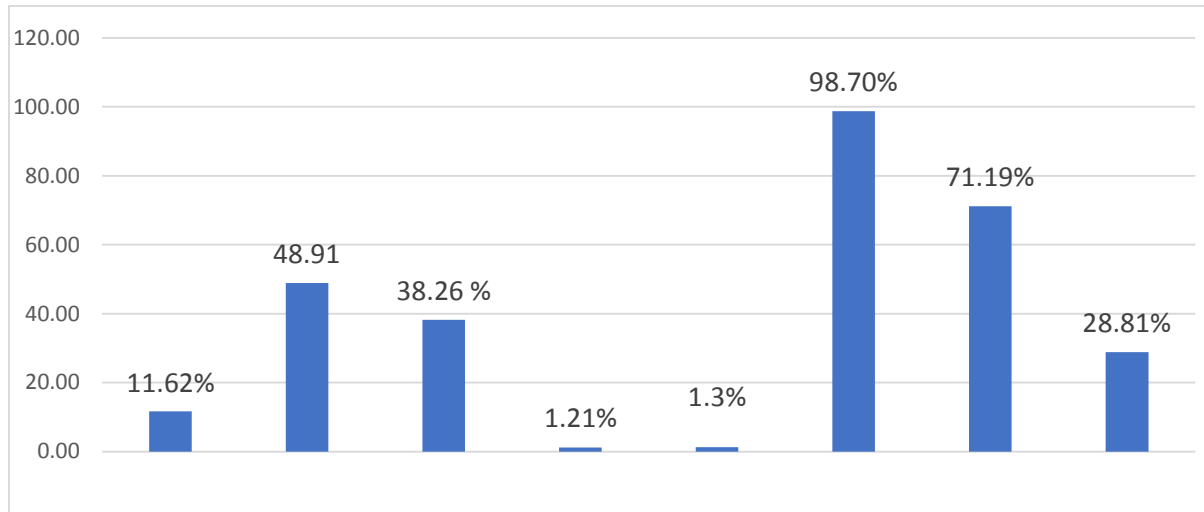


Chart 1: Researchers

*Research methodology:* We used the designed questionnaire with 45 questions about problems manifested developmental disorders; Assessing the need for supportive; method supporting for children; Advantages and disadvantages in supporting children.

Part 1: Understanding of kindergarten teachers about developmental disorders

Part 2: Manifested developmental disorders at children

Part 3: Supportive measures for children with developmental disorders and practices supporting children with developmental disorders

SPSS 22.0 is used to analyze data collected.

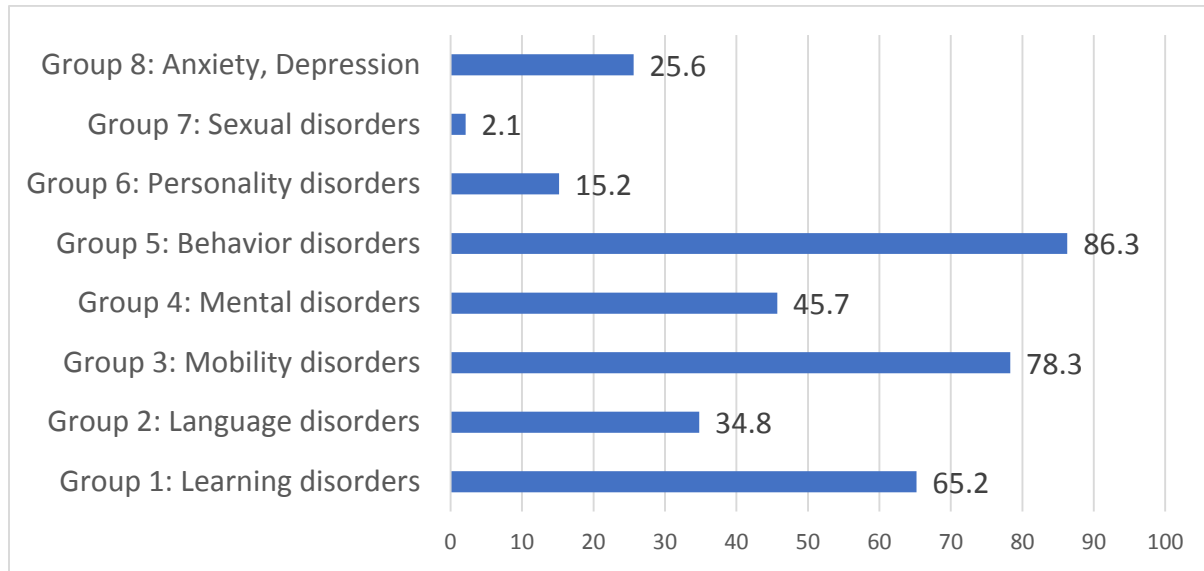
## RESULTS

### 1. Understanding of kindergarten teachers about developmental disorders

In research we choice 8 groups in developmental disorders, they are: learning; language; mobility; mental; behavior; personality; sexual; anxiety, depression. The result is:

There are 86.3% kindergarten teachers understanding about behavior disorders; 78.3% teachers understanding about mobility disorders; 65.2% understanding about learning disorders;

Table 1: Understanding of kindergarten teachers (%)



This result show that, the kindergarten teachers have understanding with developmental disorders children, special behavior disorders and mobility disorders, because they are the disorders easy for observing. When the kindergarten teachers understand problem of children, they can ask them – self about the way for helping.

## 2. Manifested developmental disorders at children

We have questions for knowing how manifestation developmental disorders at children. The result show that: The manifestation in group Personality disorders is the most important, with mean was 3.33. The manifestations are Suspicious – paranoid; schizoid; schizotypal and antisocial; Emotional and impulsive – borderline, histrionic and narcissistic; Anxious – avoidant, dependent and obsessive compulsive. The second manifestation is group Learning disorders – (The children will have Difficulty with reading and/or writing; Problems with math skills; Difficulty remembering; Problems paying attention; Trouble following directions; Poor coordination; Difficulty with concepts related to time). It takes mean was 3.25.

Table 2: Teachers can know about manifestation developmental disorders at children

Manifestations of children	Analyze(%)				Mean	Describe level	S.D.
	Never	Rarely	Some times	Always			
Group 1: Learning disorders Difficulty with reading and/or writing. Problems with math skills. Difficulty remembering. Problems paying attention. Trouble following directions. Poor coordination. Difficulty with concepts related to time.							
Problems staying organized.	1.6	10.8	48.6	38.9	3.25	3	.309
Group 2: Language disorders Struggles to say sounds or words (stuttering)	2.2	5.9	49.2	42.7	3.32	2	.485

Manifestations of children	Analyze(%)				Mean	Describe level	S.D.
	Never	Rarely	Some times	Always			
Repetition of words or parts of words (stuttering)							
Speaks in short, fragmented phrases (expressive aphasia)							
Says words in the wrong order (expressive aphasia)							
Struggles with using words and understanding others (global aphasia)							
Group 3: Mobility disorders							
Difficult in movement, late for movement	4.9	7	53.5	34.6	3.18	5	.462
Group 4: Body disorders							
Sleep disturbance							
Eating disturbance...	7	8.6	42.8	41.6	3.19	4	.332
Group 5: Behavior disorders							
attention deficit hyperactivity disorder (ADHD)							
oppositional defiant disorder (ODD)							
autism spectrum disorder (ASD)							
anxiety disorder.							
depression.							
bipolar disorder.							
learning disorders.							
conduct disorders.	3.8	4.9	53.5	37.8	3.25	3	.318
Group 6: Personality disorders							
Suspicious – paranoid, schizoid, schizotypal and antisocial.							
Emotional and impulsive – borderline, histrionic and narcissistic.							
Anxious – avoidant, dependent and obsessive compulsive.	3.2	3.2	50.3	43.2	3.33	1	.396
Group 7: Sexual disorders							
Behave like the opposite sex	14.5	16.1	52	17.4	2.72	6	.218
Group 8: Anxiety Disorders.							
Mood Disorders.							
Schizophrenia/Psychotic Disorders.							
Dementias.							
Eating Disorders.	10.1	46.4	27.5	15.9	2.45	7	.326

### 3. Describe the synthesis of acquired data to support for children with developmental disorders

There are many educational support methods for children with developmental disorders. The kindergarten teachers can use one of many therapy methods to teach children with developmental disorders. Educational support includes:

**Applied Behavior Analysis (ABA) :** The ABA teacher observes the behavior of a person with developmental disorders and then provides instructions on any necessary missing skills. The teachers teach by providing a concise instruction and reward a correct response. The reward system encourages the positive behavior.

**TEACCH:** TEACCH is a structured teaching method that provides an organized school environment with a strict schedule, visual teaching methods and short, clear instructions. TEACCH programs can easily be personalized. **Sensory Integration Therapy:** Teachers can use sensory integration therapy to help children with autism who have repetitive behavior or sensory issues. The therapy can help some children develop language skills, especially with tomatis vocal exercises.

**Developmental, Individual Difference Floor-time (DIR) :** Greenspan's DIR Floor time uses play to teach autistic children emotional engagement, how to connect ideas and focus attention as well as problem solving and self-expression.

There are many measures in helping the children, from the role of kindergarten teachers, can use some measures follow.

- Promote self-awareness
- Improve muscle control
- Improved sensory processing
- Encourages communication
- Creates appropriate focus
- Very motivational
- Encourages self-regulation
- Behavior and Equine Assisted support
- Support the parents

Our result show that the first method is "*Promote self-awareness*" at children. The teacher will be helping the children stronger, proactive in their activities, the mean is 2.92. points. The second measure is "*Behavior and Equine Assisted support*", it'll make the children more and more be stronger in the life, the mean is 2.81. The third measure is "*Encourages communication*" with mean is 2.68. The teachers will encouragement, praise to children in every activity every day.

Table 4: Method helping children with developmental disorders

N	Method helping children	Mean	S.D.
	Promote self-awareness	2.92	0.35
1.	Improve muscle control	2.51	0.34
2.	Improved sensory processing	2.45	0.35
3.	Encourages communication	2.68	0.31
4.	Creates appropriate focus	2.34	0.32
5.	Very motivational	2.57	0.35
6.	Encourages self-regulation	2.28	0.39
7.	Behavior and Equine Assisted support	2.81	0.42
8.	Support the parents	2.13	0.35

## CONCLUSIONS AND DISCUSSION

Research around the world shows that, now a day, more and more children have special need, and have developmental disorders. The Kindergarten teachers must understand with this situation and Suggested solutions to support children with developmental disorders are:

1. Kindergarten teachers must be having more information about children with developmental disorders (trained / experienced / special way of teaching children)
2. At each Kindergarten, it must have the special teachers for helping children with developmental disorders.
3. Social must have more education special center for helping children with developmental disorders and we should have special teachers for teaching the children.
4. There should be active cooperation between families and Kindergarten to better support children together. The teachers and the parents should discussion about each child in their situation.

## ACKNOWLEDGEMENTS

I have many support for this research. The first, my thank for *DaNang Univeristy*, who have support for project "Improve the capacity to learn characteristics of autism spectrum disorders for preschool teachers in Da Nang city", code T2017-03-07. The second, my thank you for *MA. Le Thi Phi* – My corresponding author, co-research to finis our research.

## REFERENCES

- [1] American Psychiatric Association (APA), *Diagnostic and Statistical Manual Of Mental Disorders* (DSM-5), Fifth Edition, published on May 18, 2013.
- [2] Segen Joseph, C. (2006). *Concise Dictionary of Modern Medicine* (Illustrated ed.). McGraw-Hill.
- [3] Macey, K. D. (2005), *Attention-deficit/hyperactivity disorder: teacher knowledge and referral for assessment* (Doctoral dissertation, Texas A&M University).
- [4] Goldberg, M. R., Dill, C. A., Shin, J. Y., Nguyen, V. N. (2009). Reliability and validity of the Vietnamese Vineland Adaptive Behavior Scales with preschool-age children. *Research in Developmental Disabilities* 30 (2009) 592–602
- [5] Sparrow, S. S., Cicchetti, D. V., Balla, D. A. (2005). *Vineland Adaptive Behavior Scales, Second Edition – Survey Forms Manual*. American Guidance service, Inc.
- [6] Searight, R. (2001). Conduct Disorder: Diagnosis and Treatment in Primary Care. *American Family Physician*, April 15, 1579-1589.
- [7] The National Institute of Mental Health (NIMH) is part of the National Institutes of Health (NIH), a component of the U.S. Department of Health and Human Services. <http://www.nimh.nih.gov>.
- [8] Macey, K. D. (2005), *Attention-deficit/hyperactivity disorder: teacher knowledge and referral for assessment* (Doctoral dissertation, Texas A&M University).
- [9] Polanczyk, G., de Lima, M. S., Horta, B. L., Biederman, J., Rohde, L. A. (2007), The worldwide prevalence of ADHD: a systematic review and metaregression analysis, *The American journal of psychiatry*, 164, 6, 942-948.
- [10] Scahill, L., & Schwab-Stone, M. (2000), Epidemiology of ADHD in school-age children, *Child and adolescent psychiatric clinics of North America*.
- [11] Scruggs, T. E., Mastropieri, M. A. (1996), Teacher perceptions of mainstreaming/inclusion, 1958–1995: A research synthesis, *Exceptional children*, 63, 1, 59-74.
- [12] Szatmari, P., Offord, D. R., Boyle, M. H. (1989), Ontario Child Health Study: prevalence of attention deficit disorder with hyperactivity, *Journal of Child Psychology and Psychiatry*, 30, 2, 219-223.



## CURRENT STATUS OF AGGRESSIVE BEHAVIORS OF PRESCHOOL CHILDREN IN DA NANG CITY

Ho Thi Thuy Hang  
Nguyen Thi Bich Hanh  
Bui Thi Thanh Dieu

*University of Education – Da Nang University*

*Address: No. 459 Ton Duc Thang Street, Lien Chieu District, Da Nang City*

*Country: Viet Nam*

*Corresponding Email: hothuyhang0807@gmail.com*

### ABSTRACT

The study focused on the level and expressions of aggressive behavior of pre-school children in Da Nang city through non-verbal behaviors and linguistic behaviors. The study uses the observation table consisting of 16 aggressive behavioral codes, including eight expressions of aggression by linguistic behavior and eight expressions of aggression by nonverbal behavior. The observation was conducted on 207 preschool children of two kindergartens in Da Nang city. The results show that pre-school children show signs of aggression clearly, expressions by action are more than by language. When aggressive, mainly children are directly toward object causing anger, discomfort for them.

**KEYWORDS:** aggression, aggressive behavior, preschool, Da Nang city

## INTRODUCTION

The aggressive behaviors of preschool children are behaviors in a particular situation, expressed in words or gestures to hurt others or themselves. This behavior may reveal directly to the object that causes the child to be upset, angry, or exposed indirectly to the person or thing around. The relationship between children having aggressive behaviors with family, friends and teachers is always tense and contradictory. This can undermine children's health both physically and mentally. In addition, aggression can become a stable personality trait, affecting the personality and social development of the children at later stages. Longitudinal studies have confirmed that children with aggressive behaviors are at risk of substance abuse, poor emotional adjustment, school failure, delinquency, etc. (Shaw D, Gilliom M, Ingoldsby E, Nagin D; 2003). If young children are exposed to aggressive behavior during the preschool years, about 50% of them will continue to exhibit this behavior in their teens, and a significant proportion will continue to engage in anti-bullying behaviors (Campbell, 1995, Campbell, 2000; Bor.W et al., 2001). A comparison of the aspects of aggression behavior among different target groups will help to find ways to reduce this behavior in each object.

## MATERIALS AND METHODS

Selected samples in a one-time transect survey were 207 pre-school children in two public schools in Da Nang City, including 96 children live in the inner city (46.6%) and 111 children in the suburbs (53.6%); There were 102 boys (49.3%) and 105 girls (50.7%); 43 children (20.8%) were single children and 164 children (79.2%) had brothers and sisters in the family.

The study used observational methods to collect objective data about the aggressive behaviors of pre-school children through language and non-verbal behaviors during the time in school. The process adheres to the principle of nature, not affect the psychology of children. We observe aggressive behaviors in the form of events to collect quantitative data on aggression, at the same time can gather information in child groups and can compare the frequency of occurrences of aggressive behaviors. The aggressive behavioral codes include 16 behaviors, including linguistic and nonverbal behaviors. These behaviors are highly distinctive, not misleading, simple to understand. The process of observation is carried out in all activities of the child, from the beginning of class to the time the child leaves. For collecting data, we divide the number of children in the class into 6 small groups for objective and natural observation. Each group will be observed by an observer during a one-day stay at school with all the activities that the child participates in, then continue with the other groups. With the observation process described above, each group was observed for 3 cycles, equivalent to 3 days in a month. Observations were recorded directly from the designed observation table. With each manifestation of aggressive behavior, the observer will mark the pre-designed observation table. Frequency of behavior will be summarized and scored according to the following criteria:

- Behavior has not yet appeared - "Never" - 1 point
- Behavior that occurs once a day - "Rarely" - 2 points
- Behavior occurs 2-3 times a day - "Sometimes" - 3 points
- Behavior that occurs 4 or more times a day - "Frequently" - 4 points

The higher the score, the more aggressive behavior of pre-school children is clear

Depth interviews were also conducted to develop qualitative data sets. Interview content is problems that the researcher concerned related to the topic. The content is clearly prepared, including: information about children, family circumstances, relationships between children and those around them; Reveals, causes and measures to reduce the child's aggressive behaviors.

The data was processed by SPSS software version 20.0 for quantitative evaluation to ensure the reliability of the results obtained. Parameters and statistical operations used in this study are descriptive statistical analysis and inferential statistical analysis. Indicators used in descriptive statistics analysis include: frequency, average of score, standard deviation; Inferential statistical analysis uses statistic: Compare means

## RESEARCH RESULTS

There are many different ways to analyze the results on the current status of aggressive behaviors of preschool children in the public schools in Da Nang City. However, we have chosen the methods that are appropriate with objects and characteristics of the sample to analyze.

### 1. Synthesized results of aggressive behaviors of pre-school children

To investigate the current status of aggressive behaviors of preschool children, we first investigated the level of aggressive behaviors in the children surveyed. Summary of the aspects of aggressive behavior expression through observation results in children, the results are as follows:

Table1 .Level of aggressive behaviors in the preschool children

No.	Level of aggressive behaviors	Number (N)	Ratio (%)	Mean	Standard deviation (SD)
1	Low	31	15	16	0,00
2	Medium	142	68,6	20,6	2,74
3	High	34	16,4	35,5	4,81
<b>Total</b>		<b>207</b>	<b>100</b>	<b>22,14</b>	<b>6,3</b>

**Note:** Mean below 17: aggressive behaviors are at low level

Mean from 17 to 28: aggressive behaviors are at medium level

Mean above 28: aggressive behaviors are at high level

Data from Table 1 shows that the majority of preschool children surveyed had aggressive behaviors at average level. 68.6% of preschool children have aggressive behaviors at medium and low level. These children do not have aggressive behaviors expression or only one aggressive behaviors expression occurring once a day. This shows that in class, most children have less aggressive behavior, hurting others like fighting, insulting, screaming... If there is anger or conflict with friend, the children in this group oftengrunt, stick alone or use language to resolve conflicts.

It is notable that 34 (16.4%) children surveyed had high levels of aggressive behaviors. In these children, the frequency of aggressive behaviors appears more than 3 times a day. Although there are not many children with high levels of aggressive behaviors, these children still need special attention, because their behaviors can affect the children around them. Children scream, shout when playing, hard to control angry emotions. If a conflict occurs, these children often loud and using items such as toys, drinking glasses, rugs... or using body parts such as teeth, hands, head... to cause pain, injury to others.

Previous studies have shown that aggressive behaviors in may be a risk for subsequent violent behavior, which affects the social relationships of older children. Nearly one-third of five-year-old children are still aggressive at age 14 (Shaw, Gilliom&Giovannelli, 2000; Richman, Stevenson & Graham, 1982; Bor, Najman, O'Callaghan, Williams & Anstey, 2001); 50% of preschoolers will continue these behaviors in adolescence and a significant number of these children will have anti-social behavior in adulthood (Campbell, 1995). In other words, it is an important prediction for the development of the child's personality in the future. Therefore, we believe that regardless of the child's level of aggressive behaviors, attention should be paid and there must be timely intervention.

We found a positive correlation when comparing the results of aggressive behaviors of children in the classroom with the aggressive behaviors of children at home through the parental checklist DBC-P ( $r = 0.287$ ,  $p = 0.000$ ). Thus, children can not only express their aggression in the classroom but also express it during their time at home such as screaming, cursing, being agitated, biting, stomping, stepping on the door, angry screaming, throwing or smashing things, deliberately teasing or provoking others.

Aggressive behaviors of preschool children are expressed through direct and indirect nonverbal behavior and language.

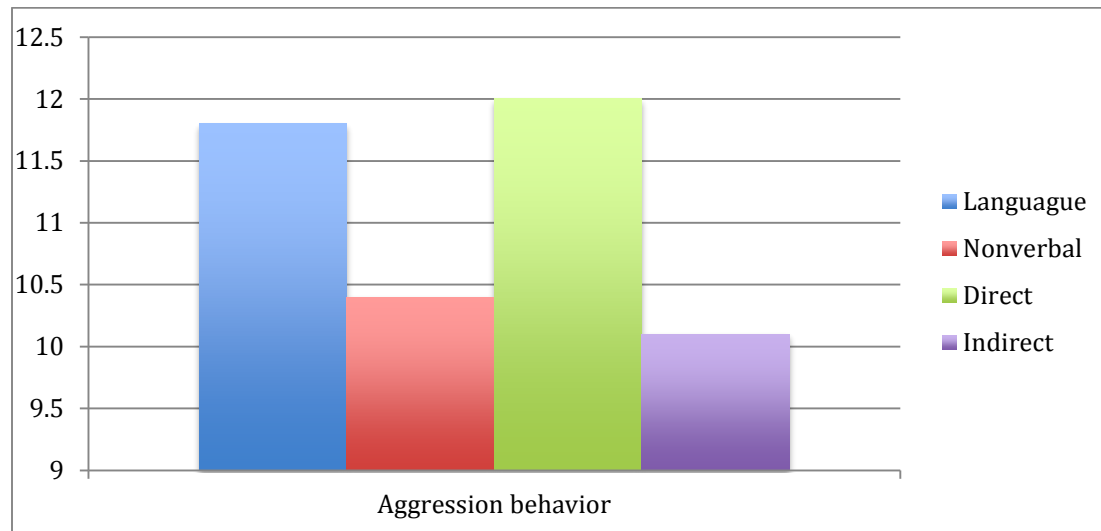


Figure 1. Levels of expressions of aggressive behaviors of preschool children

Observation of the child's classroom activities shows that the aggressive behaviors of children is *clearly expressed through linguistic behavior* (GPA = 11.8). Children tend to use offensive, aggressive language with intonation, high volume and vicious attitude, constant gestures... whenever angry, uncomfortable, dissatisfied... with friends and the people around. When asked about forms of aggression, preschool teachers stated that "in the classroom, children are taught how to deal with conflicts with others by word or deed, so children rarely hit friend", "In my class, if being angry with others children often shout, there are only a few instances that children hit friend, even make friend to cry". Some prior research has also proven this.

At the age of preschool, child is able to control his or her strong emotions. In addition, children have mastered their mother tongue in daily activities. Therefore, the child is able to inform others of his angry attitude about something by words, intonation...

The expression of aggressive behaviors through language will reduce the danger of this behavior to those around him. This also proves that this is not a sign of disorder but the psychological characteristics of this stage.

Aggressive behaviors of preschool children are mainly expressed directly ( $\bar{X} = 12$ ). In situations of conflict, most children often have direct reactions to the object causing their anger (biting, hitting, jerking, pushing, etc.). In addition, some children turn their anger into surrounding objects such as furniture, school supplies, toys, etc., or anger with this friend but have other hurtful behaviors. At the preschool age in general, children are sensitive, the emotional expression of children to the surrounding people is very clear. So, when children are angry or unhappy with someone, children often have aggressive behaviors directly toward that person.

## 2. Expression of the aggressive behavior of pre-school children through linguistic behavior

As discussed above, aggressive behaviors of preschool children are exposed through clear linguistic behaviors. He uses words with pronunciation and intonation to express his aggressiveness.

Table 2. Aggressive behaviors of preschool children express by language (N=207)

Classify	No.	Behavior	Mean	SD	Level
Direct language	1	Children argue teacher when not satisfied	1,34	0,67	5
	2	Children say the mess with friends when angry	1,36	0,67	4
	3	Children quarrel with friend when having there is a conflict	1,99	0,92	1
	4	Children shout at friend while playing	1,85	0,95	2
	5	When unhappy about something, children grunt, stick alone	1,57	0,76	3
Indirect language	6	Child are angry with one friend but say a mess with another	1,17	0,48	7
	7	When angry with friends, children scolded objects around	1,16	0,46	8
	8	Trong những cuộc xích mích, trẻ có những lời nói khiêu khích bạn bè xung quanh In the friction, the child has the words to provoke friends around	1,33	0,66	6
Mean of Direct language			5,24	1,62	
Mean of Indirect language			6,54	2,41	

The above results showed that preschool children often have aggressive behaviors expressions such as "loud with you when there is a conflict", "screaming, shouting at friends while playing", "grunting, sticking alone" quite clearly (= 1.99, 1.85 and 1.57 points).

The process of observing the children in the classroom, we noticed that while playing, some children shouted at another when grabbing toys, teasing. Children often say loudly, over other's voice, sometimes screaming some words such as "shut up or I will hit you", "go away", "are you crazy"... with angry attitude.

Some children leave group when angry or not happy, alone in the corner of the class with irritation. Some kids scold friends around, even though they are not the ones who have conflict with him. A small number of children, when dissatisfied with the teacher, reacted in protest. We find that when aggressive, the words of children with friends and teachers are often very curt and do not have subject in sentences. The child speaks loudly and breath fast, stomping leg or swinging hand, pointing at the opposite person.

### 3. Aggressive behaviour expression through non-verbal behaviors

The aggressive behavior of pre-school children are also manifested through nonverbal behaviors. We identify non-verbal behaviors that demonstrate the child's aggression, including gestures, actions to attack or hurt a friend or a teacher.

These actions can be directly toward the object that causes the child to be aggressive or object around. Results showed that children have aggressive behaviors such as "Using parts of the body to hurt others" ( $\bar{X} = 1,69$ ), "Frictions with this friend but beating other" ( $\bar{X} = 1,37$ ), "Child uses any object to hit friend" ( $\bar{X} = 1,29$ ) (Table 4.3)

**Table 4.3.** Aggressive behaviors of preschool children through non-verbal behaviors (N=207)

Classify	No.	Behavior	Mean	SD	Level
Directly non-verbal behavior	1	Children use any widgets (toys, chairs...) to hit others.	1,29	0,632	3
	2	Children use body parts (arms, legs, head, teeth...) to cause pain to others (hitting, pulling hair, biting...)	1,69	0,837	1
	3	When seeing a fight, children enjoy watching and go on strike	1,27	0,55	4
	4	Children are agitated when friend grabs toys	1,23	0,55	5
	5	Child has conflict with this friend but hit another	1,37	0,661	2
Indirectly non-verbal behavior	6	When being angry, children have strong behavior with objects around (throw toys, trample objects..)	1,19	0,491	7
	7	When being angry with someone, children often break their belongings	1,13	0,411	8
	8	When being angry, children tantrum	1,22	0,582	6
Mean of Directly non-verbal behavior			4,9		
Mean of Indirectly non-verbal behavior			5,47		

The most common aggressive behaviors is "the child uses parts of the body that cause pain to others." They use their hands to punch, pinch, grab, pull, push other down; mouth biting, spitting; foot kick, pedal to other; head up to other; push other fall...

Children also "use any item to attack, beat others." Children use pencils to pierce friend, use a glass of water to hit other's head, use toys to hit or throw at a friend, push the bed or chair to make other hurt.

Some children turn their aggression to people or things around when being angry or not happy. When the child is upset, if there are any children standing near the child will hit him with the threat. Some children use their feet, hands, or punches against walls, doors or objects; Throwing objects to the ground, trample on objects. Tantruming less appears in the classroom.

These behaviors are very rapid, almost the child reacts immediately to anger, discomfort. This makes it difficult for the teacher to intervene in time, causing other children to be hurt.

Through the observation of children in the classroom, we found that in any activity children can also appear aggressive behaviors, from learning to free play, corner activities, outdoor activities, eating time, before sleeping, brushing... However, in activities with little control of the teacher (corner activities, before meals, outdoor activities...) or when the teacher does not notice, the aggressive behaviors of children appear much.

Situations that lead to the child's aggression are also quite diverse: children compete with each other (competing toys and plays, learning supplies, fighting for the toilet first, painting chairs, bed sheets before go to sleep, fight for the teacher to compliment...), children were teased by friends (child was told to look like baby, was laughed when being incontinent), children were unsatisfied (someone put pillow at wrong place, someone stand at child's place, someone pull child's hair, someone takes the chair, someone take child's clothes...), the child wants to attract attention, the child reminded by the teacher, the child is not satisfied with teacher (she does not treat as the

way child wants, the child thinks she is not fair...). Even some children hit others even when there are no obvious causes.

### CONCLUSIONS AND DISCUSSION

The results of this study show that most of pre-school children in the study group showed aggressive behavior, in which aggression was manifested through linguistic behavior more clearly than non-verbal behavior. These findings are the basis for proposing appropriate, effective interventions to reduce this behavior in children.

### REFERENCES

- [1] Block, JH (1983). Differential premises arising from differential socialization of the sexes: Some conjecture. *Child Development*, 54, 1335–1354.
- [2] Bor. W, Najman. J M, O’Callaghan, M. Williams, G M & Anstey. K (2001). Aggression and the development of delinquent behaviour in children. *Australian Institute of Criminology: Trends & Issues in Crime and Criminal Justice*. Australian Institute of Criminology.
- [3] Campbell, S. B. (1995). Behaviour problems in preschool children: A review of recent research, *Journal of Child Psychology and Psychiatry*, 36, 1, 115–119.
- [4] Campbell, S.B., Shaw, D. S. & Gilliom, M. (2000). Early externalising behaviour problems: Toddlers and pre-schoolers at risk for later maladjustment. *Development and psychopathology*, 12, 467–488.
- [5] Crick, NR, Bigbee, MA, & Howes, C. (1996). Gender differences in children's normative beliefs about aggression: How do I hurt thee? Let me count the ways. *Child Development*, 67, 1003–1014.
- [6] Feshbach, S. (1970). *Aggression*. In PH Mussen (Ed.), *Carmichael's Manual of J Sch Psychol*.
- [7] Jacqueline L. Martin, Hildy S. Ross (2005). Sibling aggression: Sex differences and parents’ reactions. *International Journal of Behavioral Development*, Vol 29, Issue 2.
- [8] Jansen, EA, & Pidada, S. (2002). United States and Indonesian children's and adolescents' reports of relational aggression by disliked peers. *Child Development*, 73, 1143–1150.
- [9] Gunam D. Singh; Gertruida M. Steyn (2013). Strategies to address learner aggression in rural South African secondary schools. *Koers (Online)*. Vol.78 n.3.
- [10] Kevin Leman (2001), *Living in a Step-Family Without Getting Stepped on: Helping Your Children Survive the Birth Order Blender*, Thomas Nelson Inc.
- [11] Maccoby, EE & Jacklin, CN (1974). The psychology of sex differences, *Social Development*. Vol 13 n2. p255-277.



## FORMATION OF VIETNAMESE COMMUNICATION SKILL, FOR 5-6 YEAR-OLD H'MONG CHILDREN IN LAO CAI PROVINCE, VIETNAM SITUATION AND SOLUTIONS

Dinh Van Vang and Giang Thi Gam

*Editor-in- chief of Children's Literature Magazine*

*Lecturer at Lao Cai Teacher Training College, Chieng On street, Binh Minh Ward, Lao Cai City, Vietnam*

*Corresponding author-E-mail address: [gamsplc@gmail.com](mailto:gamsplc@gmail.com)*

### ABSTRACT

Develop children's communication skills for 5-6 year old H'mong in of Vietnamese is an important task in caring children process in remote kinder schools. Vietnamese is thought as a means of communication, cooperation with friends and perceived knowledge in learning activities at school. Besides, Vietnamese helps children to integrate confidently with their classmates, learn and share together. The fact shows that, children of H'mong ethnic children' communication skills of competency in using Vietnamese have certain limitations. They are usually shy, not very confident in communication. Their vocabulary is poor, linguistic sounds are not very good. Therefore, the fact finding the causes and suggest solutions to develop children's communication skills for 5-6 year old H'mong in Vietnamese be better is very necessary.

**KEYWORDS:** *communication skills, ethnic H'mong, Vietnamese, children 5-6 years old*

## INTRODUCTION

Lao Cai is a province bordering Vietnam and China with more than 20 ethnic groups. As the society grows, there are more and more ethnic minority children going to school. In addition to their languages, they are taught Vietnamese and practice Vietnamese communication skills (VCS). This is necessary to help them build a strong foundation in Vietnamese when they enter the school - the learning environment, communicating in Vietnamese. Therefore, the survey and assessment on the status of VCS of H'mong ethnic minority children in our research namely "Formation of Vietnamese communication skills for 5-6 year old H'mong children" is very important and necessary. This is the basis for the development of orientations and methods of VCS for H'mong children in particular and ethnic minority children in Lao Cai province in general.

## RESEARCH METHODS

- Analysis, synthesis and comparison: Reading books and analysis to collect information relate to research.
- Observation: observe activities during the training cultural communication behavior to find the issue for the research.
- Survey: use exercises, survey sheets
- Data processing: use mathematical statistics to handle the metrics of the article

## RESERCH QUESTIONS

- What difficulties do you have when studying about the status of VCS for 5-6 year old H'mong children?
- Why do you choose H'mong children to study VCS, not other ethnic groups?

## RESULT

We studied 285 teachers teaching in classes for 5 - 6 year old children and 332 H'mong children aged 5 - 6 in 30 preschools in Si Ma Cai, Bac Ha, Sa Pa, Muong Khuong and Bat Xat in Lao Cai province. During doing research time, we do the research on teachers and students.

To teachers, we use survey sheets, questionnaires to know about the awareness from teachers about the importance to develop children's communication skills by Vietnamese and how they use the training activities and measures to develop children's communication skills by Vietnamese for 5- 6 year H'mong children. We use exercises, observe classes activities to adjust children's communication skills.

After doing the survey, study issue about developing children's communication skills by Vietnamese for 5- 6 year H'Mong children, we have the results:

### \*Teachers

- Perceptions of preschool teachers on the need to VCS for 5-6 year-old H'mong children

Conducted a survey of 285 teachers of 30 preschools in 5 districts: Bac Ha, Si Ma Cai, Sa Pa, Muong Khuong, Bat Xat - where many H'mong ethnic children study through questionnaires and conversations with preschool teachers, we have the following results:

Table 1. Perception of Lao Cai preschool teachers about the need to form VCS for 5 -6 year old H'mong children (Under ethnic groups)

Ethnic groups	Degree of necessity						Σ	$\bar{X}$	Rank
	Very necessary		Necessary		Unnecessary				
	SL	%	SL	%	SL	%			
H'mông (n = 89)	71	79,8	18	20,2	0	0	249	2,80	2
Tày (n = 45)	35	77,8	10	22,2	0	0	125	2,78	3
Dao (n = 37)	26	70,3	11	29,7	0	0	100	2,70	4
Nùng (n = 28)	18	64,3	10	35,7	0	0	74	2,64	5
Kinh (n = 86)	71	82,6	15	17,4	0	0	243	2,83	1
Chung (n = 285)	221	77,5	64	22,5	0	0			
Total									

(Note: Very Necessary: 3 points, Necessary: 2 points, Unnecessary: 1 point)

This result shows that most of the teachers studied (77.5%) think that the formation of VCS for ethnic minority children in general and 5 – 6 year-old H'mong ethnic minority children, in particular, are very necessary. There are no preschool teachers think that teaching Vietnamese language and the formation of VSC for ethnic children at preschool age is unnecessary. Not only Kinh teachers but also many ethnic minority teachers such as H'mong, Tay have the same perception on this issue. The average score (A) on the necessity of forming VCS for ethnic minority children of all ethnic minorities was quite high (ranging from 2.64 to 2.83)

- Situation of using educational activities as a means of forming VCS for 5-6 year old H'mong children of kindergarten teachers in Lao Cai province

Through the survey with anklets sheets and directly exchanging with some kindergarten teachers and studying their lesson plans, we found that kindergarten teachers in Lao Cai province have used a lot of educational activities to form VCS for H'mong children aged 5- 6. Frequency of using these activities is different, in which the most common is targeted learning activities (77.89%), followed by playing activities (64.91 %) and feeding children (62.11%) (see table 2)

Table 2. Degree of using the educational activities as a means for the formation of VCS for 5-6 year-old H'mong children in Lao Cai

		Degree of using						$\Sigma$	$\bar{X}$	Rank
No.	Activities	Usually		Sometimes		Never				
		Quantity	%	Quantity	%	Quantity	%			
1	Playing activities	185		59		41		714	2,51	2
			64,91		20,70		14,39			
2	Targeted learning activities	222	77,89	56	19,65	7	2,46	785	2,75	1
3	Picking-up activities	125	43,86	95	33,33	65	22,81	630	2,21	5

No.	Activities	Degree of using						$\Sigma$	$\bar{X}$	Rank
		Usually		Sometimes		Never				
		Quantity	%	Quantity	%	Quantity	%			
4	Feeding children activities	177	62,11	68	23,86	40	14,04	707	2,48	3
5	Personal hygiene	90	31,58	125	43,86	70	14,56	590	2,07	6
6	Optional activities	170	59,65	74	25,96	41	14,39	699	2,45	4
7	Walking, sightseeing	96	33,68	84	29,47	105	36,84	561	1,97	7
8	Cleaning activities	75	26,32	116	40,70	94	32,98	551	1,93	8

(Note: Usually: 3 points, Sometimes: 2 points, Never: 1 point)

Some educational activities sometimes used are personal hygiene activities (43.86%) and cleaning activities. There are even activities like walking and sightseeing (36.84 %) and cleaning activities (32.98%) never used.

- The situation of measures to organize educational activities in order to form VCS for 5-6 year-old H'mong children of kindergarten teachers in Lao Cai province.

When organizing the educational activities for children, teachers often use a combination of different methods. The effectiveness of the educational activities is largely dependent on the methods that teachers use to organize activities for their children. To investigate the current situation of measures to organize educational activities for the formation of VCS for 5 - 6 year old H'mong children, we combine many research methods such as: survey by anklets, study the plan of organizing the activities of teachers, observing the educational activities for preschool children, and talking to the teachers about forming VCS for 5 - 6 year old H'mong children. Based on the survey, we found that preschool teachers in Lao Cai province use a number of measures to organize the educational activities at different frequencies to form VCS for 5-6-year-old H'mong children. Details as follows: Table 3. Current situation of measures to organize the educational activities for the formation of VCS for 5 - 6 year old H'mong children in Lao Cai province

No.	Measures	Degree of using						$\Sigma$	$\overline{X}$	Rank
		usually		Sometimes		Never				
		Quantity	%	Quantity	%	Quantity	%			
1	Creating a communication environment for Vietnamese in all activities	192	67.37	65	22.81	28	9.82	734	2.58	2
2	Creating problematic communication situations for Vietnamese in all activities.	129	45.26	91	31.93	65	22,81	634	2.22	6

No.	Measures	Degree of using						$\Sigma$	$\overline{X}$	Rank
		usually		Sometimes		Never				
		Quantity	%	Quantity	%	Quantity	%			
3	Building up the circle of friends and encouraging children to communicate in Vietnamese.	75	26.32	124	43.51	86	30,18	559	1.96	9
4	Creating opportunities for children to experience and explore life around	108	37.89	65	22.81	112	39,30	566	1.99	8
5	Using literary works (poetry, riddles, folk songs...)	185	64.91	75	26.32	25	8.77	730	2.56	3
6	Using games	101	38.11	69	26.04	95	35,85	536	2.02	7
7	Encouraging children in right time	210	73.68	65	22.81	10	3.51	770	2.70	1
8	Coordinating with children's family in forming VCS for children.	115	40.35	121	42.46	49	17,19	636	2.23	5
9	Orienting and creating opportunities for children to use body languages	60	21.05	100	35.09	125	43,86	505	1.77	10
10	Providing and expanding the Vietnamese language for children.	125	43.86	105	36.84	55	19,30	640	2.25	4

(Note: Usually: 3 points, Sometimes: 2 points, Never: 1 point)

In this table, although the kindergarten teachers in Lao Cai province have used a lot of measures to organize educational activities to form VCS for 5-6 year old H'mong children in different frequency of use. In which, the measures usually used by teachers are encouragement, timely encouragement (73.68%), followed by the creating

communication environment for Vietnamese in all activities (67, 37%) and the last is the use of literary works (64.91%). Encouraging children to communicate in Vietnamese is urgently needed. However, this method is only effective when children have some achievements during their process of communication in Vietnamese. So the measures such as building up a circle of friends, encouraging children to communicate in Vietnamese, creating opportunities for children to experience, explore life around and using games should be prioritized to use regularly when organizing activities for the purpose of forming VCS for 5 - 6 year old H'mong children. In fact, many teachers in Lao Cai sometimes or never use (ranked the end of the statistics table). Observing some activities of children, we found that the methods teachers use to form VCS for children is not suitable, so children are not encouraged to be brave, confident in using the Vietnamese language to resolve the problems. For example, in the activity of exploring the surrounding environment, some teachers occasionally create opportunities for children to use Vietnamese to answer the questions, describe the object that children know and exchange with friends. However, teachers do not pay attention to correct the pronunciation error and the sentence created when they answer, describe the objects and exchange with friends, This limits their ability of Vietnamese and communication skills.

- Status of VCS of 5 - 6 year old H'mong children.

Since 5 - 6 year- old children are unable to read or write, their VCS is expressed through listening and speaking skills. Vietnamese listening and speaking skills are expressed in 4 component skills with indicators as follows: 1. Vietnamese listening comprehension skills (3 indicators). 2. Vietnamese monologue skills (2 indicators). 3. Vietnamese conversation skills (2 indicators). 4. Skills in using Vietnamese language and non-verbal language appropriate to communication context (2 indicators). Each indicator is divided into 4 ranges of formation as follows:

- Range 1 (Maturity skills) 30-36 points
- Range 2 (Skills not yet Mature) 23-29 points
- Range 3 (having sign of kills) 16-22 points
- Range 4 (no sign of kills) under 16 points

Through the experimental system evaluating the VCS of 5 to 6 year-old H'mong children in activities to determine the VCS of children, combined with talking with teachers, parents and children, we get results as follows:

Table 4. Status of VCS of 5 - 6 year old H'mong children (based on their residence)

Residence	Degree of VCS							
	Level 1		Level 2		Level 3		Level 4	
	Quantity	%	Quantity	%	Quantity	%	Quantity	%
Bắc Hà	10	10,8	15	16,1	31	33,3	37	39,8
Sì Ma Cai	10	9,5	17	16,2	35	33,3	43	41,0
Sa Pa	6	12,8	9	19,1	12	25,5	20	42,6
Mường Khương	5	10,0	6	12,0	18	36,0	21	42,0
Bát Xát	6	14,3	11	26,2	13	31,0	12	28,6
Chung/Totals	37	11,0	58	17,2	109	32,3	133	39,5

According to this table, VCS of 5-6-year-old Hmong children in Lao Cai is very limited. Up to 39.5% of children do not have VCS (Level 4), 32.3% of children only have signs of VCS (Level 3).

The number of children with VCS is not much: 28.2% (11.0% at level 1 - 17.2% at level 2 – not yet mature level). There is a difference in the level of VCS in different residences.

The highest percentage of children having VCS in Bat Xat is 40.5% (in which 14.3% at armature level, 26.3% in not yet mature). The percentage of children who do not have VCS in Sa Pa, Muong Khuong and Si Ma Cai is quite high (42.6%, 42.0%, 41.0% respectively).

Observing the communication in Vietnamese of children with teachers and friends, we found that most Vietnamese children's pronunciation is not clear, the tone is not natural, even the most commonly used words such "Hoa cà tím tím" read into "hoa cà tin tin"; "cà chua" read into "cà chố"; "quả chuối" read into "quả chúi"; "cái đuôi con mèo" read into "cái đui con mè"

Children have difficulty in understanding the spoken Vietnamese when communicating with others, especially when they speak fast and much. In such cases, we observed that the children do not meet the requirements of the teachers. They become scared and shy, especially when teachers look at them. The ability to monologue, conversational Vietnamese in the process of participating in the educational activities of children is very limited. Limitations in expressing, using words when communicating in Vietnamese of H'mong children aged 5 - 6 are expressed in many different forms such as voice not expressive, reverse saying, saying disordered sentences, saying not enough sentences. For example, when asked if the child has dinner yet, his answer is like: "Rice eats already" or "Apple 4" for the question "How many apples"

When communicate in Vietnamese, emotional expression of H'mong children aged 5 - 6 years is very limited. Some of them have habit to repeat after others

They repeat some words that they just heard. This shows that the children have the ability to hear and keep what they heard in short-term memory, long enough to be repeated. For example, when meeting the children, the teachers remind: "Say hello to me!", then the children repeat: "Say hello to me!". Or when the teachers asks "What is your father's name?" The children repeat that question: "What is your father's name?"

Due to limited VCS, children do not actively use Vietnamese to cooperate and share with friends while studying or playing. Most children do not ask friends and they only ask their friends using the same languages. The questions sometimes do not match the communication context, as well as the partner.

When communicating in Vietnamese, children rarely use non-verbal language such as eyes, facial expressions, smile and gestures to interact with others. It may be that children are too timid, shy or do not understand the Vietnamese language, so they do not use non-verbal means to express their feelings.

In many cases, children use non-verbal language but not suitable for communication situation and their attitude and emotions. For example, they nod their head to ask teachers to repeat the question? (The children nod but do not understand what teachers say).

-By gender

Based on the survey, we found that there is a small difference in the level of VCS of H'mong boys and girls aged 5 - 6 years (see Table 5).

Table 5. Status of VCS of 5-6 year-old H'mong children (by gender)

Figure 5. The problem of communication skills in Vietnamese of ethnic children 5-6 year

Sex	Level of skills							
	Level 1		Level 2		Level 3		Level 4	
	number	%	Number	%	number	%	number	%
Boys	17	5,1	32	9,5	51	15,1	70	20,8
Girls	20	5,9	26	7,7	58	17,2	63	18,7

The figure shows that the rate % in level 1 of girls' communication skills in Vietnamese is higher than boys (girls: 5,9%; boys: 5,1%). The rate % in level 2 of boys' communication skills in Vietnamese (but not very good) is a



bit higher than girls (boys: 9,5%; girls: 7,7%). The rate % in level 4 of boys' communication skills without Vietnamese is a little higher than girls (boys: 20,8%; girls: 18,7%).

*\* Follow each criterion*

Communication skills in Vietnamese of ethnic H'Mong children 5-6 year is shown in 4 criterias: Listening skills in Vietnamese, monologue in Vietnamese, Speaking skills in Vietnamese, combining ability in using Vietnamese and body language.

From the date 4 criteria of communication skills in Vietnamese of ethnic H'Mong children 5-6 year, we have the following results

Figure 6. The problem of communication skills in Vietnamese of ethnic children 5-6 year follow each criterion

criteria	Level of skills								$\bar{X}$	Thứ bậc
	Level 1		Level 2		Level 3		Level 4			
	number	%	Number	%	number	%	Number	%		
Listening skills in Vietnamese	28	8,3	62	18,4	99	29,4	148	43,9	1,91	2
monologue in Vietnamese,	38	11,3	49	14,5	115	34,1	135	40,1	1,97	1
Speaking skills in Vietnamese,	30	8,9	47	13,9	105	31,2	155	46,0	1,86	3
combining ability in using Vietnamese and body language	39	11,6	65	19,3	105	31,2	128	38,0	1,75	4

Through the table, we see that the average number of criteria incommunication skills in Vietnamese of ethnic children is express skills at level 3. Meanwhile, amonologue in Vietnamese is the best ( $\bar{X} = 1,97đ$ ), Listening skills in Vietnamese ( $\bar{X} = 1,91đ$ ). Combining ability in using Vietnamese and body language is lowest ( $\bar{X} = 1,75đ$ ). Talking to children we found that, they can use Vietnamese in communicating is quite good, but their speech is not very fast enough and lacking confidence

When we have conversation about loved animal with Giảng Seo Chur, Cán Cầu kinder school, Sĩ Ma Cai district. He talked slower and sometimes have disorder sentences. "One of the animals, cat loves me most", in fact, he wants to say "One of the animals, I love cat most"

Hàng Thị Máy, Cao Sơn kinder school, Mường Khương district talk about her family, she can herself describe her house, members of the family and pets. In her talk, she uses quite a good Vietnamese, but her pronunciation is not very good some words, for example; Hoa ca tim tim, they say Hoa ca tin tin, qua chui – qua chui, .... Sometimes they use H'Mong language in the conversation "chau namxmaos (ăn cơm) with parents, cháu thích đi cwoł tuos (đi học) ...

### SOME SUGGESTED SOLUTIONS

From approaching Vietnam children education is organizing activities base on themes and problem to develop Vietnamese communication skills for ethnic Hmong children 5-6 in Lao Cai province – Viet Nam. We introduce 5 solutions to develop Vietnamese communication skills for ethnic Hmong children 5-6:

*Create chances for children use Vietnamese regularly to talk with teachers and friends in the co-activities at schools*

- Encourage children in time, correct their mistake in communicating when attending activities at schools.
- Have children work in groups with Kinh children in the activities
- Organize outdoor activities to create the opportunity for children use Vietnamese in communication
- Establish the relationship between school and family to teach children touse Vietnamese every day

Those methods have interactive relationship each other in organizing activities at school. Teacher need use methods creatively with school condition and children competency to develop Vietnamese communication skills for ethnic Hmong children 5-6 in daily activities

### CONCLUSION AND DISCUSSION

Through the research results, we found that kinderschool teachers in Lao Cai are aware of the importance of Vietnamese communication skills for ethnic children 5-6 and use different methods to organize activities at school to teach children Vietnamese effectively

### REFERENCES

- [1]. Ministry of Education and Training, 2014. *ECE Program*. Vietnamese Education Publishing House.
- [2]. Ministry of Education and Training, 2010. *Circular No. 23/2010 / TT-BGDDT dated 23/7/2010 Promulgating the Regulation on the Five-Year-Old Children Development Standard"*
- [3]. Nguyen Thi Hoa, 2009. *Early childhood education curriculum*. Publisher of Pedagogical University.
- [4]. Nguyen Thi Hoa, 2013. *Integrated Early Childhood Education Curriculum*. Publisher of Pedagogical University.
- [5]. Le Thu Huong (Ed.), 2015. *Guiding the organization of the implementation of educational activities in kindergarten under the theme (kindergarten children)*. Education Publishing House.
- [6]. Le Thu Huong - Tran Thi Ngoc Tram - Le Thi Anh Tuyet. 2015, *Guiding the implementation of ECEC programs (kindergarten children)*. Education Publishing House
- [7]. Trieu Thi Lien, 2011 *Research and propose solutions to increase Vietnamese awareness in ECEC programs in highland districts of Ha Giang province's Northern*. Scientific research project, provincial level, Ha Giang Department of Education and Training.
- [8]. Hoang Phe, 1976. *Teaching Vietnamese to ethnic minority students*. Journal of Educational Research, No. 4, 1976.
- [9]. Dinh Hong Thai, 2008. *Language development curriculum for preschool children*. Education Publishing House.
- [10]. Nguyen Anh Tuyet - Nguyen Thi Nhu Mai, 2008. *The curriculum of development psychology children preschool age*. Education Publishing House.
- [11]. Dinh Van Vang - *Early Childhood Education* - Education Publishing House, 2008.
- [12]. Nguyen Anh Tuyet - Nguyen Thi Nhu Mai, 2008. *The curriculum of development of the psychology of preschool children*. Education Publishing House.

## IMPROVING TRAINING CULTURAL COMMUNICATION BEHAVIORS FOR PRE-SCHOOL CHILDREN IN KINDERGARTEN SCHOOL IN LAO CAI PROVINCE

Giang Thi Gam and Vu Thi Binh,  
Lecturer at Lao Cai Teacher Training College, Chieng On street, Binh Minh Ward, Lao Cai City, Vietnam  
Corresponding author-E-mail address: gamsplc@gmail.com

### ABSTRACT

Cultural communication behavioral training for preschool children in general and kindergarten children, in particular, is a matter of great concern as it directly affects the development of the child's personality. Because, it is a disadvantage for the children if they are not taught about cultural communication behavioral training, especially at school; they may fail in developing their personalities. Thus, this is an important factor in the training of children in preschool. Especial the communication behavior groups such as; behaving in polite communicating way behavior, expressing in the conversations, showing the needs with other people, expressing the sympathy and respect in communicating. In this article, we discuss the current status and some methods of communication behavioral training for kindergarten children in preschool.

**KEYWORDS:** pre-school children, communication behavior, cultural communication, communication culture training

## INTRODUCTION

Cultural communication behavioral training for preschool children is important and necessary. It created the first premise for the formation of a new socialist human personality. If we do not focus in training children at the early age it will be difficult to develop strong ethical and moral qualities in order to acquire the social normative knowledge. In fact, the cultural communication behavioral training for children has been paid more attention. However, the content in training courses is not rich; the training measures from teachers are also imposed, not logical and put pressure on children.

Many children at this age do not have the right attitude in communicating to meet social target, aware of wrong and right is still limited. Depend on study from the experience, we introduced some solutions in communicative behavioral training for pre-school children in some kindergartens in Lao Cai province.

## RESEARCH METHODS

- Analysis, synthesis and comparison: Reading books and analysis to collect information relate to research.
- Observation: observe activities during the training cultural communication behavior to find the issue for the research.
- Survey: use exercises, survey sheets
- Data processing: use mathematical statistics to handle the metrics of the article

## RESEARCH QUESTIONS

- In the selected solutions, what is the best solution? Why?
- Why does cultural communication behavioral training contribute to the development of personality for kindergarten children?

## RESULT

To assess the current status of cultural communication behavioral training for kindergarten children, we used a questionnaire that combined the exchange and sharing with teachers and administrators in some kindergartens in Lao Cai province and observes the organization of daily activities for the children of teachers to know what degree of cultural communication behavioral training.

Perceptions of teachers and administrators at kindergarten on the significance of cultural communication behavioral training for children.

We surveyed 275 managers and teachers in kindergartens in Bao Thang, Van Ban, Bao Yen, Bat Xat, Sa Pa, Lao Cai, Lao Cai.

Table 1: The need for cultural communication behavioral training for kindergarten children.

Ward/City	Degree of necessity						Rank	
	Very necessary		Necessary		Unnecessary			
	SL		SL		SL			
	Quantity	%	Quantity	%	Quantity	%		
Văn Bàn	42	89.4	5	10.6	0	0	2,80	6
Bảo Thắng	50	96.2	2	3.8	0	0	2,85	2
Bảo Yên	26	92.9	2	7.1	0	0	2,70	4
Sa Pa	36	90.0	4	10.0	0	0	2,64	5
Bát Xát	41	93.2	3	6.8	0	0	2,81	3
TP Lào Cai	80	97.6	2	2.4	0	0	2,90	1
Tổng/ Total	275	93.2	18	6.8				

The above results show that 93.2% of teachers and managers think it is necessary; 6.8% is considered necessary. From these results, most teachers have identified the importance of cultural communication behavioral training for preschool children during child training. From that perception, most teachers (93.2%) have paid much attention to cultural communication behavioral training for children. When asked about the "evaluation of the use of cultural communication behavioral training for preschool children", most of the teachers (85.8%) did not regularly educate their children, only interested in polite and obeyed behavior: greetings, thanks, apologies, permission, etc during school hours or different activities during the day. Thus, we find that cultural communication behavioral training for preschool isn't used regularly in a synchronized manner so that there are still certain limitations in cultural communication behavioral training for preschool. Talking about the "measure of cultural communication behavioral training for preschool", the majority of teachers (71.7%) taught children through daily activities with the method like: when the children use the wrong words or not suitable for the context of the communication, children were asked to repeat after the teachers only; Teachers even do not care about children's attitudes, gestures, and cents when they communicate with others. Observing some of the activities of teachers in the class, we found teachers do not proactively introduce the way to educate cultural communication behavior for children. Moreover, sometimes teachers ignore this. For example, when seeing children have an aggressive attitude or snatching toys from friends, teachers laughed (because it is funny and it shows the personality of the child), then ask children to say sorry to friends.

We surveyed 120 preschool children in some preschools of Lao Cai city, Sa Pa, Bat Xat on the cultural communication behavior:

Table 2: Survey results of the cultural communication behavior of preschool children

No.	Cultural communication behaviors	Degree							
		Excellent		Good		Average		Weak	
		Quantity	%	Quantity	%	Quantity	%	Quantity	%
Communicative behaviors of politeness and obeying									
1	Greetings	22	18.3	41	34.2	47	39.2	10	8.33
2	Thanks	30	25	35	29.2	46	38.3	9	7.5
3	Apologies	23	19.2	29	24.2	62	51.7	6	5
4	Asking for permission	12	10	32	26.7	53	44.2	23	19.2
5	Obeying	21	17.5	38	31.7	50	41.7	11	9.17
Behaviors in conversations									
6	Agree and listen to others	23	19.2	23	19.2	65	54.2	9	7.5
7	Do not interrupt when others are talking	31	25.8	29	24.2	52	43.3	8	6.67
8	Face the person talking to	24	20	22	18.3	68	56.7	6	5

9	<i>Speak loudly enough, do not say impolite words</i>	38	31.7	30	25	50	41.7	2	1.67
10	<i>Use intimate words with friends</i>	35	29.2	41	34.2	37	30.8	7	5.83
<b>Behaviors of expressing demand with others</b>									
11	<i>Know how to demand someone</i>	21	17.5	46	38.3	49	40.8	4	3.33
12	<i>Know how to demand to join activities</i>	20	16.7	45	37.5	46	38.3	9	7.5
<b>Behaviors of expressing sympathy and sharing</b>									
13	<i>Care about relatives, friends and others who need help</i>	25	20.8	45	37.5	39	32.5	11	9.17
14	<i>Play and share information with friends</i>	30	25	41	34.2	40	33.3	9	7.5
<b>Behaviors of expressing respect in conversations</b>									
15	<i>Agree with others comments</i>	21	17.5	46	38.3	48	40	5	4.17
16	<i>Respect others hobbies</i>	35	29.2	57	47.5	21	17.5	7	5.83
17	<i>Comply with the general rules</i>	15	12.5	35	29.2	62	51.7	8	6.67
18	<i>Do not make noise in public</i>	12	10	31	25.8	63	52.5	14	11.7
<b>Total</b>		<b>438</b>	<b>20.28</b>	<b>666</b>	<b>30.83</b>	<b>898</b>	<b>41.57</b>	<b>158</b>	<b>7.31</b>

The above results show that the cultural communication of preschool children in behavioral groups is uneven. The rate of children in the average degree (41.57%) and weak (7.31%) was very high, of which the excellent rate was only (20.28%) and good (30.83%). Some cultural communication behaviors in the group Communicative behaviors of politeness and obeying are supposed very simple that any child can do like: "Greetings", "Thank you", "Sorry", "Please". In fact, these behaviors are not very effective; the rate of children achieving good, average and weak is quite high while excellent degree is low. Similarly, in other behavioral communication groups such as behaviors in conversations, Behaviors of expressing demand with others, Behaviors of expressing sympathy and sharing and behaviors of expressing respect in conversations also achieved very low results.

### SOME SUGGESTED SOLUTIONS

From the above, we think it is necessary to take appropriate measures to educate intercultural communication behavior for pre-school children in a specific and suitable way to be effective in the process of educating children in pre-school. The following are some measures to improve the effectiveness of cultural communication behaviors for preschool children in some kindergartens in Lao Cai.

#### \* Cultural communication behavioral training through playing activities

Playing is the primary activity of children in kindergarten; play is also the best way to educate cultural communication behaviors for children since games are the activity of reproducing the social life of adults through which children learn to be human. For preschoolers, playing with toys only takes place in the classroom, children love to participate in games, especially role-playing games. Teachers should take advantage of this way to educate cultural communication behaviors such as playing with friends, sharing information with friends, following the general rules and asking friends to take part in the games. They also teach children the communication behaviors with others in daily life. For example, in the game "Family", children learn to communicate with each other among family members. One example in conversations between the father and the mother: "Honey, please give me a jacket... Yes, please wait for me a second, I'll get it right now..." or the conversation between father and son: "Hi, son. Are you happy at school?" - "Hi, Daddy, I'm very happy"; In the "Sales" game, children learn cultural communication behaviors between salespeople and shoppers through conversations such as: "Good morning uncle, please buy some vegetables for me" - "OK. How much of the vegetables? Give me 2 bunches". Thus, we can see that through playing, children experience to accumulate knowledge and life experiences for themselves. Moreover, they can also practice cultural communication behaviors. Hence, teachers should strengthen the integration of cultural communication behaviors training for preschool children through games.

#### \* Cultural communication behavioral training through learning activities

Learning time is a form of targeted learning activity at preschool. During the learning time, children are interacting with teachers and friends, through which children learn the symbol of the world around. In learning activity, teachers not only provide elementary knowledge of surrounding world or skills but also teach cultural communication behaviors for children. It can be said that this is the most favorable opportunity to educate cultural communication behavior for children. As a result, teachers need to take advantage of the classroom time to educate cultural communication behavior. To educate cultural communication behaviors for preschool children, teachers should:

Teachers must focus on the integration of cultural communication behaviors with appropriate characteristics of each activity. For example, in science exploring activity, children explore topic family, teachers should talk with children about their family members; Let children express their feelings for everyone and through it, educate children how to communicate and show their respect to their family. Or in the literary work, through the characters, teachers can educate cultural communication behaviors by asking questions for children to answer, or placing children in the position of a certain character to solve the problems.

Teachers need to teach their children to listen to others; specially, not to interrupt others while they are talking, even when they want to talk. When talking to others, children have to face the person talking to them with enough volume.

Teachers should immediately correct the children if their communication behaviors are inappropriate or inaccurate. Teachers can make a model first and then ask them to repeat. In particular, the teacher needs to pay attention to their tone of the voice as well as the communication attitude.

#### \* Cultural communication behavioral training through picking-up time.

This is the activity in which there are 3 communicators who are teachers, children and grandparents or parents. It is a favorable condition for cultural communication behavioral training for children. Through this activity, we can educate children about cultural communication behaviors such as polite greetings with teachers, parents and grandparents, respect gestures with others, teaching children to speak in full sentences (included subject and predicate). Children learn how to show their respect and politeness through the questions and answers between the teachers and the parents or between teachers and children in the picking-up time. Children are encouraged to have a



habit of communicating at all times when they meet adults. For example, when they meet their grandparents, aunts or uncles, they must know automatically. folded hands bowed greeting politely with sincere and happy feelings.

\* Cultural communication behavioral training through problematic situations and through imitation of good people and good deeds.

Communication behavioral training through problematic situations is to force the children to think and fulfill the requirements of the adults in order to promote their initiative and creativity. Adults need to create problematic situations for their children to solve, as it is an opportunity for children to practice communication behaviors at all times, and to create good habits in communication. At first, teachers can give simple situations and gradually raise the difficulty of situations so that children could solve their own problems.

In the process of cultural communication behavioral training for preschool children, teachers need to take the example of real good people for children to follow in order to create excitement and build self-awareness in the implementation of the Behavioral intercultural communication.

Particular attention should be paid to the example of H'mong people helping their children to have more motivation, more pride to carry out cultural communication behaviors in daily activities. In addition, through storytelling with "good" characters, teachers can also use the example in the process of educating children so that they can learn the good things in actions or words. Besides, teachers must always be a good example in communication and dealing with people around for the children to learn and follow.

\* Collaboration with families in educating cultural communication behaviors for children.

The family is a close, loving environment for children, where they were born and grows. Therefore, it has a big impact on the children's cultural communication behaviors. Teachers need to work closely with their families to educate children's cultural communication behaviors in a variety of ways: sharing with parents (when parents pick up children), or through meetings, or visiting their house to communicate and guide parents how to educate some cultural communication behaviors.

## CONCLUSION AND DISCUSSION

From the above results, we have recognized that teachers are aware of the importance of cultural communication behavioral training for pre-school children but they have not yet had appropriate training at all measures. Therefore, based on practical research, we propose some measures to improve the effectiveness of cultural communication behavioral training for pre-school children in kindergartens. These measures are in line with the current state of research, hopefully, in the process of educating children, teachers will flexibly use these measures to help to improve the effectiveness of cultural communication behavioral training for preschool children, contributing to the formation and development of personality for children in kindergarten.

- Why do we need to educate cultural communication behaviors for pre-school children?
- In the above cultural communication behaviors, what is the best behavior? Why?

## REFERENCES

- [1]. Le Thu Huong - Tran Thi Ngoc Tram - Le Thi Anh Tuyet. 2015, *Guiding the implementation of ECEC programs (kindergarten children)*. Training Publishing House.
- [2]. Ho Sy Hung: *The status of communicative behavioral training for preschool children 5-6 years* - Science magazine, University of Training, Ho Chi Minh City, 57/2014.
- [3]. Nguyen Anh Tuyet - *Cultural behavioral training for preschool children* (Volume 1) - Training Publishing House, 2005.
- [4]. Nguyen Anh Tuyet - *Cultural behavioral training for preschool children* (Volume 2) - Training Publishing House, 2005.
- [5]. Nguyen Anh Tuyet, Nguyen Nhu Mai - *Early Childhood Psychology*, 2008
- [6]. Dinh Van Vang - *Early Childhood Training* - Training Publishing House, 2008.

## THE INVESTIGATION OF THAI EFL'S VOCABULARY LEARNING STRATEGIES

Nathaya Chomchiawchan  
*Rajabhat Maha Sarakham University, Thailand*

### ABSTRACT

This study investigated the vocabulary learning strategies used by university students. The aims of the study were to examine the strategies used among the students and to compare the strategies employed by the students with different levels of education. There were 116 students who were the first-, second- and third-year students studying at Rajabhat Maha Sarakham University participated in the study. They were the English major students who were asked to complete the questionnaire adapted from the taxonomy of Schmitt (1997) and Doczi (2011). The results of the study indicated that the most frequent strategies used among the students was memory strategies while determination strategy were the least frequently used. Moreover, the results of strategies employed by the students with different levels of education presented the different mean score but the same detail of sub-categories.

**KEYWORDS** :vocabulary, vocabulary learning strategies, levels of education

## INTRODUCTION

Vocabulary is considered as important aspect in language acquisition and learning .It considers as a heart of language (Lewis, 1994) which supports in all skills :reading, writing, listening and speaking .To illustrate, in terms of audiences, vocabulary knowledge is an aspect indicated how well they understand messages .Likewise, people can perceive information with others comprehensively if they have vocabulary knowledge .Thus, vocabulary knowledge plays a major role in language learning and acquisition.

In order to study English, especially vocabulary, learners would find techniques or strategies to improve their knowledge .These techniques can be called as language learning strategies which have played a very significant role in learning a second or a foreign language (Oxford, 1990). Oxford (1990) stated that the process in learning depends on learners that it is linked their personality factors, learning style, age, sex and cultural background. However, learning strategies are considered as general strategies that cover all skills .The learning strategies consists of many subcategories that directly indicate specific skill, in this study, which is vocabulary learning strategies .

### Vocabulary learning strategies

Vocabulary learning strategies (VLS) are a subclass of language learning strategies .They are the language learning strategies which mainly emphasize learning vocabulary .Asgari and Mustapha (2011) considered vocabulary learning strategies as the step that learners use to learn or acquire new words. Additionally, According to Naveh et al., (2011), "A vocabulary strategy is a special instructional tool and way of going about directly or explicitly as well as the independent word learning skills required to learn words independently ".This is similar to Ruutemets (2005), who mentioned LVS as the strategies that learners use when learning new words' meanings, retaining words in memory, recalling to understand, and using in their production .Therefore, if learners concentrate on vocabulary learning strategies, their vocabulary learning can be improved .

There are various VLSs learners used to accomplish their vocabulary tasks .Brown and Payne (1994) identified strategies used in learning new words, such as thinking think of the image of that word including its form . Then they try to link to its meaning and connect both meaning and form in their memory before they use that word for their production .Likewise, Schmitt (1997) compiled the strategies by examining vocabulary reference books and textbooks, asking Japanese intermediate-level to write a report of the strategies they used in learning vocabulary, and asking teachers to review the list of strategies .After the compilation process, he designed the questionnaire and gave to 600 Japanese learners :junior high school students, high school students, university students, and adult learners. Schmitt (1997, 2000) classified VLSs into two main dimensions, which are discovery and consolidation . He stated that the discovery strategy focuses on the first time that learners experience a new word while consolidation strategy aims at what learners do when they meet the same word again .However, both strategies are partly based on Oxford's (1990) taxonomy of language learning strategies :social, memory, cognitive and metacognitive strategies .Determination and social strategies are categorized into discovery strategies while social, memory, cognitive and metacognitive strategies are subdivision of consolidation strategies .

### Studies on vocabulary learning strategies

There are many studies investigating vocabulary learning strategies (Gu, 2010; Asgari & Mustapha, 2011; Dóczy, 2011; Seddigh, 2012; Mohammad & Amirian, 2013; Nosidlak, 2013; Boonkongsaen & Intaraprasert, 2014). Some researchers focus on the frequency of use of vocabulary learning strategies (Asgari & Mustapha, 2011; Seddigh, 2012; Mohammad & Amirian, 2013), and some found that learners employ different vocabulary learning strategies depending on their fields of study (Boonkongsaen & Intaraprasert, 2014), levels of education (Dóczy, 2011; Nosidlak, 2013), and gender (Seddigh, 2012).

It was found that determination strategy is the most frequent use by EFL learners (Asgari & Mustapha, 2011; Mohammad & Amirian, 2013; Seddigh, 2012) while the social strategy seems to be less employed (Mohammad & Amirian, 2013; Seddigh, 2012). Asgari and Mustapha (2011) interview Malaysian students at University Putra Malasia .The result of their study showed the first four common uses of vocabulary learning strategies included determination, cognitive, social and metacognitive strategies .For example, their participants stated that they learn vocabulary through guessing meaning from the context or using a monolingual dictionary .However, this study explored the strategies used by learners without mentioning other variables such as proficiency, age, or gender .Like Asgari and Mustapha (2011), Mohammad and Amirian (2013) also investigated vocabulary learning strategies, but

in their case, with 74 Iranian students from Hakim Sabzevari University. They classified their participants into two groups, which were postgraduate and undergraduate students; however, they did not report the differences between the two groups. In this study, they employed a 5-point likert-scale questionnaire adapted from Schmitt's (1997) taxonomy of vocabulary learning strategies without translation into their participants' mother tongue. Their result was quite similar to Asgari and Mustapha (2011) in that determination and cognitive strategies had the most frequently use. The researchers also added that the low frequency strategies were metacognitive and social strategies. Their participants avoided asking their teacher and tried to skip new words. Likewise, Seddigh found that 120 medical students, at Shiraz University of Medical Sciences, also reported that they commonly used guessing meaning and dictionary strategies when learning vocabulary and did not study preferences (Seddigh, 2012). Seddigh's (2012) participants were first, second and third -year medical students. Again, the researchers did not focus on the different strategies used by students at different levels of education. However, he paid attention to gender. He asked the participants to complete a 5-point likert-scale questionnaire, which was translated into Persian. It was found that there were no differences between genders about the most and least frequently used strategies; however, there was some change in the order of the strategies in between. For example, the rank of strategies employed by male were guessing, dictionary, selective attention, memory, note -taking, social, autonomy and study preferences respectively while the rank of female were guessing, dictionary, note-taking, memory, autonomy, selective attention, social and study preferences.

There was an investigation on vocabulary learning strategies by different levels of education (Dóczi, 2011; Nosidlak, 2013). Dóczi (2011) conducted a pilot study to explore the strategies used by learners with different levels of education :high school and university students. He asked his participants to complete a yes-or-no questionnaire adapted from Schmitt's (1997) taxonomy of vocabulary learning strategies. He found that learners with higher education use more strategies than the lower, and there was some change in using the strategies when they were at a high levels of education. For example, when learners were more advanced, they tended to use skipping a new word, putting words into sentences, and pronunciation while they decreased the level of using word lists. Additionally, like Asgari and Mustapha (2011), Mohammad and Amirian (2013), Seddigh (2012), the most common strategies by the high school and university students, were guessing meaning from context and using monolingual dictionary respectively.

In Thailand, there was also an investigation of vocabulary learning strategies (Boonkongsan & Intaraprasert, 2014). Since the culture of learning in Thai is different from other cultures, vocabulary learning strategies by Thai learners interest researchers to examine. The researchers investigated the vocabulary learning strategies with 905 students from 11 institutions included private universities and public universities including Rajabhat Universities, and Rajamangala Universities of Technology in the Northeast of Thailand. They employed a 4-point rating scale questionnaire developed. They classified the questionnaire into three main categories :Discovery of Meaning or Other Aspects of New Vocabulary Items, the Retention of the Knowledge of Newly-Learned Vocabulary Items and the Expansion of Knowledge of Vocabulary Items. However, the focus of this study was the different strategies used by learners in different fields of study. Therefore, the participants were from different types of majors :arts-oriented, science-oriented and business-oriented fields. The result of the study revealed that learners in different fields use different strategies in vocabulary learning. Additionally, learners who were in arts-oriented fields employed significantly more strategies and more frequently used the strategies than those who were in science-oriented and business-oriented fields.

From the discussion of the previous studies above, we can see that many studies have examined the use of vocabulary learning strategies in EFL learners. They paid attention to fields of study (Boonkongsan & Intaraprasert, 2014), levels of education (Dóczi, 2011; Nosidlak, 2013), and gender (Seddigh, 2012). Moreover, they tried to find only the strategies that were considered as the most and least used strategies by learners (Asgari & Mustapha, 2011; Seddigh, 2012; Mohammad & Amirian, 2013). However, in Thailand, there has been research on vocabulary learning strategies. Even in the large-scale study by Boonkongsan and Intaraprasert (2014), the main focus was on the different fields of study without mentioning the students' levels of education. Therefore, this study aims at investigating the vocabulary learning strategies used by learners at different levels of education, i.e. learners who are the first-, second -and third -year students at Maha Sarakham Rajabhat University.

## OBJECTIVES

The objective of this study was to investigate the vocabulary learning strategies employed by the students with different levels of education and to compare the most and the least vocabulary learning strategies used by the first-, second -and third -year students .

## R4ESEARCH QUESTIONS

The research questions were formed as:

1. What vocabulary learning strategy do the students use the most?
2. What strategies do the students in different levels of education use?

## RESEARCH METHODOLOGY

### Participants

The participants of this study were 116 students studying at the Faculty of Humanities and Social Sciences, Rajabhat MahasaKham University, academic year 2016, participated in this study .They were the representative of the first -to the third-year students who were majoring in English .Of the 116 students, 40 students were the first-year students, 40 students were the second-year students, and another 36 were the third-year students .

### Vocabulary learning strategies questionnaire

The vocabulary learning strategy questionnaire was adapted from the taxonomy of Schmitt (1997) and Doczi (2011). Schmitt taxonomy provided different vocabulary learning strategies which were generally employed by learners .However, the questionnaire was designed into yes/no question that allowed learners to rate whether they employed those strategies .Additionally, Schmitt's (1997) questionnaire covered five main strategies included determination, social, memory, cognitive and metacognitive strategies .So discovery strategy of Doczi (2011) also adapted to use in the present study .

The questionnaire consisted of three main parts .The first part was demographic information .This part consisted of the information of the levels of education and GPA .The second part was designed into the 5-Likert rating scale to ask for the strategies used by the participants .This part consisted of thirty statements including the sub-categories of the strategies such as discovery, determination, social, memory, cognitive, and meta-cognitive strategies .In the final section was an open-ended question .The questionnaire was translated into Thai and was checked by two experts to validate the questionnaire and avoid the problem of readability that might occur when the participants did the questionnaire .After that two students read the questionnaire again to check the understanding of each statement .

### Procedure

The students were informed about the objectives of this study .Then the consent form for asking their permission to participate in the study was sent before they completed the questionnaire .The students spent approximately 15-20 minutes to finish the questionnaire .

### Data collection and analysis

The data from the questionnaire was collected by employing the 5-Likert rating scale and then it were statistically analyzed .

## RESULTS AND DISCUSSIONS

The first part of the questionnaire was the demographic information (Table 1). The participants of the study consisted of 116 students :97 female and 19 males .There were 40 first-year students, 40 second-year students, and 36 third-year students .Additionally, there were 36 students whose GPA in the range of 4.00-3.00, 53 students whose GPA in the range of 2.99-2.51, and 27 students whose GPA was lower than 2.50 (Table 2).

**Table 1 :**The demographic information :Genders

Year	1		2		3		Total
Genders	Summary	Percentage	Summary	Percentage	Summary	Percentage	Summary
Male	9	22.5	4	10.0	6	16.7	19
Female	31	77.5	36	90.0	30	83.3	97
Total	40	100.0	40	100.0	36	100	116

**Table 2 :**The demographic information :GPAs

Year	1		2		3		Total
GPAs	Summary	Percentage	Summary	Percentage	Summary	Percentage	Summary
4.00 – 3.00	19	47.5	11	27.5	6	16.7	36
2.99 – 2.51	10	25.0	20	50.0	23	63.9	53
Lower than 2.50	11	27.5	9	22.5	7	19.4	27
Total	40	100.0	40	100.0	36	100	116

### **Finding of Research Question 1 :What vocabulary learning strategy do the students use the most?**

The second part of the questionnaire explored the overall vocabulary strategies used by the students .The result showed that the most frequently used strategies employed by the students were memory strategy (Table 3) which its average was 4.01 (S.D = .0.86). The second strategy was discovery strategy (mean =3.79, S.D = .0.90). The statistic showed that the least strategy used by the students was determination strategy (mean =3.31, S.D = .0.95). The mean scores for the metacognitive strategy was 3.66 (SD = 0.86) ; the cognitive strategy was 3.63 (SD =0.89) ; the social strategy was 3.60 (SD =0.97).

**Table 3 :**The summary of the vocabulary strategies used by the students

Strategies	Mean	SD	
Discovery	3.79	0.90	often use
Determination	3.31	0.95	moderately use
Social	3.60	0.97	often use
Metacognitive	3.66	0.86	often use
Memory	4.01	0.86	often use
Cognitive	3.63	0.89	often use

This result of the study was inconsistent with Dóczy's (2011) and Mohammad and Amirian's (2013) studies who found that the determination strategies were the most frequently used among the students; however, the present study showed that memory strategy was the most frequently strategy used by the students .Additionally, the result was inconsistent with these researchers, Asgari and Mustapha (2011), Dóczy (2011) and Mohammad and Amirian (2013) who indicated that the least strategies were social strategies while this study revealed that determination strategy was the least strategy used by the students .Although the English major students seemed to employ discovery, social, metacognitive, memory and cognitive strategies often, these partial support Asgari and Mustapha's (2011) study that they claimed that determination, social, cognitive and metacognitive strategies were the first four common uses of vocabulary learning strategies .However, among the strategies mentioned by Asgari and Mustapha (2011), only social, cognitive and metacognitive strategies which matched with the present study .



### Finding of Research Question 2 :What strategies do the students in different levels of education use?

The result was classified the use of vocabulary learning strategies by the students with different levels of education (Table 4). It seemed that the students in different levels of education used various strategies .Firstly, the first-year students employed discovery strategy more than the third-, and the second-year students as the mean score of them were 3.88 (S.D = .0.92), 3.84 (S.D = .0.87), and 3.65 (S.D = .0.91) respectively .Secondly, the third-year students employed determination strategy more than the first-, and the second-year students as the mean score of them were 3.46 (S.D = .0.82), 3.30 (S.D = .1.08), and 3.16 (S.D= . 0.94) respectively .Then, the second-year students employed memory strategy more than the first-, and the third-year students as the mean score of them were 3.66 (S.D = .0.84), 3.63 (S.D = .1.04), and 3.51 (S.D = .1.01) respectively .The first-year students employed social strategy more than the third-, and the second-year students as the mean score of them were 3.88 (S.D = .0.90), 3.69 (S.D = .0.85), and 3.39 (S.D = .0.83) respectively .Likewise, the first-year students employed cognitive strategy more than the third-, and the second-year students as the mean score of them were 4.21 (S.D = .0.90), 4.02 (S.D = .0.81), and 3.62 (S.D = .0.85) respectively .Lastly, the third-year students employed metacognitive strategy more than the first-, and the second-year students as the mean score of them were 3.72 (S.D = .0.82), 3.69 (S.D = .1.01), and 3.47 (S.D = .0.84) respectively.

**Table 4 :**The vocabulary learning strategies used by the students in different levels of education

Year Strategies	1 <sup>st</sup> year		2 <sup>nd</sup> year		3 <sup>rd</sup> year	
	mean	SD	mean	SD	mean	SD
Discovery	3.88	0.92	3.65	0.91	3.84	0.87
Determination	3.30	1.08	3.16	0.94	3.46	0.82
Memory	3.63	1.04	3.66	0.84	3.51	1.01
Social	3.88	0.90	3.39	0.83	3.69	0.85
Cognitive	4.21	0.90	3.62	0.85	4.02	0.81
Metacognitive	3.69	1.01	3.47	0.84	3.72	0.82

It seemed that the first-year students often used discovery, social, and cognitive strategies more than the third -and second-year students respectively .Meanwhile, second-year students often used memory strategy more than the first -and third-year students .Finally, the metacognitive strategy was more employed by the third -year students comparing to the first -and second-year students respectively .

The finding revealed the same vocabulary strategies used by all levels of education (Table 5). The most frequently vocabulary learning strategies for discovery strategies was ‘I discover the meaning of new vocabulary when reading texts for my university/high school courses.’ Which the first-, the second-, and the third-year students marked as 4.35, 4.40, and 4.25 respectively .All students agreed that they use a bilingual dictionary to find out the meaning of a new word for determination strategy .The mean score of the strategy for the first-year students was 4.07, for the second-year students was 3.95, and for the third-year students was 4.03 .Asking teacher, a classmate or someone else for the L1 translation of a new word was a social strategies that the first-, the second-, and the third-year students were frequently used (3.82, 3.93, and 3.75 respectively). The first-, the second-, and the third-year students tried to memorize vocabulary by making note of a new word on handout or underlining and adding L1 equivalent . The mean score of the memory strategy was 4.20 for the first-year students, 4.05 the second-year students, and 4.17 the third-year students .Saying a word out loud was the cognitive strategy that the first-year (4.32), the second-year students (4.00), and the third-year students (4.05) always used .Surprisingly, the third-year students made an effort to use new vocabulary when speaking and writing as a strategy in cognitive strategy (mean =4.05). Lastly, the



students seemed to use English-language media as a metacognitive strategy in vocabulary learning .The mean scores were 4.07, 4.03, and 4.11 for the first-, the second-, and the third-year students respectively .

**Table 5 :**The most frequently used strategies by the students

Strategies	Statements /Sub-categories	1 <sup>st</sup> year ( <i>x</i> )	2 <sup>nd</sup> year ( <i>x</i> )	3 <sup>rd</sup> year ( <i>x</i> )
Discovery	I discover the meaning of new vocabulary when reading texts for my university/high school courses.	4.35	4.40	4.25
Determination	I use a bilingual dictionary to find out the meaning of a new word .	4.07	3.95	4.03
Social	I ask my teacher, a classmate or someone else for the L1 translation of a new word .	3.82	3.93	3.75
Memory	I make note of a new word on my handout – underline, add L1 equivalent, etc .	4.20	4.05	4.17
Cognitive	I say the word aloud.	4.32	4.00	4.05
Metacognitive	I use English-language media (e.g .songs, movies, newscasts).	4.07	4.03	4.11

Although the mean score of each strategy is different, the results of the sub-categories of each strategy were quite the same .For example, the result of the questionnaire presented that the most commonly used strategy in determination strategies among the students was using bilingual dictionary strategy .This result was consistent with Asgari and Mustapha's (2011), Seddigh's (2012), and Mohammad and Amirian's (2013) studies who mentioned that dictionary strategy is the most popular or common strategy in vocabulary learning .This might be because the students rely more on the dictionary since it helps them to learn more words and it includes words' explanation and illustration (Mohammad & Amirian, 2013). It also found that all students used less frequent on skipping new word strategy as a metacognitive strategy .The result was also consistent with Dóczy (2011) and Mohammad and Amirian (2013) who mentioned that if the learner became more advance, they are able to skip or pass a new word since they know what word can be skipped.

## CONCLUSION

It can be concluded that the students employed the memory strategy more frequently than other strategies while the least strategies were determination strategy .Additionally, the result revealed that although the students were at different levels of education, they employed the same strategy but they used the strategies with the different degrees of frequency .The finding presented that there were some differences of the mean score of the strategies used by the first-, second-, and third-year students, however, the sub-categories of each strategy used by the students were the same .All students presented that discovering word meaning in read texts, using bilingual dictionary, asking teachers or classmate for translation, taking note in class, saying a word aloud, and using English-language media were the most frequently used among the discovery, determination, social, memory, cognitive and metacognitive strategies respectively .

However, in order to gain more insight information on vocabulary learning strategies, the further study should add interview as another instrument in the study since this was the limitation of the present study due to the study employed only a questionnaire .

The implication, based on the result, can be observed .The result can increase the awareness on the important of vocabulary learning strategies .Moreover, this can improve teaching method .Teachers could modify their teaching to match the strategies .They can also teach or introduce the strategies to students .

## REFERENCES

- Asgari, A. & Mustapha, G. B. (2011). The Type of Vocabulary Learning Strategies Used by ESL Students in University Putra Malaysia. *English Language Teaching*, 4 (2), 84–90.
- Boonkongsaen, N., & Intaraprasert, C. (2014). Use of English Vocabulary Learning Strategies by Thai Tertiary-Level Students in Relation to Fields of Study and Language-Learning Experiences. *English Language Teaching*, 7 (5).
- Brown, C., & Payne, M. E. (1994). Five essential steps of processes in vocabulary learning. *A paper presented at the TESOL convention*. Baltimore, Md.
- Dóczy, B. (2011). Comparing the vocabulary learning strategies of high school and university students :a pilot study. *WoPaLP*, 5, 138–158.
- Gu, Y. (2010). Learning Strategies for Vocabulary Development. *Reflections on English Language Teaching*, 9 (2), 105–118.
- Lewis, M. (1994). *The Lexical Approach :The State of ELT and a Way Forward*. London :Language Teaching Publications.
- Mohammad, S., & Amirian, R. (2013). A Survey on Vocabulary Learning Strategies :A Case of Iranian EFL University Students. *Journal of Language Teaching and Research*, 4 (3), 636–641.
- Naveh, M. H., Kafipour, R., & Soltani, R. (2011). The relationship among extroversion tendency, vocabulary learning strategies and reading comprehension of EFL undergraduates in Kerman Province. *Studies in Literature and Language*, 3 (2), 104–110.
- Nosidlak, K. M. (2013). Vocabulary Learning Strategies of the Advanced Students. *Journal of language teaching and research*, 4 (4), 655–661.
- Oxford, R. (1990). *Language learning strategies :what every teacher should know*. Boston, MA :Heinle.
- Ruutemets, K. (2005). Vocabulary Learning Strategies in Studying English as a Foreign Language (Unpublished master's thesis). Retrieved May 22, 2017, from :<http://www.utlib.ee/ekollekt/diss/mag/2005/b17557100/ruumets.pdf>
- Schmitt, N. (1997). Vocabulary learning strategies. In N. Schmitt, & M. McCarthy (Eds.), *Vocabulary :description, acquisition and pedagogy*. Cambridge :Cambridge university press. pp. 199–227
- Schmitt, N. (2000). *Vocabulary in language teaching*. Cambridge :Cambridge university press.
- Seddigh, F. (2012). Vocabulary Learning Strategies of Medical Students at Shiraz University of Medical Sciences. *English Language Teaching*, 5 (2), 160–173.

## THE FACTORS AFFECTING THE CAPACITY PROFESSIONAL ORIENTATION OF STUDENTS - OVERVIEW OF ARGUMENTS

Assoc. Prof. Nguyen Duc Quang

MA, Le Thi Duyen

MA. Ho Thi Thuy Hang

*Hanoi pedagogical University No 2*

*University of Education - University of Da Nang*

*University of Education - University of Da Nang*

*Corresponding author-E-mail address: duyentl05@gmail.com*

### ABSTRACT

This report presents some of the research on the factors affecting the capacity of career-oriented students. Data was collected from various sources in and outside the country with the survey tools and criteria to ensure reliability. Overall, the studies collected using survey tools is questionnaires and confirmed that the capacity of career orientation has an important role to the success of satisfaction with career future and affect academic performance in school. At the same time there are many factors that influence the capacity of professional orientation of students such as: internal factors and external factors.

**KEYWORDS:** career orientation; influence factors; Overview; career; student.

## INTRODUCTION

The recent study showed that the capacity of career orientation has an important role not only for the individual student but also have implications for society. O'Brien (1996) asserts that all people should have an honest profession. However, many students will make the wrong decision about the profession due to lack of information, lack of understanding, the pressure of friends, the wrong model or because of the prestige attached to certain career (Salami, 1999, Ndambuki và Mutie, 1999;).

According to which "professional competence is the ability of individual oriented to future career options based on the consideration of many factors such as abilities, the capacity to recognize the request characteristics and the transformation of the world; from there take out the choices and career decisions, effective fits; bring satisfaction, success in the profession. "

According to Kerka (2000), the career choices are affected by many factors including personality, hobbies, concepts, cultural identity, globalization, socialization, role models, social support and the resources available as information and finance (Avugla D.K.G, 2011, page. 11). Bandura and associates (2001) stated that each individual performing this process is affected by many factors including the context they live, personal aptitudes, social address and their academic achievements (Bandura A, Barbaranelli C, Caprara G & Pastorelli C, 2001). The external causes including the aspects of work such as: long holidays, salary and status. Intrinsic factors such as engine, inspiration, interests, needs, nature of work; social value elements including the desire and passion, great love for the profession (Kyriacou và Coulthard, 2000). These studies showed that the main reasons for choosing the career consists of two main elements: subjective factors and objective factors. On this issue the world was interested in researching for so long and this is still the current content is interested in research with the aim of improving the quality of vocational education in the family and career in General. General article some studies on the factors affecting the career orientation for the school.

## METHODS

The subject of using the method to collect information online: we have searched the data on PsycINFO, the account in the library of the university of Melbourne. In addition, we choose an advanced search on google is not limited to about the time of publication and author, then aggregate analysis from multiple sources, books, magazines to ensure credibility, the effect.

Below is the results are aggregated according to the different research aspect about the factors affecting the career orientation for the school.

## RESULTS

### 3.1. The research on the influence of subjective factors to the student's career

Research of the author has claimed that the subjective element inside the individual has great influence on career orientation of students, specific elements such as:

Splaver (1977) said "personality" plays a key role in choosing the right career. The personality of a student must be a kind of automatic, to investigate the possibility of career from early life, rather than the type of delay to wait until they're forced to decide. He said that " it is important that you understand yourself, your personality, if you want a smart career planning " (Small J, McClean M, 2002, page 12).

Akinade, Sokan and Oserenren (1996) for that element of the needs, the wishes of a person's deciding factor. She believes that the career choices based on the orientation or childhood experiences to meet the needs; so people choose careers that meet important demand. Similarly, Avugla (2011) conducted a study to investigate the factors influencing career choice among senior middle school students in the South Tongu District in Volta, Ghana and the extent to which these factors influence the orientation of career. The research results showed that subjective factors: interest or the desire of individuals in their choice of career had driven the decision to the individual's career. Next is the ability to monitor and control their own emotions is said to lead to awareness and higher confidence (Goleman 1998). Therefore, it leads to the personal actions during the orientation and decision-making occupations (Brown and Associates, 2003). By Salovey and Mayer (1990), the individual reviews, aware and respond to their feelings will correctly can better understand those with whom they interact, then they can develop the ability to identify emotions in the professional activity. In addition Jaeger (2003) and Sewell (2007) highly emotional intelligence development when needed to enhance the ability of career oriented individuals; or Puffer (2011) also assert that emotional intelligence help the school career better, more confident and ready to explore the many career preferences over.

The research of the author Amedzor (2003) also for that of prestige and personal values affect the career orientation. The value of each individual based on their attitudes and beliefs about what is important in life. Secer and cs has studied the relationship between the values of personal and career orientation of their favorites. esearch has shown the value of the personal approach as a two dimensional structure consists of horizontally and vertically, the longitudinal personal values regarding the orientation of thinking in career choices and personal values horizontally Auto-related career (Amedzor, 2003)

The gifted and the aspiration also has affected the career orientation of the individual. Judee k. Burgoon, the author and his consideration of the influence of the gifted and the aspiration to professional orientation of students in the United States and to see if the gifted students of the field of activity or career aspirations right from high school will have a better career than other individuals (Burgoon, Judee K.1, Buller, David, 1987). Moreover Klapwijk, Remke1 and associates said that the experience or the personal skills that affect career orientation. The student will choose a better career if they have come into contact with the industries and there are some certain personal skills related to careers; so they will tend to be more confident in the direction of future trades (Klapwijk, Remke1, Rommes, 2009)

The level of awareness can also affect career orientation. The author Kamoche, Professor Ken and associates have reviewed the relationship between personal perceptions of control and current career orientation (Kamoche, Professor Ken, Siebers, Dr Lisa Qixun, 2015). Or Liesbeth Baartman author; Lotte Ruijs (2011) has studied the relationship between cognitive capacities-activities in beliefs about yourself-and decided to choose the profession. From that research indicates cognitive capacity capabilities of students is the deciding factor to the beliefs and behaviors of their career options.

In addition the commitments chosen profession also considered factors affect the certainty in the future career direction (Blustein et al., 1989). The concepts of certainty, confidence, and a stable future significance also profession is related directly to the occupational identity building.

So according to author Michael Borchert (2011) in the three main factors that influence the career choices are: environment, opportunities and personal characteristics, then the group elements are personal characteristics most important to influence the career choices of students Middle School (Minna Kyttala, Piia Maria Bjorn, 2010, page 16). In which the subjective elements inside may include the characteristics of the personality; individual needs; personal emotional intelligence; the excitement of careers; personal values; skills and career aspirations; the level of awareness of personal and professional commitments. So to form and develop the capacity for learners need to pay attention to the above factors.

### 3.2. The research on the influence of objective factors to the professional competence of students

Stebleton, (2007) States that there are objective factors that affect their career choices. The objective factors include considerations about politics and economics, the previous work experience and influence the people around are important in the lives of individuals. Pummel, Harwood and Lavallee, (2008) reported that the objective influence to help shape the personal career choices and also affected by others through the social support from those of you with (Fina Aku Woasey, 2015, page 7)

Which can reach the objective factors as some of the following aspects:

#### *\* The influence of the social environment factors*

Bojuwoye and Mbanjwa (2006) found that the professional orientation of students affected by the lack of finance, lack of information, poor academic career and career counselling services unsatisfactory (Bojuwoye O, Mbanjwa S, 2006). Similarly, Beggs and cs (2008) studied and for that aspect of occupational social trends, such as financial income, promotion opportunities that affect professional orientation of students. Elements of sex and gender differences in the various societies also affects the career orientation. According to author Gottfredson (2002) have to pay more attention to the stereotyping of gender roles in the career orientation, as people realize that many of the girls identified themselves with the career of nurses and teachers, while the son identified more with police and sports career. Author Coetzee, Melinde research career orientation of different race, gender, marital status, employment status and age groups in South Africa have found significant differences between gender groups, race in the career orientation (Coetzee, 2012);. By Sharf (2002), the stereotyping of occupational aspiration may be due to the bias in education.

#### *\* The impact of the learning environment and school*

Schools play an important role with regard to the career orientation (Weishew and Penk 1993). In his research, Garrahy (2001) Note that the school is the social organization reinforces the behavior, preferences and career accordingly. This structure includes the subjects of the program, teaching quality, student participation in

the activities of the school, the school's practices, policies and learning materials for students that have influenced the career choices of people who study (Bojuwoye O, Mbanjwa S, 2006, page 8)

Author D.W. Chapman and Associates (2008) States that the fixed elements in the University such as geographical location, policy support in terms of cost or dorm environment will affect the decision to select a student's secondary school. In addition the study also emphasizes the level of influence and efforts of the school to students' career selection decision (Avugla D.K.G, 2011, page 5).

Moreover, by Sababa (2010) that affect the learning environment and the concept of occupational interests.

Kuijpers, m. and Associates confirmed the school learning environment stimulates motivation and operational experience to help students practice their career direction. In this study the author gave a basic concept that is the "school climate"-including awareness of the emotional support and career services available at the school, the school rules and set out the need to build "the climate is nice, healthy school" (Kuijpers, M Meijers, F Gundy, 2011)

Outside the school environment, the teachers also have great influence on professional orientation of students. Jolien author m. van Uden and cs (2014) for that belief and behaviour of teachers will directly influence the emotions; involvement and students' career selection decision. Or author Annemi Winters and Associates (2013) indicates the level of guidance on careers in vocational education allows the development of professional identity. How the teacher's dialogue that affects the quality of vocational education. So the study proposed the dialogue process in vocational education for students.

In addition the relationships of friends in the school also affect a student's career. Other studies showed the peers played a major role in the choice of career of the student. Teens susceptible to influence by friends because friends often provide confirmation of the choice that they make including career decisions. For example, Stuart (2000) found that the attitude of friends can increase or decrease a person's confidence in the direction and pursue the career.

#### **\* *The impact of the family factors***

Studies have confirmed the role of families and parents to the vocational orientation of children. A number of studies of Knowles (1998), Mau (2000), the Bikos and Wilson (1992) have discovered that parents have an important influence for the career choices. The family provides the resources have important implications regarding the child's ideas about the future such as: financial and emotional at the same time convey the values, goals and expectations to children. The research suggests that parents assist in shaping a child's career and the concept known as role models (1962 Crites, Super 1957). Without the consent or support of parents, students and youngsters often don't want to pursue or even explore diverse career possibilities. A number of studies of the author as Bradley (1984); Bradley (1992); Nelson & Jensen-Scott (1993) refers to the concept of "family dynamics" in the process of vocational orientation; This motive in encouraging your child to learning through the requirements, directions and daily review; through the exchange of decision choosing careers; including the negative aspects, which are "forced to choose the profession".

In his research, Salami (2006) found the involvement of the family as the most important predictors for career choices in the majority world. Similarly, Kniveton (2004) found that the family provided information and instructions directly or indirectly to the career choices of young people. For example, the parent provides proper support for some certain career choices tend to pursue. (Small and McClean 2002, page 9).

Patick Raymund author James m. Garcia and Associates (2011) has studied the influence of parental support to target-oriented learning and career decisions. The results showed that the higher the student's rank when the support as many of the parents in the learning goal orientation and this correlation is positive correlation. The study has identified the influence of father and mother for the career choices of sons and daughters. The results showed that the mothers tend to affect career decisions or aspirations of more children than fathers. In his research, Mickelson and Associates (1998) found that the career aspirations of girls often resemble the profession that the mother had chosen. In particular they point out the student wishes to discuss career plans with their mother than with her. The mother provides the support that helps diminish the child's apprehension about his career (Hairston 2000).

The study also pointed out the specific role of the variables in the family factors that influence students' career, in particular:

The first is education and family income affects the career orientation. Study of the Mau and Bikos (2000) suggests that the education level of the parents will influence the extent of their children's positive orientation in



future trades. Besides the family with good economic conditions, the older less limited when choosing the areas of industries and universities.

The second is to factor in the scale, as the big family there many generations often happens contradiction in the career orientation for children as well as less money tend to create conditions for children to be in College (Trice A.D, 1991).

The third is the influence of family relationships-in the degree of conflict or the cohesion of families to the career orientation. Johnson and cs (1999) had studied about the family environment in selected trades and indicates the environment, the psychological atmosphere, the Mount of families as high as possible to promote and create favorable conditions for the children in vocational orientation right from small. Family conflict is usually not interested in studying as well as career-oriented education for your child, so little impact on the child's career choice than, if often the impact of negative trend (Johansson, Charles B, 2003, page 13).

The fourth is the expectation of the parents are also referred to as a core factor to influence the choice of career. Most parents have higher educational expectations for their children, but they may not draw out the meaningful linkages between expectations and job opportunities in the future. The research on the link between the parents shows that parents can help their child organizational strategies to life around the education and career opportunity. Author s. Alvin Leung and Associates (2011) when learn difficult decision to choose the profession have pointed out the expectations of parents putting pressure and compromising skewed results choose the profession of his compare with capacity and actual excitement for the profession. The expectation that can stem from the desire and the different social impact rather than stemming from the characteristics about abilities, preferences, the needs of children in the process and the decision to choose the profession (S. Alvin Leung, Zhi-Jin Hou, Itamar Gati, Xixi Li, 2011)

Finally the style elements do parents have diverse influences to the career orientation of young. Research showed interest, usually the parents defend their children, meet all the needs of the child will make the parents put a lot of expectations, requirements on your child. However, the parents leave the child and could not express love with a young child often feel a burden, abandoned and that affect the attractiveness of the child for the profession related to human and human relations.

So there are many variables in the family factors that affect a student's career path such as family structure, occupation, family atmosphere, expectations of parents or parent style, income and family education ...

In summary, through this study, the authors point out the factors that influence the career orientation and career education process; the level of participation of each of the elements, it is the subjective factors and objective factors. Identifying the factors that influence the impact process helped to shape the development of professional competencies for students to be more effective.

## THE CONCLUSION

There are many studies indicating the factors influencing a student's career path, which consider this problem on many different aspects to create on a broad perspective, about the factors that influence and the process of vocational orientation career. The results of this study will be the basis for the educator, who do the work of vocational education to the educational effectiveness of measures aimed at strengthening the vocational orientation for the school. However, these studies should be considered in relation to characteristics of objects; consistent with the culture, politics, economics, education of each region, each country; but still fit the general trend of the world. There are new so accurately and objectively.

## REFERENCES

- [1]. Allan B de Guzman, Kyoung Ok; Choi *The relations of employability skills to career adaptability among technical school studen*; Journal of Vocational behavior 82 (2013) 199-207
- [2]. Annemie Winters, Frans Meijers, Mariette Harlaar, Anneke Strik, Herman, Marinka Kuijper; *The Narrative Quality of Career Conversations in Vocational Education*; Journal of Constructivist Psychology, 26 (2), 115-126, 2013
- [3]. Avugla D.K.G., (2011) ; *Factors influencing career choice among the senior high school students in the south Tongu district of Volta region, Ghana*: A thesis submitted to the school of graduate studies, University of education, Winneba, in partial fulfilment of the requirements for award of the master of philosophy degree
- [4]. Blau P., (1992). Mobility and status attainment: *Contemporary Sociology*, 21: 596–598.



- [5] Bojuwoye O., Mbanjwa S., (2006); *Factors impacting on career choices of Technikon students from previously disadvantaged high schools*: Journal of Psychology in Africa, 1: 3–16.
- [6] Burgoon, Judee K.1, Buller, David B.2, v; Minorities and Journalism: *Career Orientations Among High School Students.*; Journalism Quarterly. Summer/Autumn87, Vol. 64 Issue 2, p434-443. 10p.)
- [7] Carolin Kreber. *Transforming Employment-Oriented Adult Education to Foster Arendtian Action: Rebuilding Bridges Between Community and Vocational Education*. University of Edinburgh, Edinburgh Scotland, UK.
- [8] Coetzee (2012); *Archetypal life themes, career orientations, and employability satisfaction of higher education students: A postmodern career counselling perspective*; South African Journal of Higher Education. 2012, Vol. 26 Issue 4, p691-716. 26p. 1 Diagram, 4 Charts.
- [9] Crites, J. O. (1981). *Career counselling: models, methods and materials*. New York: McGraw-hill.
- [10] Fina Aku Woasey (2015); *Factors Influencing the career choice of undergraduate students in the humanities of the university of Ghana*; This thesis submitted to the university of Ghana, Legon in partial Fulfillment of the requirement for the award of M.Phil guidance and counselling degree.
- [11] Johansson, Charles B. (2003); *Career Assessment Inventory™--The Vocational Version*; Pearson, 19500 Bulverde Road, San Antonio, TX, 78259, pearsonassessments@pearson.com, www.pearsonassessments.com.
- [12] Jolien M.van Uden, Henk Ritzen, Jules M.Pieters (2014) *Engaging students: The role of teacher beliefs and interpersonal teacher behavior in fostering student engagement in vocational education*. JM van Uden at al/ Teaching and Teacher Education 37-21-32
- [13] Patrick Raymund James M. Garcia, Simon Lloyd D.Restubog. *Differential Moderating Effects of student- and Parent-Rated Support in the relationship Between Learning Goal Orientation and Career Decision-Making Self-Efficacy*.
- [14] Kamoche, Professor Ken, Siebers, Dr Lisa Qixun; *Examining the relationship between individual perceptions of control and contemporary career orientations*; Personnel Review. 2015, Vol. 44 Issue 3, p346-363. 18p.)
- [15] Klapwijk, Remke1, Rommes (2009); *Career orientation of secondary school students (m/f) in the Netherlands*; International Journal of Technology & Design Education. Nov2009, Vol. 19 Issue 4, p403-418. 16p. 2 Diagrams, 2 Charts.)
- [16] Kniveton B.H., (2004). *The influences and motivations on which students base their choice of career*: Journal of Research in Education, 72: 47–59
- [17] Kuijpers, M.; Meijers, F.; Gundy, C (2011); *The Relationship between Learning Environment and Career Competencies of Students in Vocational Education*; Journal of Vocational Behavior, v78 n1 p21-30 Feb 2011. 10 pp.
- [18] Mau W.C., Bikos L.H., (2000). *Educational and vocational aspirations of minority and female students: A longitudinal study*: Journal of Counseling and Development, Spring, 78: 186–194.
- [19] Mickelson R., Velasco A., (1998). *Mothers and Daughters Go To Work: The Relationship of Mothers' Occupations to Daughters' Career Aspirations*: Paper presented at the Annual Meeting of the American Educational Research Association, 13-17 April 1998. San Diego, CA.
- [20] Minna Kytala, Piia Maria Bjorn. *Prior mathematics achievement, cognitive appraisals and anxiety as predictors of Finish students later mathematics performance and career orientation*. Educational Psychology, Vol. 30, No. 4, July 2010, 431–448
- [21] Ladany, Nicholas, Melincoff, Deborah; *At-Risk Urban High School Students' Commitment to Career Choices*; Journal of Counseling & Development. Winter97, Vol. 76 Issue 1, p45-52. 8p)
- [22] Lerpornkularat, Koul và Sujivorakul (2012); *The influence of ability beliefs and motivational orientation on the self-efficacy of high school science students in Thailand*. Australian Journal of Education. Aug2012, Vol. 56 Issue 2, p163-181. 19p. 5 Charts, 2 Graphs.
- [23] Lindstrom Johnson, Sarah; Pas, Elise; Brad (Secer, Baris; Cinar, Efe (2011); *Individualism and New Career Orientations*. With English summary; Yonetim ve Ekonomi, 2011, v. 18, iss. 2, pp. 49-62
- [24] Roe, A. (1956). *The psychology of occupation in Zunker, V. G. (1990); Career counselling: Applied concepts of life planning*. California: Brooks/Cole Publishing Company.

- [25] S. Alvin Leung, Zhi-Jin Hou, Itamar Gati, Xixi Li (2011). *Effects of parental expectations and cultural-values orientation on career decision-making difficulties of Chinese University students*. Journal of Vocational Behavior 78 (2011) 11–20
- [26] Secer, Baris; Cinar, Efe (2011); *Individualism and New Career Orientations*. With English summary; Yonetim ve Ekonomi, 2011, v. 18, iss. 2, pp. 49-62)
- [27] Small J., McClean M., (2002). *Factors impacting on the choice of entrepreneurship as career by Barbadian youth: A preliminary assessment*: Journal of Eastern Caribbean Studies, 27 (4) : 30– 54.
- [28] Trice A.D., (1991). *Stability of children's career aspirations*: The Journal of Genetic Psychology 152:137–139.
- [29] Waite, Linda ; *The Effects of Parenthood on the Career Orientation and Job Characteristics of Young Adults*; Social Forces. Sep86, Vol. 65 Issue 1)
- [30] Wilson P.M., Wilson J.R., (1992). *Environmental influences on adolescent educational aspirations; A logistic transform model*: Youth and Society, 24: 52–70.

## CURRENT STATES OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN CHILDREN AND PARENTS' AWARENESS ABOUT CARING AND EDUCATING CHILDREN WITH THIS SYNDROME

Nguyen Thi Phuong Trang, MA<sup>1</sup>

Ho Thi Thuy Hang, PhD Student<sup>2</sup>

<sup>1,2</sup> Psychology and Education Department – University of Education – The University of Danang – Vietnam

Corresponding authors–E-mail address: [phuongtrangtlgd@gmail.com](mailto:phuongtrangtlgd@gmail.com)

### ABSTRACT

Attention Deficit Hyperactivity Disorder (ADHD) is a common mental disorder with children, especially children in elementary school age. Researching on the current state of ADHD in children and their parents' awareness about this syndrome will be very helpful for taking care of and teaching children in their family. Vanderbilt ADHD scale was used for screening for ADHD on 340 pupils at five elementary schools in Da Nang city (Vietnam), and the result showed that the rate of children with ADHD was about 4-5%. Using questionnaire, this survey would like to evaluate how parents think and support children at home. Evaluating the awareness of 310 parents indicated that many of them had misconception about familial activities in looking after and educating children with ADHD.

**KEYWORDS:** Attention Deficit Hyperactivity Disorder, awareness, parents, familial activities, children with ADHD.

## INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a common mental disorder in children, especially children in elementary and middle school age. This disorder can continue in their adulthood. If children with ADHD is not detecting early and treating promptly, they will have difficulties in social relationships, and have to face with many obstacles in their development process.

In The United States of American, the American Psychiatric Association (APA, 2000) showed that the ratio of boys and girls with ADHD is 4: 1. In 2010, The Centers for Disease Control and Prevention had announced the increase of ADHD from 7.8% (2003) to 9.5% (2007) and to 22% (2010). In the United Kingdom, studies by Taylor and Hemsley from the National Center for Health Research or the Ministry of Education of Northern Ireland (2005) found that the proportion of children with ADHD ranged from 0.5 to 1%. The ratio of ADHD in 7-11-year-old children was highest. In Australia, a research based on the evaluation and diagnosis of 10,438 children at the age 5-15 showed that 3.6% of boys and 0.85% of girls had ADHD (Ha, 2013).

In Vietnam, Nguyen Cong Khanh (Khanh, 2002) in his study "Initial Adaptation of Conners Scales on Elementary and Secondary Students" adapted the Conners' scales to diagnosis ADHD in elementary and middle school students. After that, many researches on ADHD were conducted in Hanoi and Ho Chi Minh City: Nguyen Thi Van Thanh (Thanh, 2010), Le Thi Minh Ha (Ha, 2013) ... The results indicated that 1-4% of elementary school children having this syndrome.

Children with ADHD are more likely to have problems with social skills, such as social interaction and forming and maintaining friendships. They also encounter troubles such as managing anger, being poor in handwriting, and delaying in speech, language and motor development... (AAP, 2011). Therefore, they need special support from the family, namely parents. Their parents' perception toward the familial in caring and educating infants with ADHD is one of the most important determinants. For that reason, researching on parents' awareness about ADHD is needed. The result can be useful for adjusting parents' manner in caring and educating children with ADHD at home.

## MATERIALS AND METHODS

This study was conducted on 340 pupils (176 boys accounted for 51.8% and 164 girls accounted for 48.2%, and the average age was 8.52); 310 parents (103 fathers and 207 mothers) and 143 teachers (47 males and 96 females) from 05 primary schools (Huynh Ngoc Hue, Be Van Dan, Dung si Thanh Khe, Le Van Tam, and Ham Nghi school) in Thanh Khe district - Da Nang city in the period from January 2016 to November 2016. Samples were randomly selected.

In order to perform two research tasks: understanding the current state of ADHD in children and their parents' perceptions of family function in caring and education of children with ADHD, we used the Vanderbilt ADHD scale which having 02 versions: 01 for teachers and 01 for parents, and questionnaire for parents.

In addition, interviews and observations methods were also used to collect additional information to clarify the results obtaining from the questionnaire survey. Researcher interviewed and observed teacher and parents about what they think and do to support their children in class and at home. The data were processed by SPSS 20.0 software.

## RESULTS AND DISCUSSION

### 3.1. Current state of ADHD in elementary school pupils

#### 3.1.1. Current state of ADHD in elementary school pupils

Through the Vanderbilt scale, teachers and parents assessed the state of ADHD in elementary school pupils. There is a negligible difference between the teachers' and the parents' assessment. Figure 1 shows the teachers' and parents' assessments about ADHD in the children.

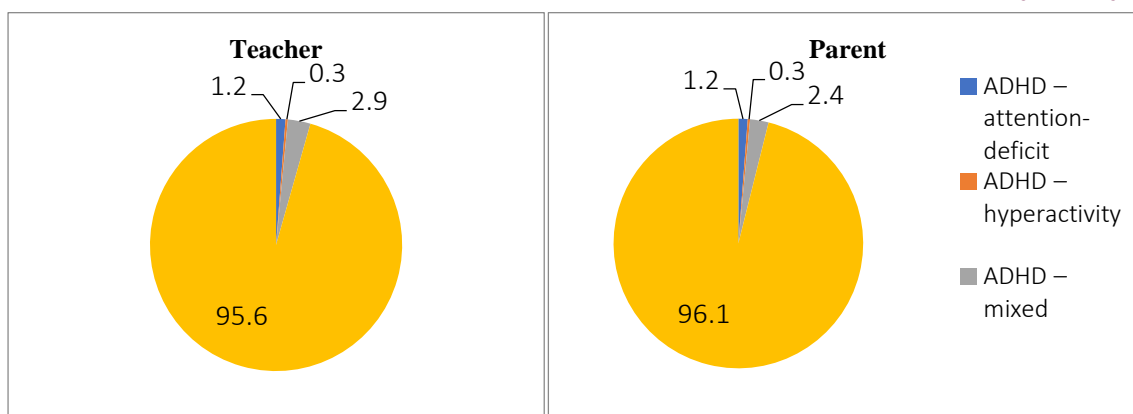


Figure 1. Teachers' and parents' assessments about ADHD in the student

According to Figure 1:

- Among 340 children surveyed, teachers assessed that 95.6% of children (equivalent to 325 children) developed normally, which mean that they did not show ADHD, parental income was 96.1% (corresponding to 327 children). This means that teachers and parents have a fairly similar assessment of the rate of children with ADHD. The difference is the type of ADHD.

- Teachers concluded that 4.4% of children (equivalent to 15 children) had signs of ADHD. Of these, 1.2% of children (corresponding to 04 children) was in type attention-deficit ADHD, 0.3% of children (1 child) was in type hyperactivity ADHD and 2.9% of children (corresponding to 10 children) with mixed ADHD (type attention-deficit and hyperactivity ADHD). Parents concluded that 3.8% of children (12 children) had ADHD, the ratio of types attention-deficit, hyperactivity and mixed ADHD disorder were respectively 1.2% (4 children), 0.3% (01 children) and 2.4% (08 children).

Thus, both teachers and parents concluded that the most common form of ADHD in children was mixed ADHD, then attention-deficit ADHD, and hyperactivity ADHD. The only difference between the teachers' and the parents' evaluating was the amount of children in type mixed ADHD: teachers concluded that 10 children had this type, but parents concluded that only 08 children.

### 3.1.2. Current state of disorders associated with ADHD in elementary school pupils

Similar to the assessment of ADHD status, there is also a negligible difference between teachers and parents in assessing the status of disorders associated with ADHD in children. Figure 2 showed the teachers' and parents' assessments of disorders associated with ADHD in the students.

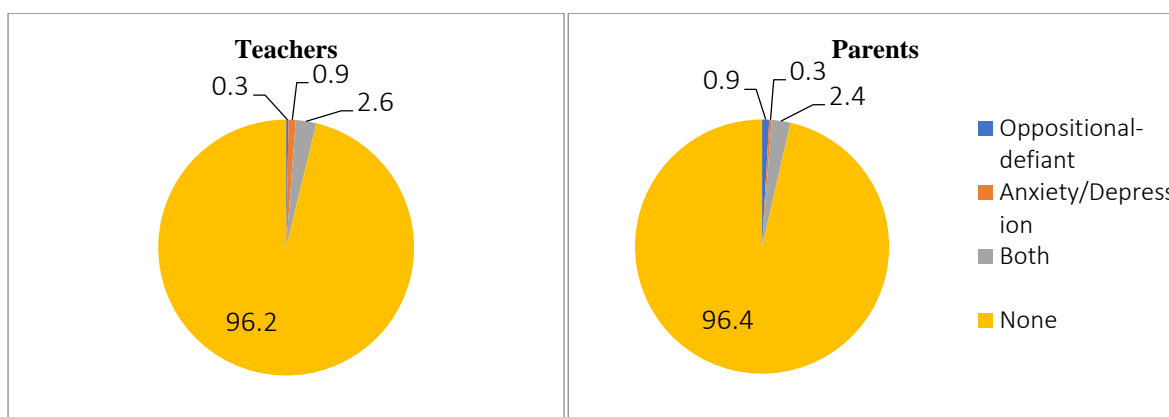


Figure 2. Parent and teacher assessment about disorders associated with ADHD in the students

Through Figure 2, we can see:

- Among 340 children surveyed, teachers assessed that 96.2% (327 children) had no symptoms of disorders associated with ADHD, while the rate made by parents was 96.4% (corresponding to 328 children).

This mean that teachers and parents had similar assessment of incidence of associated disorders with ADHD and normal (no associated disorders with ADHD). The difference is in the type of associated disorder.

- The teachers concluded that 3.8% of children (corresponding to 13 children) having signs of associated disorders. Among these individuals, 0.3% of children (corresponding to 01 child) had the oppositional-defiant disorder, 0.9% of children (corresponding to 03 children) exhibited the anxiety disorder, and 2.6% children (corresponding to 09 children) had both associated disorders. Parents concluded that 3.6% of children (12 children) exhibiting signs of associated disorders, in which the rate of the oppositional-defiant, anxiety, and both disorders was respectively 0.9% (03 children), 0.3% (01 children), and 2.4% (08 children).

Thus, in evaluating the ADHD-associated disorder in children, both teachers and parents assessed that children with ADHD had two types of ADHD-associated disorders. The difference between the teachers and the parents was that teachers indicated the next most common disorder children experienced was anxiety disorder, while the parents stated that it was oppositional-defiant disorder.

### 3.1.3. The correlation between teachers' and parents' assessment about ADHD in children

The following figure showed the comparison of Vanderbilt's average scores (Mean) for item groups assessed by the teachers and the parents.

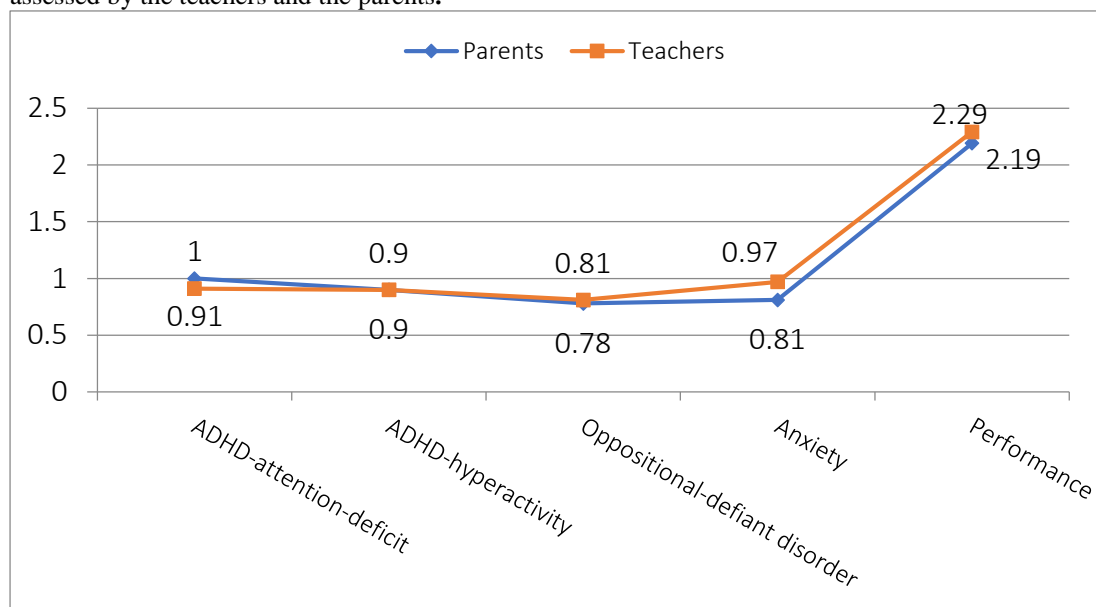


Figure 3. Mean of Vanderbilt's item groups assessed by teachers and parents

Figure 3 showed a significant correlation between parents' and teachers' conclusions about ADHD and associated disorders in children.

- According to both teachers and parents conclusions, mean of items in the symptom assessment (including ADHD - attention deficit, ADHD - hyperactivity, oppositional-defiant and anxiety disorders) was less than or equal to 1, meaning that the majority of children evaluated have symptoms ranging from "never" (0 points) to "sometimes" (1 point), which was meaning normal.

- Mean of items in the performance assessment was very small (2.29 and 2.19, respectively), meaning that the majority of children evaluated had achievements in level "above average" (2 points).

Combining the two symptoms and performance assessments, both teachers and parents concluded that the most of children have normal development. However, the test also screened small percentage of children with ADHD and associated disorders. This result were well documented in the sections above.

The correlation between teacher's and parents' assessments of ADHD and associated disorders in children was showed in Table 1.

Table 1. The correlation between teachers' and parents' assessment of ADHD and associated disorders in children

		Teachers' assessment of ADHD	Teachers' assessment of associated disorders
Parents' assessment of ADHD	<i>Pearson Correlation</i>	0,874**	0,675**
	<i>Sig. (2-tailed)</i>	0,000	0,000
Parents' assessment of associated disorders	<i>Pearson Correlation</i>	0,685**	0,675**
	<i>Sig. (2-tailed)</i>	0,000	0,000

Note:

*Pearson Correlation: correlation coefficient (\*\*: Strong correlation)*

*Sig. (2-tailed): real correlation coefficient (Sig <0.05: the difference between the correlation coefficients was statistically significant)*

From the Table 1, we could see that:

- Teachers' assessment was strongly correlated with parents' assessment of ADHD and associated disorders in children.
- The difference between correlation coefficients is statistically significant (all correlation coefficients of the variables are less than 0.05).

### 3.2. Parents' awareness forward familial activity in caring and educationing children with ADHD

Table 2 below indicated the results of parents' awareness forward familial activity in caring and educationing children with ADHD

Table 2. Parents' awareness forward familial activity in caring and educationing children with ADHD

Serial	Activity	Right		Not sure		Wrong	
		Amount	%	Amount	%	Amount	%
1	Giving child an appropriate diet	278	89,7	23	7,5	8	2,8
2	Know the child's limitations and needs to provide the best care and education	257	82,7	40	12,9	13	4,4
3	<i>A child with ADHD does not required special education</i>	227	73,2	64	20,6	19	6,3
4	Set a quiet place to keep children from scattering (while doing homework or other tasks)	170	54,8	99	31,8	41	13,4
5	Give child adequate sleep (minimum 8-9 hours a day, and naptime should be given during the day)	296	95,5	8	2,6	6	1,9
6	<i>Punish if necessary to make child behave well</i>	265	85,4	20	6,5	25	8,2
7	Reward (toys, food, outings...) if the child gets good results even if small	165	53,2	131	42,1	14	4,7
8	Give child the short, simple, specific words instead of general instructions	209	67,4	46	14,8	55	17,7
9	Help children to set regular habits by regularly feeding them, prompting them to go to sleep, and waking them up in time...	247	79,7	46	15,0	17	5,4
10	<i>Let children watch television, talk, or see strange attractive objects while they are on duty.</i>	211	67,9	71	22,9	28	9,2
11	Parents learn the knowledge and skills to care of children	143	46,2	110	35,5	59	18,4



Serial	Activity	Right		Not sure		Wrong	
		Amount	%	Amount	%	Amount	%
12	Give child simple tasks in the form of repeated games	178	57,5	109	35,2	22	7,4
13	Parents exercise emotional control to be able to handle their own problems	127	40,9	122	39,3	61	19,8
14	Punish actively the wrong behaviors of children	149	48,1	119	38,4	42	13,6
15	Ignore or divert behaviors that parents do not want to encourage	183	59,0	113	36,5	14	4,5
16	Always encourage children	284	91,5	12	3,9	14	4,7
17	Limit children to participate in collective activities, play outdoor sports or practice martial arts	268	86,5	26	8,4	16	5,1

For the correct states about ADHD (items 1, 2, 4, 5, 7, 9, 11, 12, 13, 14, 15 and 16):

Parents give the most accurate evaluation (choose “right” about 80% to over 95%, choose “wrong” less than 5%) on items related to daily child care such as “Giving child an appropriate diet”, “Know the child’s limitations and needs to provide the best care and education”, “Give child adequate sleep (minimum 8-9 hours a day, and naptime should be given during the day)”, “Help children to set regular habits by regularly feeding them, prompting them to go to sleep, and waking them up in time...”, and “Always encourage children”. These are things that almost parents do for children, but they are especially needed in care of children with ADHD at home.

Activities that involved ADHD in children, such as “Set a quiet place to keep children from scattering (while doing homework or other tasks)”, “Reward (toys, food, outings...) if the child gets good results even if small”, “Punish actively the wrong behaviors of children”, “Give child simple tasks in the form of repeated games”... were less “right” chosen (about 50%), and more “not sure” chosen (about 30% to 40%). While these are very effective measures that parents need to do regularly at home to help children with ADHD establishing proper behaviors.

With statements about self-cultivation of knowledge, skills and mental health of parents such as “Parents learn the knowledge and skills to care of children”, “Parents exercise emotional control to be able to handle their own problems”, the percentage of parents agreeing is low compared to the other right options (46.2% and 40.9%, respectively). This indicates that parents are not interested in cultivating their knowledge and skills in general (eg, emotional control skills) or directly related to ADHD. This can lead to the risk that parents will take the wrong way in supporting their child, and will impact negatively on children with ADHD.

#### For the incorrect states about ADHD (items 3, 6, 10 and 17):

There was 73.2% of parents said that “A child with ADHD does not required special education” (item 3), while the amount not sure about and disagreed with this state was 20,6% and 6.3%. It can be said that parents have made very wrong judgment on this matter, because children with ADHD really need special education, not the separation of children from their peers, but the best form is inclusive education for them.

In education individuals with ADHD, the advice is absolutely not to scold the child in any case, but to act in a positive way. Experts also advise parents not to let child watch TV, talk to, or put strange objects in front of their children while the child are on duty. But parents did not really understand this. Data show that 85.4% of parents think that “Punish if necessary to make child behave well” (item 6), and 67.9% agree with “Let children watch television, talk, or see strange attractive objects while they are on duty” (item 10). In addition, collective activities, outdoor sports or martial arts should also be encouraged because participating in these activities helps children to improve their communication skills. Meanwhile, 86.5% of parents chose “right” for the item “Limit children to participate in collective activities, play outdoor sports or practice martial arts” (item 17).

## CONCLUSION

Research on total of 340 children showed that the rate of children with ADHD was 4-5%. This was the initial screening result. It is very important to have subsequent assessments and interventions for these students.

They desperately need the special education from their family. Parents are the best people for understanding, caring and educating their ADHD children. For children with ADHD, the care and education of the family is considered one of the effective determinants which decide the quality of evaluation, diagnosis and intervention. Therefore, parents' awareness is very important. However, this research has shown that many parents do not really understand family function in supporting children with ADHD. Therefore, it is necessary to have solutions for changing the perception of parents, helping children with ADHD to be cared for and educated effectively, thereby giving them better opportunity to develop.

#### ACKNOWLEDGEMENTS

The authors would like to thank to Rajabhat Maha Sarakham University – Thailand for inviting and welcoming us to attend the 7th International Conference on Sciences and Social Sciences (ICSSS2017): “Innovation Research to Stability, Prosperity and Sustainability”. We gratefully acknowledge also the experts who read and recommended our research paper. This report would not have been possible had it not been for the invaluable inputs of many colleagues and students from Psychology and Education Department – University of Education – The University of Danang and the individuals that had participated in the survey.

#### REFERENCES

- Le Thi Minh Ha. (2013). “The current state of children with ADHD in Ho Chi Minh City”, *Journal of Science*, Vietnam Academy of Education, Vietnam, No. 7/2013, p.24-28.
- Nguyen Cong Khanh. (2002). *Initial adaptation of Conners' scales on elementary and middle school students*, Vietnam Institute of Educational Sciences, Hanoi, Vietnam.
- Nguyen Thi Van Thanh. (2010). *Clinical features of primary school children with ADHD*, PhD thesis in Psychology, Vietnam Institute of Psychology, Hanoi, Vietnam.
- American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders*, 4th Edn. Washington: American Psychiatric Association, p.85–93.
- American Academy of Pediatrics. (2011). *ADHD: Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents*. Illinois, p.11–17.

## OPPORTUNITIES FOR THE FORMATION AND DEVELOPMENT OF MATHEMATICAL REPRESENTATION COMPETENCE FOR STUDENTS THROUGH TEACHING MATHEMATICS IN JUNIOR HIGH SCHOOL

Vu Thi Binh

*Lao Cai Teacher Training College*

*Group 13, Binh Minh Ward, Lao Cai City, Lao Cai Province, Vietnam*

*Corresponding Email: vtbinh.c08@moet.edu.vn*

### ABSTRACT

The world's tendency to develop competence in secondary education and the need of reforming secondary education in Vietnam today aim to reach UNESCO's 4 pillars of learning in 21<sup>st</sup> century *learning to know, learning to do, learning to be and learning to live together*. This article mentions the mathematical representation competence and the opportunities for formation, development of the students through teaching mathematics in junior high school in Vietnam through cognition activities and understanding mathematical contents of mathematical representations accurately, logically and systematicall; through linking, transformation or creation of mathematical representations that are suitable to specific situations or contexts. And through selection, transition activities of the mathematical representations during cognition, practice, memorization and mathematical communication.

**KEYWORDS::** Mathematical competence, mathematical representation, teaching, school mathematics, mathematical representation competence, formation and development of mathematical representation competence for students.

## INTRODUCTION:

Today, the overview that education to form mathematical competence for students through activities and learning activities has been confirmed by many mathematical educators. According to PISA, an individual who is to make effective use of his or her mathematical knowledge within a variety of contexts needs to possess a number of mathematical competencies. Together, these competencies provide a comprehensive foundation for the proficiency scales. To identify and examine these competencies, PISA has decided to make use of eight characteristic mathematical competencies that are relevant and meaning ful across all education levels. In which, the *Representation competence is a very basic competency that is critically important to mathematical literacy is the capacity to successfully use and manipulate a variety of different kinds of representations of mathematical objects and situations. This may include such representations as graphs, tables, charts, photographs, diagrams and text, as well as, algebraic and other symbolic mathematical representations. Central to this competence is the ability to understand and make use of interrelationships among these different representations.* [2, pg 33]. When the American cognitive psychologist J. Bruner focused on the cognition of children, as well as representative thinking, he pointed out that it is possible to divide representation into the following three classifications, which describe the sequential development stages of representation: (E) Enactive representation; (I) Iconic representation; (S) Symbolic representation [3]. Accordingly, there are three learning activities responding to the students (1). *Object description (manipulation)* ; (2). *Ionization* and (3). *Symbolization (sign)* (according to [1, pg 208]). This ideal became the key factor in teaching mathematics, the teachers always know that the students have to start with their specific experience, switching to icons, pictures and finally to understand the abstract symbols.

## MATERIALS AND METHODS

### 1. Summary of some researches in mathematical representation

Most of researchers agreed with J. Bruner about the importance of above three kinds of representation to the human' cognition. As a result, some researchers have reduced or increased some types of representations. For example, Clark & Paivio said that there are two systems of representation (*verbal and visual*). Marzano, Pickering and Pollock mentioned *linguistic and nonlinguistic representation* ([4, pg 3]). Lesh, Landau, and Hamilton (1983) found five kinds of representations that are useful for mathematical understanding: (*a) real life experiences, (b) manipulative models, (c) pictures or diagrams, (d) spoken words, and (e) written symbols*). These categories could be considered to be an expansion of Bruner's three categories Real life experiences and manipulative models are enactive representations, pictures and diagrams are iconic representations, and spoken word and written symbols are symbolic representations. [4, pg3-4]

Specially, based on the researches by J. Bruner and Lesh, Tadao propose the broad organization of representational modes in mathematics education into the following five categories: *S2. Symbolic representation; S1. Linguistic representation; I. Illustrative representation; E2. Manipulative representation; E1. Realistic representation* [5]

The researching results in Mathematical Representation in respect of concept description, classification of representation and the methods to develop representation for the students in teaching mathematics collected in many monographs have proven the importance of the representation in teaching school mathematics. One of the typical works: "*The Roles of Representation in school Mathematics*," including 21 monographs as overall study and evaluation of the theoretical issues and integrated approach of the researches in representation inside and outside America [6].

*Representations and Mathematics Visualization* (Fernando Hitt, 2002), collected 19 researches for 4 years (1998-2002) of North American Chapter of the International Group for the Psychology of Mathematics Education [7],... which are the valuable contributions to understand the roles of representation and visualization in mathematical understanding, the way of learning for the students to build up representations of the mathematical phenomena, nature of representation, how the students to create representations and learn to use them.

In 2000, National Council of Teachers of Mathematics (NCTM), determined Representation is 1 of 5 Process Standards of the *School Mathematics*. Then, *Mathematical Representation* has been studied more detailed, concretization into Representation Standard for School Mathematics: Prekindergarten through Grade 12, which is the compulsory standard in teaching and evaluating school mathematics in America and some other countries in the world [8].

## 2. Formation of mathematical representation of students in junior high school in Vietnam

In Vietnam, 2338 mathematical teachers and students in junior high school have been surveyed by providing questionnaire about using mathematical representation and the way of learning that students use such mathematical representation; attending the mathematical classes in junior high schools, especially grades 6, 7, especially the first grade of junior high school; examining notebooks, mathematical tests. All of these methods showed that students have many difficulties in representing mathematical contents. The students are embarrassed to use the representations such as photographs, charts, signs, symbols... so it is difficult for them to find mathematical solutions in learning and real life. Many teachers have no effective measures to organize activities in mathematical representation for the students. This causes the fact that when learning mathematics, the students are not proactive, self-confident and flexible in making use of mathematics in dealing with the practical issues in real life. Following tables are illustration for above judgments.

Table 1. School students' competence to use symbols, photographs, charts, diagrams, graphs... (*representations*):

Content	Competence							
	Very good		good		Average		Poor	
	Q.ty	%	Q.ty	%	Q.ty	%	Q.ty	%
(a) Use representations to organize, record, and communicate mathematical ideas;	0	0.0	356	15.2	1687	72.2	295	12.6
(b) Create representations to organize, record, and communicate mathematical ideas;	0	0.0	182	7.8	1412	60.4	744	31.8
(b) Select, apply, and translate among mathematical representations to solve problems	0	0.0	220	9.4	1655	70.8	463	19.8
(c) Use representations to model and interpret physical, social, and mathematical phenomena.	0	0.0	217	9.3	1380	59.0	741	31.7

Table 2. Students learn to use symbols, photographs, charts, diagrams, tables... (*representations*) in mathematical classes:

Content	Frequency							
	Very often		Often		Rarely		Never	
	Q.ty	%	Q.ty	%	Q.ty	%	Q.ty	%
Observe, imitate the use of <i>representations</i> of the teachers	802	34.3	1262	54.0	274	11.7	0	0.0
Observe, imitate the use of <i>representations</i> of other friends	368	15.7	1315	56.2	525	22.5	140	6.0
Select and create the <i>representations</i> , think to find mathematical solutions	112	4.8	390	16.7	1366	58.4	470	20.1
Select and create the <i>representations</i> to represent the mathematical solutions	118	5.0	411	17.6	1336	57.1	473	20.2

## 3. Opportunities for the formation and development of mathematical representation competence for students through teaching mathematics in junior high school

In the primary education, during the process of learning mathematics, the students have got acquainted with and commonly applied the visual mathematical representations (chart of perpendicular lines, specific objects, images...) to express any connections, relationships, objects when mathematical operations or formulas are formed, in solving the mathematical literacy, problems of finding two numbers

with two conditions;... In the junior high school, the role of mathematical representation is exploited more profoundly and diversely to find out any mathematical rules, connections or relationships. The students shall use not only the chart of perpendicular lines, illustrator but also plane figures, cubes, diagrams, charts, tables, graphs..., allowing generalization of common rules and abstract relationships; then, improving and developing the students' capacity of applying the mathematical representations to the research and explanation of phenomena in life.

**3.1. Formation and development of mathematical representation competence for students through cognition activities and understanding mathematical contents of mathematical representations accurately, logically and systematically**

Scientific history shows that the logical structure and the development of mathematical theories, since a definite development period, have increasingly depended on the use of mathematical symbols and improvement of such symbols. The system of such symbols in mathematics in junior high school has been more and more rich and diverse, which may abstract and generalize a mathematical model or relationship under rules. Through the teaching activities to form the mathematical symbols, the students can read, write, understand the meanings and structure of grammar, identify and express mathematical representations...; then help the students understand and use accurately and effectively symbols in the process of learning mathematics.

**Example 1.** Learning function graph  $y = f(x)$ , the students shall identify the way of representing the respective  $(x; y)$  of function  $y = ax$  ( $a \neq 0$ ) on the coordinate plan through the implementation of the following activities:

- (1). Write collection of respective pairs  $(x; y)$  of function  $y = f(x)$ ;
- (2). Draw coordinate system  $Oxy$ ;
- (3). Determine points of which coordinate is  $(x; y)$  on the coordinate plane; (4). Introduce name of representation: function graph  $y = f(x)$ ;

Since then, when a point on the coordinate plane is given, the students may know the coordinate of such point, check whether such point in on any function graph; it means that the students are able to solve the given mathematical representation.

Other than the representations which are terminologies, mathematical symbols, the students need to understand correct meanings of symbolic representations, charts, or mathematical models.

**Example 2.** The following chart is suggestive, resulting in basic property of fraction:

$$\frac{1}{2} \xrightarrow{\cdot 2} \frac{2}{4}$$

$$\frac{-4}{8} \xrightarrow{:(-4)} \frac{1}{-2}$$

The correct understanding of such mathematical representations is very important for the students during the mathematical cognition. The teachers needs to regularly apply the mathematical representations which are tables, line chart, Venn diagram, mind map,... (not teaching explicitly in the syllabus) and explain such representations to help the students understand and use reasonably in study.

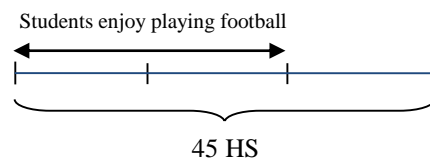
**3.2. Formation and development of mathematical representation competence for students through linking, transformation or creation of mathematical representations that are suitable to specific situations or contexts.**

In teaching mathematics in junior high school, *symbols, drawings, diagrams, table etc...* are usually used, therefore the students can develop and deepen their understanding of concepts and mathematical relations when creating, comparing and using different representations. They help reduce the abstraction of mathematics, make formulas, mathematical transformations closer to the perceptions of the students. According to J. Piaget, at different age stages, there is a different type of learning action: the learning action of students in the primary school (from 7-11 years old) usually begins with material, practical action; the students in the junior high school and high school act on objects as symbols, clauses, diagrams, models, etc... In teaching mathematics in junior high school, the activities related to linking, transformation or creation of the mathematical representations are consistent with the specific and meaningful situations, contexts, make the transition from *material, practical action* in the mathematical cognition of students to *action on the objects as symbol, clause, diagram, model etc...*

**Example 3.** Exercise: Find the fractional value of a given number.



Considering example: Class 6A has 45 students, of which  $\frac{2}{3}$  of total students enjoys playing football, 60% students enjoys kicking a shuttle cock,  $\frac{2}{9}$  students enjoys playing table tennis and  $\frac{4}{15}$  enjoys playing volleyball. Calculate the number of students in class 6A enjoying playing football, kicking a shuttle cock, playing table tennis and volleyball. The students may be organized to use, link, transform and create the mathematical representations during cognition as follows:

Teacher – Ask	Students- Think and answer
1. Use a line segment diagram to represent the number of students of class 6A enjoying playing football?	1. 
2. Based on the diagram, calculate the number of students enjoying playing football?	2. The number of students enjoys playing football: $(45:3).2 = 30$ (students).
3. Write $(45:3).2$ in the form of multiplication (of 45 and $\frac{2}{3}$ )?  - Thence to find out $\frac{2}{3}$ of 45?	3. $(45:3).2 = 45 \cdot \frac{2}{3}$  - Get 45 multiplied with $\frac{2}{3}$ (write: $45 \cdot \frac{2}{3}$ )
4. Similarly, calculate the number of students enjoying kicking a shuttle cock, playing table tennis, volleyball?  $(60\% \text{ of } 45; \frac{2}{9} \text{ of } 45; \frac{4}{15} \text{ of } 45)$	4. The number of students enjoys: - kicking a shuttle cock: $45 \cdot 60\% = 45 \cdot \frac{60}{100} = 27$ (students) - playing table tennis: $45 \cdot \frac{2}{9} = 10$ (students) - playing volleyball: $45 \cdot \frac{4}{15} = 12$ (students)
5. To find $\frac{m}{n}$ of a given $b$ , how do we do?	5. Get $b$ multiplied with $\frac{m}{n}$ ( $b \cdot \frac{m}{n}$ )
General: "To find $\frac{m}{n}$ of a given $b$ , we calculate $b \cdot \frac{m}{n}$ ( $m, n \in N, n \neq 0$ )"	

**Comment:** The mathematical representation activities inhere consist of: *Creation of representation* (a line segment diagram); *Linking of representation*: From the line segment diagram representation, we find out the symbolic mathematical representation (corresponding to the number of students who enjoy playing football):

$(45:3).2$ ; *Transformation of representation*:  $(45:3).2 = 45 \cdot \frac{2}{3}$ ; *Creation of symbolic representation* for the general

rule: "To find  $\frac{m}{n}$  of given  $b$ , we calculate  $b \cdot \frac{m}{n}$  ( $m, n \in N, n \neq 0$ )". Thus, the students thoroughly understand the meaning of the language and symbolic representations in the general rule and in practice.



### 3.3. Formation and development of mathematical representation competence for the students through selection, transition activities of the mathematical representations during cognition, practice, memorization and mathematical communication

In teaching mathematics, selection and transition activities of the mathematical representations are usually done. However, organization of purposeful activities is to form provide the students with the ability to select and transit the mathematical representations in cognition, practice, memorization and mathematical communication which should be more paid attention. There are many opportunities for the students to select different mathematical representations for the same content in the mathematics learning process.

**Example 4.** To represent the function  $y = 2x$ , depending on the use purpose, the students can select the following representations:

*Representation by formula:*

$$y = 2x$$

*Representation as a table and representation by diagram (figure 1)*

In teaching mathematics, the students should be encouraged to select representations such as: thinking diagram, tree diagram, Ven diagram, tables, charts,... for memorization, summaries, systematization of mathematical knowledge.

x	-2	-1	0	1	2	...
y=2x	-4	-2	0	2	4	...

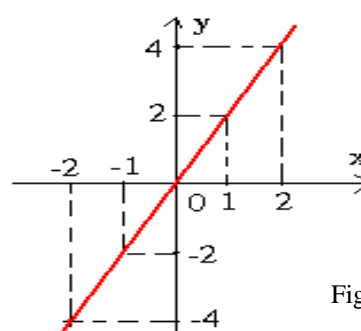


Figure 1

The students can search for mathematical solutions through the transformation of the representations. In particular, when the students must "translate" from a practical situation to a mathematical situation by using the mathematical representations (in the form of symbols, icons, etc....) and vice versa to solve the mathematical problems in practical context.

**Example 5.** There are two residential areas on the same side and not far from a highway. Find a location on roadside for construction of a medical station so that this medical station is evenly spaced between two residential areas (a straight road that connects two residential areas is not perpendicular to the highway).

Here, the students must think, use drawings, symbols, icons to model real situation; use knowledge, mathematical skills to find out, argue, prove; use the mathematical language to present the solution to the problem and switch to the natural language to answer the actual situation. It is specified as follows:

The students use two distinct points A and B (*representing two residential areas*) and a straight line d (*representing highway*) (Figure 2.a). Let C be the intersection of the midperpendicular AB (the road connecting the two residential areas) with the straight line d. We have:  $CA = CB$  (property of midperpendicular). So: C is the point to find (Figure 2.b).

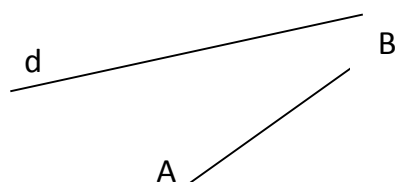


Figure 2.a

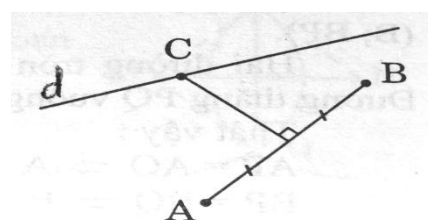


Figure 2.b

## RESULTS AND DISCUSSION

Through the organization of such similar activities, the students obtain experiences on the transformation and “interpretation” between representations in every circumstance. The observation and comparison help students understand the similarity of the mathematical representations when the same relationship is represented and the transformability of mathematical representations is flexibly formed during the learning.

It can be said that, to form and develop the mathematical representation competence for students, teachers need to pay attention to the following matters during the process of teaching mathematics in the junior high school:

- (1). Train the students to understand and use correctly the representations in mathematics textbook.
- (2). Encourage the students to use and form various representations during the process of teaching.
- (3). Encourage the students to present and assess the use of representations in solving the mathematical problems.
- (4). Teachers always form and apply various representations for the same mathematical contents.
- (5). Select exercises to train the students to use and form the mathematical representations in many ways.

## CONCLUSION

The formation and organization of study cases for students to apply the mathematical representations are not only the premise to stimulate such activities but also contribute to clarify the orientation of teaching reformation under the development of mathematical competence for learners, increase the responsibility, activeness and sense of initiative of the learners during the establishment of mathematical understanding, creation of firm knowledge, formation and development of capacity of connecting the mathematics with the reality. In the context of reforming the school mathematics, the research and formation of measures of improving the mathematical representation competence for students in teaching mathematics have been more and more necessary, tending to the formation and development of competence and virtue of learners.

## REFERENCES

- [1] Phan Trong Ngo (2011), *Philosophical and psychological basis for innovation of teaching methods in school*, University of Education Publishing House, Hanoi.
- [2]. OECD, 2009, *Learning Mathematics for Life, A view perspective from PISA*,
- [3] Tadao Nakahara, *Cultivating Mathematical Thinking through Representation—Utilizing the Representational System—* International Pacific University
- [4]. Gwenanne M. Salkind, 2007, *Mathematical Representations*, George Mason University EDCI 857 Preparation and Professional Development of Mathematics Teachers, Dr. Margret Hjalmarson
- [5]. Tadao Nakahara (2007), *Development of Mathematical Thinking through Representation: Utilizing Representational Systems*, Progress report of the APEC project "Collaborative studies on Innovations for teaching and Learning Mathematics in Different Cultures (II) -Lesson Study focusing on Mathematical Communication", Specialist Session, December 2007, University of Tsukuba, Japan.
- [6]. National Council of Teachers of Mathematics, Inc (2001), *The Roles of Representation in school Mathematics*,
- [7]. Fernando Hitt (2002), *Representations and Mathematics Visualization*, North American Chapter of the International Group for the Psychology of Mathematics Education. *Representations and Mathematics Visualization*,
- [8]. National Council of Teachers of Mathematics (NCTM, 2000), *Principles and Standards for School mathematics*, Reston, VA: Author. [www.nctm.org](http://www.nctm.org)

**PATH ANALYSIS OF FACTORS AFFECTING THE ADMINISTRATION OF DIAMOND LEVEL  
HEALTH PROMOTING SCHOOL IN BASIC EDUCATION**Budsaba Bunkanan<sup>1\*</sup>, Dr.Kraphan Srangan<sup>2</sup>, Dr.Sittichai Deelon<sup>3</sup><sup>1</sup>*A doctorate student of the Doctor of Philosophy Program in Educational Administration of Faculty of  
Education, Buriram Rajabhat University, Buriram, Thailand 31000*<sup>2</sup>*Lecturer of Educational Evaluation and Research Group, Faculty of Education,  
Buriram Rajabhat University, Buriram, Thailand 31000*<sup>3</sup>*Lecturer of Basic Education Group, Faculty of Education, Buriram Rajabhat  
University, Buriram, Thailand 31000**(\*Author for correspondence, e-mail: phaobru@yahoo.com, tel.: (+66) 0961371521)***ABSTRACT**

The purposes of this research were to study and to analyze path model of the factors affecting the administration of diamond level health promoting schools in basic education. The research samples consisted of 220 school administrators, 220 teachers and 220 chairman of basic school committees to total of 660 persons in 220 schools. The sampling method was the multi-stage random sampling. The research instrument was a five-rating scales questionnaire with validity ranging from 0.67 to 1.00 and reliability of 0.98. Data analysis was used with the computer program. The findings of this research were as follows: (1) factors affecting the administration of diamond level health promoting schools in basic education namely; leadership, motivation and community participation, (2) the factors modeling that affected administration of diamond level health promoting schools in basic education was accordance with empirical data ( $\chi^2 = 94.36$ ,  $df = 76$ ,  $p\text{-value} = 0.075$ ,  $\chi^2/df = 1.23$ ,  $GFI = 0.99$ ,  $AGFI = 0.96$ ,  $RMSEA = 0.019$  and  $RMR = 0.0013$ ). The administration of diamond level health promoting schools affected by the community participation factor at a highest level (1.00) and was indirect affected by the leadership factor at a highest level (0.86). The leadership, motivation and community participation factors explained the variability of administration of diamond level health promoting schools factor at 93 percent.

**KEYWORDS:** path analysis; administration; health promoting schools; basic education

## INTRODUCTION

The operations of health promoting schools are the development that cover every dimension of health and environment by using the learning process together with the schools and the communities. They are enable the use of the knowledge and skills of health to apply to the daily life. The students will be equipped with suitable attitudes, skills and behavior of health. The community members have good physical and mental health to live in the clean and safe environment to accomplish the goals of human development to acquire a good life quality and live happily in the societies. The health promoting schools have important and useful with all suctions because schools recognized guidelines to promote students' health and learn to lifestyle that creates behaviors lead to good, smart and happiness students (Somkuan Sithapha, 2008 : 14). However, the administration of health promoting schools depend on network participation in all suctions i.e. administrators, teachers, students and community that were major force in driving to success (Office of Health Promotion. 2011: 45). The previous operations of schools are still unsuccessful because schools have different ways of doing without the power to solve the problems (WHO. 1996 : 16-17). The research of Amornrat Phungnuam (2003 : 9) studied the evaluation of health promoting school project in secondary school service area office 39 found that the results of outcome the options of teachers about the satisfaction in this project of the community was in the lowest level. The administrators are important persons as the organization leaders that would lead the organization to be successful (Kriangsak Charoenwongsak. 2010 : 81). There are six aspects of administrators' good leadership i.e. (1) physical, (2) social background, (3) intelligence, (4) personality, (5) task-related characteristics and (6) Social characteristics (Stogdill. 1974 : 196). Harvard University (1998 : 129) found that the successful leaders' important characteristics i.e. (1) emotional stability composure, (2) defensiveness, (3) Interpersonal skills and (4) Technical and cognitive skills.

The researcher is interested in studying the path of factors affecting the administration of diamond level health promoting schools in basic education. To know factors and path of factors affecting the administration of diamond level health promoting schools in basic education, and to be applied a guideline for the development and improvement appropriately.

## RESEARCH QUESTIONS

1. What are factors affecting the administration of diamond level health promoting schools in basic education?
2. What are the characteristics of path model of the factors affecting the administration of diamond level health promoting schools in basic education?

## RESEARCH OBJECTIVES

1. to study the factors affecting the administration of diamond level health promoting schools in basic education.
2. to analyze path model of the factors affecting the administration of diamond level health promoting schools in basic education.

## MATERIALS AND METHODS

1. Studying factors affecting the administration of diamond level health promoting schools in basic education was documentary and related research and synthesis factors affecting the administration of diamond level health promoting schools in basic education by content analysis.

2. Analyzing path model of the factors affecting the administration of diamond level health promoting schools in basic education as follows;

### 2.1 Population and samples

Population consisted of school administrators, teachers and chairman of basic school committees in diamond level health promoting schools in basic education to the total of 348 schools.

The research samples size at 1 observed variables to 10 schools in this had 22 observed variables consisted of 220 school administrators, 220 teachers and 220 chairman of basic school committees to the total of 660 persons in 220 schools and using the multi-stage random sampling

### 2.2 research instrument

The research instrument was a five-rating scale questionnaire with validity ranging from 0.67 to 1.00 and reliability of 0.98.

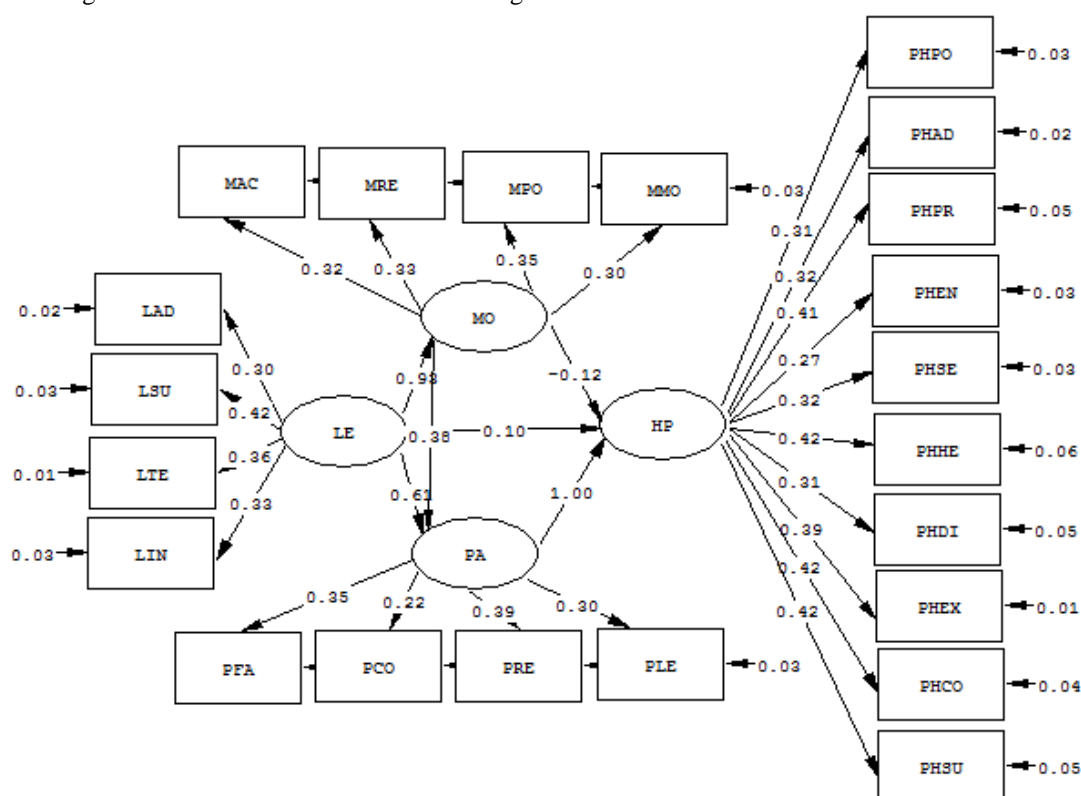
## 2. 3Statistic for Analysis of the data

The statistic used to data analysis were Linear Structural Relationship (LISREL) as a follow;  
chi-square statistics ( $\chi^2$ ), Relative chi-square statistics ( $\chi^2/df$ ), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), standardized root mean square residual (SRMR), root mean square error of approximation (RMSEA) and critical N (CN)

## RESULTS

1. The results of studying the factors affecting the administration of diamond level health promoting schools in basic education found that factors affecting the administration of diamond level health promoting schools in basic education namely: (1) leadership factor (LE) was measured from 4 observed variable consisted of management principles (LAD), enhancing and developing (LSU), teamwork (LTE) and Individualize consideration (LIN); (2) motivation factor (MO) was measured from 4 observed variable consisted of achievement need (MAC), respect (MRE), Professional advancement (MPO) and Relationship with management (MMO); (3) community participation factor (PA) was measured from 4 observed variable consisted of commitment and expectations (PRE), cooperative learning (PLE), faith and Ownership (PEA) and Collaboration (PCO).

2. The results of analyzing influence of factors affecting the administration of diamond level health promoting schools in basic education as shown figure 1.



Chi-Square = 94.36, df = 76, P-value = 0.07539, RMSEA = 0.019

**Figure 1** The linear structural equation model of factors affecting the administration of diamond level health promoting schools in basic education

In figure 1 found that the path model of factors affecting the administration of diamond level health promoting schools in basic education was fitted with the empirical data. The indices were as follows:  $\chi^2 = 94.36$ ,  $df = 76$ ,  $p\text{-value} = 0.075$ ,  $\chi^2/df = 1.23$ ,  $GFI = 0.99$ ,  $AGFI = 0.96$ ,  $RMSEA = 0.019$  and  $RMR = 0.0013$ .

The results of analyzing total effect, indirect effect and direct effect of the influence of factors affecting the administration of diamond level health promoting schools in basic education as shown in table 1.

**Table 1** Total effect, indirect effect and direct effect of the influence of factors affecting the administration of diamond level health promoting schools in basic education.

Dependent variable	Independent variables								
	Leadership (LE)			Motivation (MO)			Community Participation (PA)		
	TE	IE	DE	TE	IE	DE	TE	IE	DE
Health promoting school (HP)	0.96	0.86	0.10	0.26	0.38	-0.12	1.00	-	1.00
Motivation (MO)	0.93	-	0.93	-	-	-	-	-	-
Community participation (PA)	0.96	0.35	0.61	0.38	-	0.38	-	-	-

$$R^2 = 0.93$$

Table 1 showed the direct path coefficient of the health promoting school administration factor found that the health promoting school administration was direct affected by the community participation (PA) at the highest level with the path coefficient of 1.00, the leadership factor (LE) and motivation factor (MO) with the path coefficient of 0.10 and 0.12, respectively. That meant the community participation factor (PA) had the direct effect on administration of diamond level health promoting schools in basic education at the highest level. The indirect path coefficients were as follows: (1) The leadership factor (LE) had the indirect effect on administration of diamond level health promoting schools at 0.86 through the path of motivation factor (MO) and community participation factor (PA). (2) The motivation factor (MO) had the indirect effect on administration of diamond level health promoting schools at 0.36 through the path of community participation factor (PA). The leadership, motivation and community participation factors explained the variability of administration of diamond level health promoting schools factor at 93 percent.

### CONCLUSIONS

1. Factors affecting administration of diamond level health promoting schools namely; leadership, motivation and community participation.
2. The path modeling of factors affecting administration for health promoting schools at diamond level of basic educational schools was accordance with empirical data ( $\chi^2 = 94.36$ ,  $df = 76$ ,  $p\text{-value} = 0.075$ ,  $\chi^2/df = 1.23$ ,  $GFI = 0.99$ ,  $AGFI = 0.96$ ,  $RMSEA = 0.019$  and  $RMR = 0.0013$ ). The administration for health promoting schools was direct affected by the community participation factor at a highest level with the path coefficient of 1.00 and was indirect affected by the leadership factor at the highest level with the path coefficient of 0.86. The leadership, motivation and community participation factors explained the variability of administration for health promoting schools factor at 93 percent.

### DISCUSSION

The path modeling of factors affecting the administration of diamond level health promoting schools in basic education was accordance with empirical data. The leadership, motivation and community participation factors explained the variability of administration of diamond level health promoting schools factor at 93 percent. The details were as follows;

1. The direct path coefficient of the health promoting school administration factor was affected by the community participation (PA) at the highest level with the path coefficient of 1.00. This maybe because the feel of belonging that pushed the communities to work together with the schools with full potential and sacrifice, with the organizational commitment, and the eagerness to change; therefore, corporate with the schools and developing the learning in a better way and open an opportunity to let the community to help and support the participation on decision making, planning, operating and evaluating. This result was in accordance with the research of Watcharaporn Apiwatcharwakool (2003) which found that the factors of schools that encourage the community to participate with the schools were as follows: (1) the school administrators were the persons who would create a good relation with the communities; (2) the school administrators could work well with the basic school committees; and (3) opening the opportunities for the communities to participate in every process. The



results of research were accordance with research of Kasemsan Meejan (2010 : 44-46) found that the health promotion model in health promoting school consisted of 4 stages: (1) pro- preparation: providing the Knowledge, understanding realization and opinions of concerned in the health promotion development. (2) Preparation: setting the structure, assigning responsible persons, duties and missions, planning and making the development plan by every concerned. (3) Conduction: setting the policy, encouraging the involvement and network, developing leader students, creating the health friendly environment, improving the personal skills in the health service, strengthening community activities, following up and evaluation by concerned. (4) After conduction: students, teachers, guardians and community members continue to develop health consistently and avoid the risk behavior. Amornsri Chaisri and others. (2011 : 506) found that participation of schools, parents, primary care units, and the local administrative authority in school health consisted of 4 stages: (1) a meeting among all parties involved in school health should be arranged to clarify the roles of each party in order to improve collaborations and contributions. (2) all school teachers, students, and their parents should participate in the school health activities. (3) based on the results of this study, school health practice should be developed to suit the context of each setting. Panudda Maksampan (2015 : 3-4) found that the style of cooperative management to promote the best of health of the students of Paidampittayakom Ratchamangkalapisek School consisted of 4 aspects: (1) to educate students on the health promotion, attitudes, values and the best practice for the best of health, (2) to promote the best of health of the students and staffs in school, (3) to do the best protection and health care taking, and (4) to take good care of the environment of school.

2. The indirect path coefficient of the health promoting schools administration factor was affected by the leadership factor at a highest level (0.86). This maybe because the school administrators were the people who had the ability in managing the teamwork efficiently; had the knowledge and experiences of health promoting schools; had good relationship with the teams and communities and wore good supervisors. They improved themselves to acquire the potentiality in working and being expert in solving the weakness in their works, and they were the persons who were brave to speak out and show up. They also were emotional clever and had a great concern about individual differences and could delegate the work to suite with each person. This were in accordance with the research results of Worrasorn Netthip (2011) which found that the supports of the superiors and the emotional clever in managing the working conditions. They had some influences on expressing the role as team leaders, and the behaviors in managing the projects of the chairs of the health promoting schools. The results of research were accordance with research of Somsiri Nontasawatsri and Nisarut Hoko (2012: 56) studied the operational model for golden level health promoting school in primary school of Bangkok Metropolitan administration found that the factors which contributed to the development of the health promoting school were the school administrators' leadership and enthusiasm; the school personnel's sense of belonging to the project and their teamwork; the participation of the community, parents and students; and the public health officers' support and advice. Abdolmayeed Kasemsan (2014) studied the operation and good practices of health promotional schools administered under Satun Primary Educational Service Area Office found that (1) the school has a clear policy and work plan, (2) the school director shows good leadership and teamwork is encouraged, (3) high self-evaluation standards to assess health promotion are implemented with supervision operations; (4) development of human resources is ongoing and continuous, and (5) there is budget support for implementation of good practices by relevant authorities.

## ACKNOWLEDGEMENTS

The researcher would like to express her sincere thanks to the school administrators, teachers, chairman of basic school committees, experts, thesis advisors of Buriram Rajabhat University and Assistant Professor Dr. Suthiap La-ongthong.

## REFERENCES

- Abdolmayeed Kasemsan. (2014). *The operation and good practices of health promotional schools administered under Satun Primary Educational Service Area Office*. Master of public health program in community health, graduate school, Songkla rajabhat university.
- Amornrat Phungnuam. (2013). "The Evaluation of Health Promoting School Project in Secondary Schools, Service Area Office 39" *Journal of graduate school Pibulsongkram Rajabhat University*. 7 (1), 8-22.



- Amornsri Chaisri. (2011). "Participation of schools, parents, primary care units, and the local administrative authority in school health: case study". *Rama Nurse Journal*. 17 (3), 506-519.
- Harvard University. (1998). *Organizational Behavior and Management*. (6th ed). New York : McGraw- Hill Companies.
- Kasemsan Meejan. (2010). "Development of health promotion model in health promoting school" *Journal of Educational Administration*. 4 (1), 37-49.
- Kriangsak Charoenwongsak. (2010). *Trends of Thai Education in half of the next decade (Online)*, Retrieved from <http://learners.in.th/blog/jintana-eti-5301/246139>, Retrieved on August 10, 2016.
- Panudda Maksampan. (2015). "The style of cooperative management to promote the best of health of the students of Paidampittayakom Ratchamangkalapisek School". *Lampang Rajabhat University Journal*. 4 (1), 1-15.
- Somkuan Seethapha. (2008). *Thai Public Laws Studies for Development*. Bangkok L.T.
- Somsiri Nontasawatsri and Nisarut Hoko. (2012). "The Operational Model for Golden Level Health Promoting School in Primary School of Bangkok Metropolitan Administration: A Case Study of Wat Suwonkili School". *Kuakarun Journal of Nursing*. 19 (1), 55-70.
- Stogdill, R.M. (1974). *The school leader's view*, In J. MacBeath (Ed.), *Effective school leadership: Responding to change*. London, UK: Paul Chapman
- Watcharaporn Apiwatchararwakool. (2003). *Factors Affecting the Operation of The Health Promoting Schools*. Doctoral Thesis, Mahidol University.
- WHO. (1996). *A health promoting school*. Regional Director, HO/SEARO : New York USA.
- Worrasorn Netthip. (2011). *The Linear Structural Equation Model of the Environment Conditions and Motivation in Works towards the Service Behavior of Health Promotion and prevention of Medicine Personnel*. The Behavior Research Institute, Srinakharintarawit University.

## INOVATING SCIENTIFIC RESEARCH FOR SOCIO- ECONOMIC DEVELOPMENT

Luong Phuc Duc<sup>a</sup>, Dam Thi Hoa<sup>b</sup>, Nguyen Ngoc Ngan<sup>c</sup>

<sup>a</sup>*Elementary School-Gifted Teacher Training College Long An, Long An, Viet Nam. Email: lpducla@gmail.com*

<sup>b</sup>*Primary Education Department of Hanoi Pedagogical University 2, Xuan Hoa, Phuc Yen, Vinh Phuc, Viet Nam. Email: hoa244@gmail.com*

<sup>c</sup>*Lao Cai Teachers College, Lao Cai, Viet Nam.*

*Corresponding Email: ngocngannguyen1@gmail.com*

## ABSTRACT

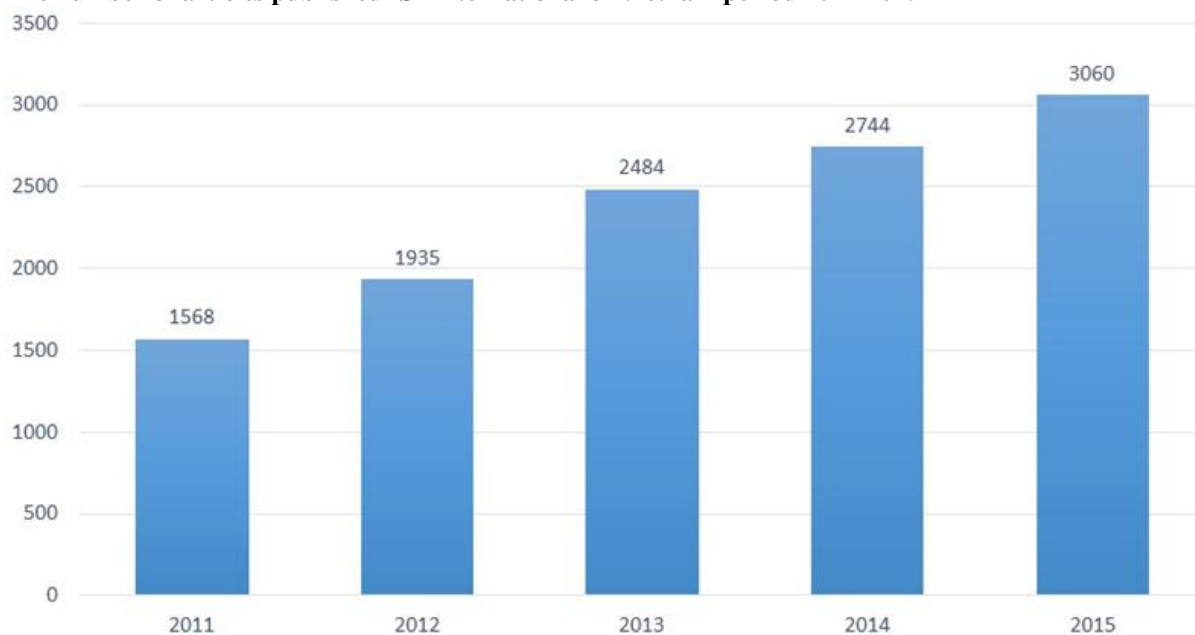
Science and technology play an important role, which is the driving force for the socio-economic development of the country. In order to promote this role, it is necessary to improve the quality of scientific research activities, in which the renewal of research content is one of important stages that need to be considered. Renew research to always develop and innovate in the direction of: Research to orient development, study to welcome the development to always grow, so as not to short of pursuit of development but still slow. The aim of this research is to propose a number of measures to improve the quality of scientific research, namely, the study of urgent issues: Study issues according to the social development rules; Study issues in the relationship between countries in the region and the world and the content of interdisciplinary and multidisciplinary research.

**KEYWORDS:** scientific research, innovation in scientific research

## INTRODUCTION

In the current trend of world integration, there are many opportunities to develop for countries. However, this is also a big challenge for each country, in which the competition for talent and intellectual products is increasing. As a result, more and more countries invest in training human resources and improving the quality of scientific research as a driving force for socio-economic development [6]. One of the criteria for evaluating the quality of scientific research is the publication of international research results. In our country, between 1970 and 2011 there were 10745 published international scientific publications [8]. In this period the number of international publications of research results was rather modest compared to other countries in the region and in the world. Since 2011, the publication of international scientific research results has been paid more attention. Specifically in the period 2011-2015 [5]:

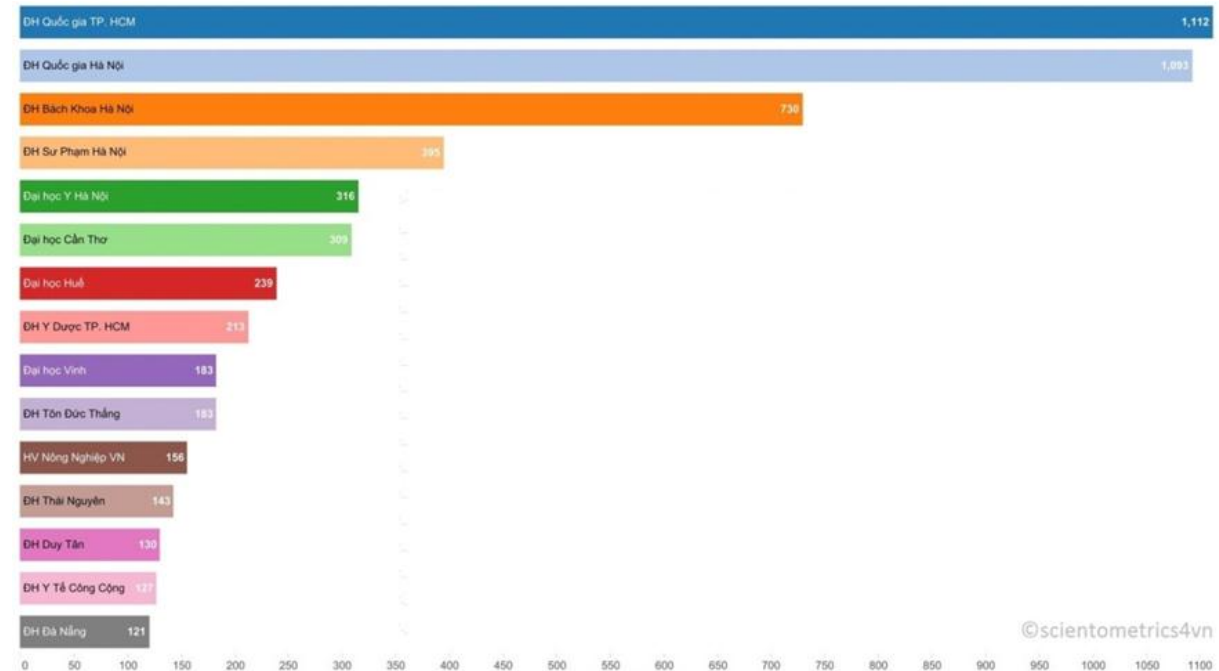
**The number of articles published ISI International of Vietnam period 2011-2015**



Number of articles published international ISI

The results show that our country is more and more interested in publishing its research results. The total number of published international journals from 2011-2015 is 11,791 research results, the number has increased significantly compared to 1970-2011. In 2015, for the first time, Vietnam has exceeded 3,000 items. In fact, the number of studies in the country is much higher, but for various reasons it has not been fully disclosed. Among the results of scientific research published in the period 2011-2015, universities (top 15 schools) contributed significantly, with a total of 5450 results of scientific research published 46.2%. Specifically as follows [3]:

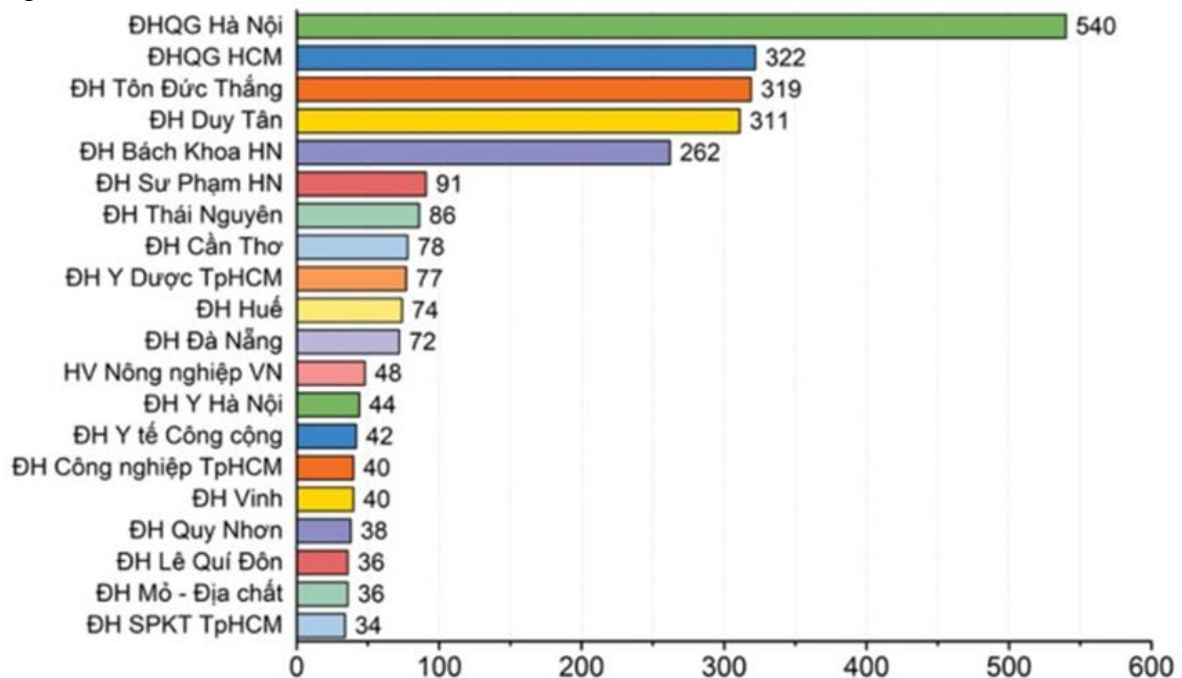
### Top 15 universities in Vietnam on ISI publication (2011-2015)



Number of international ISI publications

In the 2016-2017 academic year, the number of universities (top 20 schools) published 2580 study results, namely [4]:

### Top 20 Vietnamese Universities ISI International Announce in 2016-2017



#### Quantity (items)

In general, Vietnamese universities have made great efforts to increase the number of international publications of their research results each year. This is a good signal for scientific research activities of our country. The increasing number of scientific research shows that the potential for scientific research has raised, gradually confirming its quality and brand. However, there are still some limitations. When assessing the shortcomings in science and technology over the past time, the political report at the XII National Party Congress (January, 2016) stated "Science and technology are not real. Linking and becoming a driving force for socio-economic development. The mobilization of resources of society for science and technology has not been paid much attention. Failing to fulfill the objectives of building large scientific centers in a coordinated, focused and focused manner, having the effect of boosting the socio-economic development. Investment in science and technology is still low and efficiency is not high. The mechanism of management of science and technology is slow to be reformed. The science and technology market is slowly developing. The planning and development of science and technology is not closely linked to the requirements of socio-economic development and national defense and security. International cooperation on science and technology lacks strategic orientation, low efficiency "... [7]

Since then, the Congress has set its vision for the next five years (2016-2020) to develop science and technology. "... Strengthening scientific and technological potential and building a bright innovation system; create the nation, bring into full play the creative capacity of all individuals, enterprises and organizations. Democracy, respect and promotion of creative freedom in the research, consultancy and critique of scientists "... [7]

The Party's strategic orientation has given science and technology the opportunity to develop in the right direction and in the quality that underlies the promotion of the scientific potential and creativity of scientists; become the driving force for socio-economic development.

For the research activities in education, the above orientations have been concretized by the project "Strengthening material facilities, improving the capacity of teachers, researchers and innovation. scientific research, technology transfer in tertiary education institutions and vocational education for the period of 2017-2025, "which was approved by the Prime Minister on 16/12/2016. With the objective of ensuring material facilities and human resources for solving scientific and technological tasks; Strengthen scientific research and technological development activities in educational institutions, ensuring increased international publication and protection, with an average protection of 8-10% / year of patents and solutions. useful; To accelerate the application, transfer and commercialization of research and production results. [2]

As such, the effectiveness of the project will depend on the implementation mechanism. To renovate scientific research activities, it is necessary to renovate many factors. In this article, we are referring to the innovation of research content.

### MATERIALS AND METHODS

#### 1. Method of analyzing and synthesizing theory

- Analysis of the sources: Reports and statistical data have been published in official journals and websites; documents of the Party and guidelines of the Government for the development of education and science and technology.

- Analyze logically the content of the above sources.

- Analyzing authors: authors in the fields of education, science - technology.

#### 2. Statistical methods

Statistics report data to clarify trends in the development of scientific research is reflected in international publications.

#### 3. Method of experience summation:

- Discovering typical events which have a great influence on scientific research.

- Review the results of past activities on scientific research in Vietnam and propose solutions to improve the quality of scientific research.

### RESULTS

Due to the shortcomings of science and technology, in order to improve the quality of scientific research to meet the requirements of socio-economic development, it is necessary to renovate research contents according to direction:

### 1. Study urgent issues

Depending on the circumstances of each country, the region in the direction of social development, there are various urgent issues arising from objective reality. Resolving urgent issues will help stabilize, creating the basis for step by step development.

### 2. Study the problems according to the rules of social development

Research aims to guide development, research and development to always grow, so as not to short of pursuit of development but still slow development. If this is done, there will be less urgent problems than expected. In scientific research is always associated with the development of new technology to ensure that research products always meet the practical development of society.

### 3. Research issues in the relationship between countries in the region and the world

The world is integrating, communities are formed and closer together to live together and grow together. Therefore, the opportunity to cooperate with research is possible. In this research, we will have the opportunity to work and cooperate with the best experts and researchers from other countries. By that, we will address regional and international issues, and learn and share each other in scientific research. There are many issues that need to be tackled, such as education, employment, climate change, green energy, sustainable development, food security, etc.

### 4. Contents of interdisciplinary and multi-field research

Research on the subject matter is popular, content and results are studied in depth by subject. In reality, however, phenomenal things always exist in correlation, mutual interaction, and some are dialectical. Therefore, in addition to specialized research, it is necessary to select the problem of interdisciplinary and multidisciplinary nature in order to solve large problems in general and the results of research will be highly applicable in practice. Research results must be applied in practice, so when researching, it is necessary to set the initial goal of practical application so that the solutions proposed will be more realistic. In addition to research, attention should be paid to the international publication of research results to assert the quality and brand of the country, and to license the research results.

## CONCLUSIONS AND DISCUSSION

In short, innovation in scientific research is indispensable for development in a constantly changing world. Renovation of research content is an important step in scientific research innovation activities. For the results of research to be of good quality and able to be applied in high practice, it is necessary to renovate research contents in the direction of the urgent requirements of objective and long-term reality according to the development law of the commune. It should study interdisciplinary and multidisciplinary issues in cooperation with other countries in the region and in the world for mutual development.

## REFERENCES

- [1]. Dang Hung Thang, *Four solutions to promote scientific research*, <https://www.vnu.edu.vn/ttsk/?C1654/N17540/Bon-giai-phap-thuc-day-nghien-cuu-khoa-hoc.htm>
- [2]. Government of the Socialist Republic of Vietnam, 2016, Decision No. 2469 / QD-TTg dated 16/12/2016 of the Prime Minister, Decision approving the project "Strengthening material facilities, To raise the capacity of teachers, researchers and renewal of scientific research and technology transfer activities in tertiary education and vocational training institutions in the 2017-2025 period. "
- [3]. Hien Huynh, Hiep Pham & Abraham Tran, *Top 15 Universities in Vietnam for ISI publication (2011-2015)*, <http://www.udn.vn/posts/view/2074/58-30/10/2015>
- [4]. KB, *International ISI publication of Vietnamese universities in the academic year 2016-2017*, <https://www.tienphong.vn/giao-duc/cong-bo-quoc-te-isi-cua-cac-dai-hoc-viet-nam-trong-nam-hoc-20162017-1171799.tpo-29/7/2017>.
- [5]. Le Van, 2016, *International Declaration of Vietnam: Increases but decreases*, <http://vietnamnet.vn/vn/giao-duc/khoa-hoc/cong-bo-quoc-te-cua-viet-nam-luong-tang-nhung-chat-giam-308651.html-13/06/2016>.
- [6]. Le Xuan Dinh (Editor), 2015, *World Science and Technology*, Science and Technology Publishing House, National Agency for Science and Technology Information.
- [7]. Political report at the 12th National Party Congress of the Communist Party of Vietnam, 01/2016.
- [8]. Tran Thanh Ai, 2014, *Weaknesses in Educational Research in Vietnam: Causes and Solutions*, Journal of Science, Cantho University.

**AN INVESTIGATION INTO FEMALE STUDENTS' LEVELS OF ANXIETY ABOUT PHYSICAL  
EDUCATION AT DA NANG UNIVERSITY**

Nguyen Xuan Hien<sup>1</sup>, Nguyen Thi Hang Phuong<sup>2</sup>, Le Phuong Loan<sup>3</sup>

<sup>1</sup>*Faculty of Physical Education, The University of Danang, nxhien@ac.udn.vn*

<sup>2</sup>*The University of Education, The University of Danang, hangphuong19@gmail.com*

<sup>3</sup>*University of Foreign Language Studies, The University of Danang, loan.lephuong@hotmail.com*

**ABSTRACT**

Physical education (PE) at university is an essential aspect of education and training with an aim at improving health and personal qualities for students. Using Sprilberger's State-Trait *Anxiety Inventory* (STAI) to survey 576 female students, we found that there were 18.1 per cent of them felling anxious about PE courses. Their common expressions are headache, stomachache, tiresome, inability to concentrate, boredom and unwillingness to join the PE course. The causes of such anxiety were rooted in their fear of failing the course requirements, re-taking the course, re-taking the exam, depression and tiresome after school hours, not taking their favorite PE course, and failing to graduate on time due to lack of the PE certificate. Consequences of students' anxiety about PE courses are incorrect perception about PE, boredom at PE hours, and disappointment about PE teachers. The paper recommends a number of solutions to reduce levels of anxiety for students such as course counselling, improving distribution of course information, cordinating integrated activities into PE classes to motivate and inspire students.

**KEYWORDS:** s of anxiety; female students; anxiety reducing solutionsphysical education; anxiety; expression



## INTRODUCTION

In a study by Haskell, W. L., Lee et al. (2007), in a 50-year statistics (1900-1959) American economists found that if a country invested in human education, especially physical education, sports would help increase its profits.

In Viet Nam, the Constitution 92 (article 41), and Decree No. 36/CT issued by the 7th Central Committee Communist Party of Viet Nam regulate: (1) Physical education (PE) at schools is an important component of education and a fundamental to develop sport talents; and (2) PE is a kind of investment in human so that they can develop comprehensively in terms of physical and mental well-being.

Universities and colleges have had a tendency to expand and diverse modes of education, including PE. In fact, PE curriculum has been periodically revised, facilities have been improved, courts and tools for students have been constructed, training courses for improving teachers' capacity have been provided. Some schools even invested in renovating and constructing modern sports buildings serving the needs of PE class, extracurricular sport activities, popular sport movements, and students sport tournaments, etc.

According to Pham The Hoang (2015), physical and sport education at universities and colleges has encountered certain challenges and has not met their educational goals and requirements. Some common problems are low quality of PE classes, and students' attitudes towards the classes.

This study is conducted based on a hypothesis that female students struggles with PE classes due to levels of anxiety taking the course which affects negatively their course grades. The results presented in this study is a summary from a scientific research project (at the University of Da Nang level) namely An investigation into levels of anxiety of females students about physical education in The University of Da Nang", code **B2016-ĐN01-01**. The study is aimed at identifying female students' levels of anxiety about PE (including expression, levels, causes, and effects) to recommend solutions to reduce their levels of anxiety about PE.

Theoretically, anxiety is a normal reaction of human being toward challenges and threats from the nature and society that they have to struggle to overcome. Anxiety is an alarming sign, signaling an upcoming danger, urging people to employ all means to cope with the threats.

In late 19<sup>th</sup> century, various researchers shared special interest in human's mental health. Once classifying mental illnesses, anxiety and depression were considered psychological diseases. The International Classification of Diseases (ICD) 8 and 9 (in 1978) indicated that anxiety had a psychological cause. In 1992, ICD 10 described anxiety as a disease related to physical expressions of human. In 1994, American Psychiatric Association introduced the Diagnostic and Statistical Manual of Mental Disorders 4 (DSM-4) stating that anxiety is a negative feeling affecting personal capacity, and degrading physiological and psychological activities.

According to Dinh Dang Hoe (2005): Anxiety is a natural (normal) reaction of human being towards natural and man-made challenges and threats to survive. Doctor Nguyen Minh Tuan (2006) said: Anxiety is a simple type of disorder which has an expression of a long-lasting concern with or without a clear subject. There are different expressions of anxiety both physiologically and psychologically. In terms of physiological expressions, people with anxiety have 2/3 symptoms such as headache, stomachache, hand and leg shaking, faint, tiredness, insomnia, diet disorder. Regarding psychological expressions, they tend to be behaviorally inactive/ indifferent/ opposing/ sighing; or emotionally disappointed/ depressing/ sad/ nervous; and inability to think, calculate or memorizing, etc. In brief, people with anxiety normally have physiological, psychological (behaviorally, emotionally, and cognitively) expressions that happens at different individual levels.

Consequently, we can assess expressions of anxiety using observation and calculation methods.

Female students' anxiety about PE is a mental state occurring in a long time (2 weeks and above) making them feel tired and unable to address daily life events. They normally have expressions such as headache, stomachache, hand and leg shaking, tiredness, nervous and unable to think positively.

## MATERIALS AND METHODS

*Researchers* : We make a survey with 576 female students – who study physical education at Da Nang University. We used random sampling methods, 567 female students in 1200 female students at Da Nang University.

*Research methodology* : Our research the test of Charler D.Spilberger. Charler D.Spilberger's (1989) State-Trait Anxiety Inventory (STAI) has been employed, including 40 items with 4 levels increasing from 1 to 4.

The first 20 items evaluate the state of anxiety while the remaining 20 items evaluate the individual characteristics.

Questionnaire is used to study the levels, expressions, causes, and effects of anxiety of students in specific contexts and solutions to reduce levels of anxiety for female students in PE classes. SPSS 22.0 is used to analyze data collected.

Table 1: Research participants

Institutions	No.	Percentage	Subjects	No.	Rate
University of Education	182	31.45%	Football	55	9.63
University of Technology	154	26.7%	Basketball	43	7.47
University of Foreign Language Studies	103	17.9%	Athletics	48	8.38
University of Economics	128	22.22%	Volleyball	122	21.19
Faculty of Medicine and Pharmaceuticals	9	1.56%	Rhythmic gymnastics	133	23.03
			Badminton	119	20.72
			Table tennis	26	4.43
			Chess	30	5.15
<b>Total</b>	<b>576</b>				<b>576</b>

The total number of students taking part in the survey is 576 in which there are 182 students from University of Education and only 9 students from the Faculty of Medicine and Pharmaceuticals. The number of students in Rhythmic gymnastics, volleyball, and table tennis classes accounted for 23.03%, 21.9%, and 4.43% respectively.

## RESULTS

Clearly explain the nature of the results (10 pt). Tables and Graphs: Minimum of 10 pt type size, all captions should be upper and lower case, centered. Each Table and Figure must be on a separate page (or pages if required).

Illustrations and Photographs: Halftones, minimum of 10 pt type size, captions should be in upper and lower case, centered. Images must be computer-designed (postscript or MS Word format). Digitized photographs in 256 gray-scales are recommended. Please do not submit color images.

The results show that out of 576 female participants, 2.3% students were diagnosed with “very anxiety” level, 15.9% were anxiety (with averaging scale is above 40 scores), 64.2% had normal level of anxiety while only 19.9% had none in the 2 weeks before the survey time. In total, there were 18.1% survey respondents had very anxiety level. Compared to previous research findings with 15-20% population having similar level, the anxiety levels of female students of The University of Da Nang (UD) was appropriate.

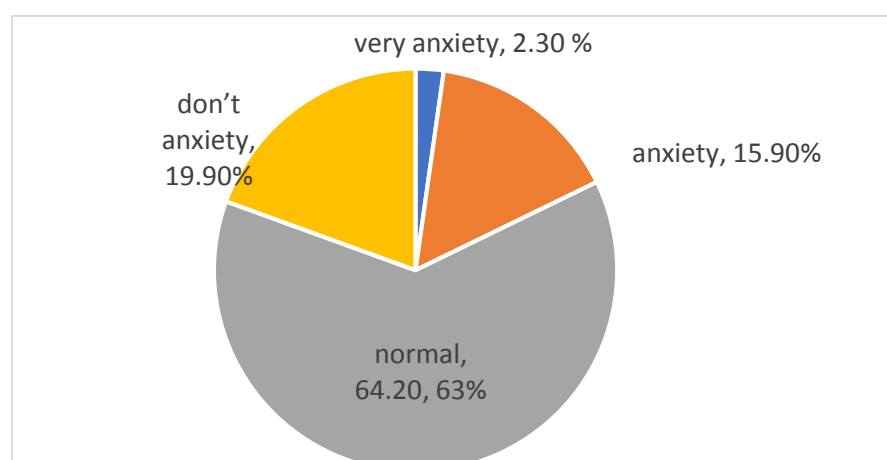


Figure 1: UD female students' levels of anxiety

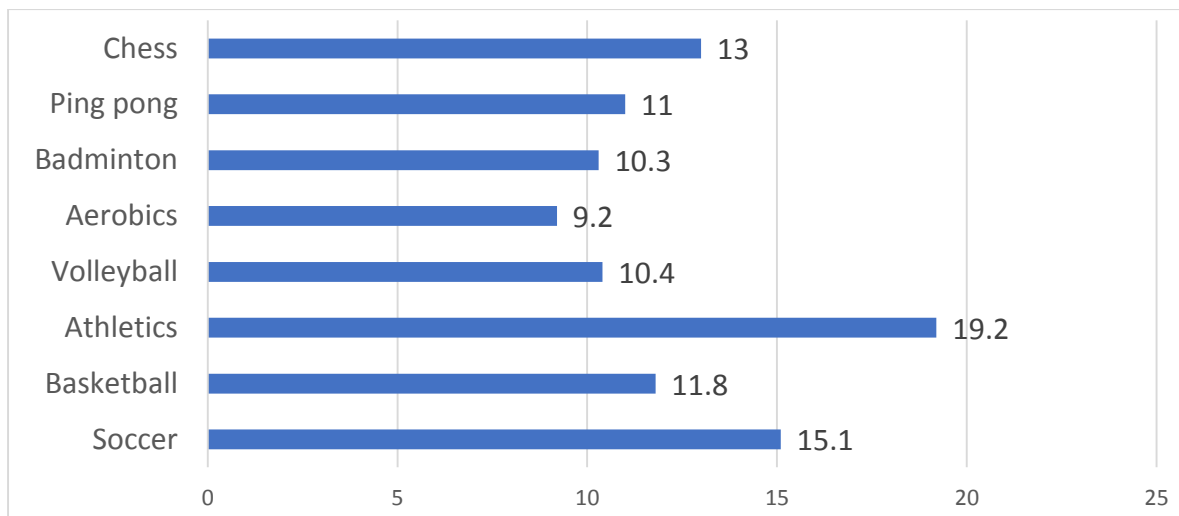


Figure 2: UD female students' levels of anxiety according to subjects

Once classified into specific subject, athletics is the subject that worries the most number of female students (at 19.2%) followed by football (15.1%), chess (13%), basketball (11.8%), table tennis (11%). Students are anxious least with such subjects as Rhythmic gymnastics (9.2%), badminton (10.3%), and volleyball (10.4%).

Using in-depth interviews, we asked students about their feelings taking the most and least favorite PE classes. T.L.P, a female student, said that: "I am very frightened taking the athletics class as I feel dizzy and breathless even only after a few rounds. I prefer Rhythmic gymnastics class since it helps me become more flexible and stronger. I can practice it at home with my favorite music choices". "I am afraid of football. Though I have to take the class due to my mistake in course registration, I always feel very tired and bored in class. I used to love chess, yet I quickly felt demotivated by complex calculation of moves", said N.L.R.

Expressions of anxiety of survey participants (in 2 weeks) were: unwillingness to attend class (average = 3.8), late arrival (average = 3.32), feeling tired and depressed (average = 3.28), suffering from lower study capacity (average = 3.24). T.Q.A, a student said, in an interview, that "I have to attend class against my will. I wish I would never have to attend PE classes. "I never go to classes late, except for PE class because I do not want to" (L.K.N.). "I can not concentrate on PE class" (L.Q.B.) "Long run is my worst nightmare. Some of my classmates fainted after finishing their turn and discouraged all of us terribly". (N.V.D). Other expressions include: dizziness, headache, making mistakes in study and daily life, demotivation, etc. according to American Psychiatric Association (ICD 10), those that have these symptoms in 2 weeks in a row are considered people with anxiety.

Table 2: Participants' expressions in 2 weeks in a row

Expressions	Levels (%)				Average	P	Correlation (r)
	Never	Seldom	Occasionally	Frequently			
Tired, depressed	34.3	36.1	18.5	11.1	3.28	< 0.05	.509
Hard to concentrate	37.6	22.4	28.7	11.3	3.25		.462
Study grades going down	27.4	21.2	35.5	15.9	3.24		.396
Unwilling to attend class	1.6	10.8	48.6	38.9	3.8		.318
Attending class later than expected	2.2	5.9	49.2	42.7	3.32		.470

Making mistakes in study, daily life and work.	4.9	7	53.5	34.6	3.2	.399
Sweating (head, palm, foot)	3.2	3.2	50.3	43.2	3.08	.475
Dizzy, breathless	3.8	4.9	53.5	37.8	3.16	.502

Studying about causes of students' anxiety about PE classes, we found that the number one cause is "pressure to pass the course, fear of re-taking exams and course, and late graduation" with average at 3.52/4. Followed by "physical tiredness after PE class" (average at 3.19/4) and "unability to take favorite PE course".

Table 3. Perception of causes of anxiety about PE class

No.	Perceptions of causes of anxiety	Level of agreement				Mean	SD
		Disagree	Partly	Agree	Totally agree		
1.	Pressure to pass the course, fear of re-taking exams and course, and late graduation	2.7	3.2	61.6	32.4	3.52	2.31
2.	Fear of injury while practice	4.3	35.1	45.4	15.1	2.56	1.61
3.	Tiredness after PE class	3.8	8.1	53.5	34.6	3.19	1.38
4.	Unability to take favorite PE course	4.3	11.9	51.4	32.4	3.12	1.48
5.	Inappropriate timetable of PE class (either too early or too late)	2.2	6.5	52.4	38.9	3.04	1.72
6.	Poor health	2.2	13.5	56.2	28.1	2.84	1.75
7.	Teachers (Behavior/ methodology, inability to select favorite teachers)	2.7	10.8	41.1	45.4	2.52	1.13

According to Pham The Hoang (2012) "The causes for students' anxiety about PE class are inadequate facilities, curriculum, and mostly students' inability to exercise".

Mr. Nguyen Tung Lam, Principal of Dinh Tien Hoang high school, Ha Noi, believed that "We haven't seen the importance of PE. Students lack opportunities to select their favorite subjects and instead, get graded for courses they dislike, especially subjects that require high skills and achievements. Hence, students always feel stressful and anxious".

Mr. Nguyen Van Khanh, PE teacher, assured that Vietnamese people seldom exercise or play sports, that is why pupils or students are discouraged to attend PE class. Even their parents or non-PE teachers take PE for granted so they make students focus on Math, Physics, Literature, English, etc. and ignore PE. The rate of students having to re-take PE exams accounted for 10%. Many students fail to graduate on time due to their incompleteness of PE courses.

In addition, T.L.Q said: "Even though PE is an important course, many students take it for granted because grades from PE courses do not affect their final GPA. Also, students are demotivated and discouraged at attending inappropriate PE classes against their will. Popular PE subjects now are running and volleyball of which students feel tired and opposed".

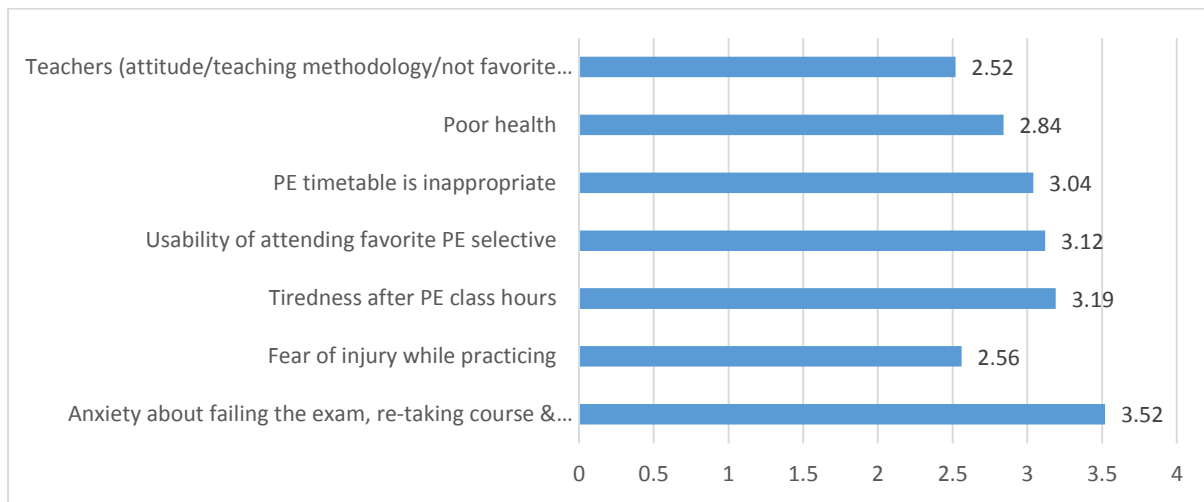


Figure 3: Causes of students' anxiety about PE classes

Suffering from the above-mentioned causes, students have wrong perception of PE courses. For example, 45.4% of survey participants agreed that "PE courses are not meaningful" while 52.4% believed that "Attending PE class is very boring". These perceptions make students tired and their grades go down. Hence, 10% of students had to re-take the PE exams and class. Many students agreed that PE teachers are often too tough, strict and demanding leading to suppression and depression to all students in the PE class.

Table 4: Students' perception about taking PE course

No	Perception about taking PE course	Level of agreement				Mean	S.D.
		Disagree	Partly	Agree	Totally agree		
1.	PE courses are not meaningful	2.7	10.8	41.1	45.4	3.32	.43
2.	PE class is very boring	3.2	6.5	52.4	37.9	2.76	.61
3.	PE class makes students tired	2.2	13.5	56.2	28.1	3.19	.38
4.	Re-taking class is costly	2.8	26.3	41.5	29.4	3.12	.48
5.	PE class is time-consuming (due to re-taking)	3.8	8.1	53.5	34.6	3.04	.42
6.	Re-taking PE class interfered with personal plan	6.3	11.9	51.4	30.4	2.84	.55
7.	Boredom at PE class leads to offences to PE teachers	4.3	35.2	45.4	15.1	3.52	.41

#### Solutions to reducing female students' levels of anxiety about PE class

From the above findings, some solutions to reduce levels of anxiety for female students have been recommended. The solution that was students' favorite was "increasing students' awareness about roles of PE subjects which are improving and protecting one's health", (accounted for 85.2%). There were 83.1% of students agreed on the solution to create a relaxing and funny PE class hours, e.g. course counselling or relaxing activities, etc."

About 67.3% students suggests "an opinion mailbox for students to feedback so that their teachers can modify and revise teaching methodology" and "it is necessary to design relaxing activities related to the lesson content and reduce levels of tiredness and stress". Also, "teachers have to set specific requirements for each subject which are appropriate with students' health." In addition, teachers have to encourage, cheer up, and motivate students to practice on a regular basis.

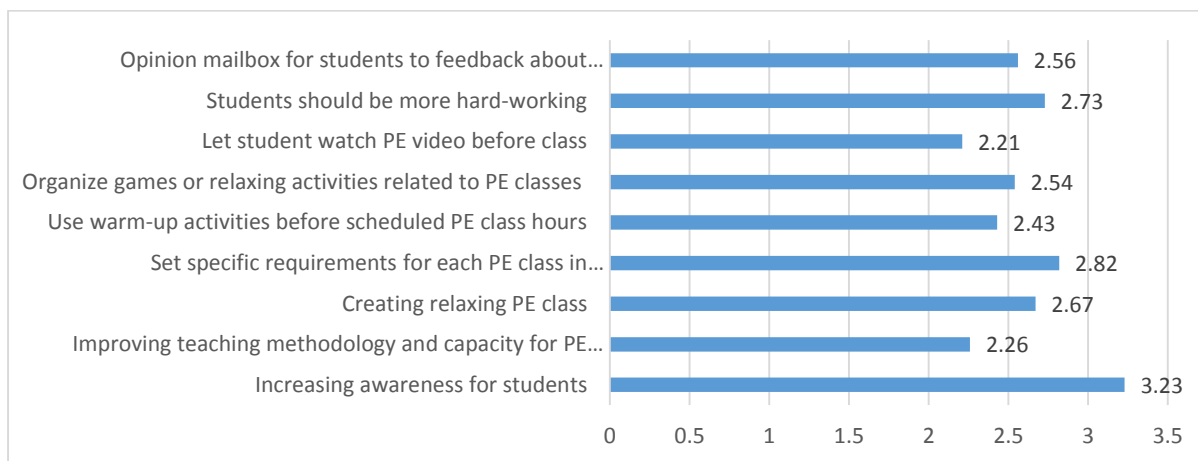


Figure 4: Solutions for reducing female students' levels of anxiety

## CONCLUSIONS AND DISCUSSION

Clearly indicate advantages, limitations and possible applications

Employing Spielberger's STAI in the calculation of results, we found that there were 18.1% female students with anxiety about PE courses in which the highest levels of anxiety was on athletics. The common expressions of anxiety were headache, stomachache, losing focus, tiredness, sweating, and study scores going down. The causes of anxiety were identified: fear of failing the PE course, re-taking PE class and exams, late graduation, tiredness and anxiety after PE hours, and attending dislike PE courses. Effects of anxiety were wrong perceptions of PE course, demotivation, and disappointment about PE teachers.

Accordingly, some solutions have been recommended to reduce female students' levels of anxiety, namely counseling activities to increase students' awareness about roles of PE. These activities can be organized in curriculum hours, sport news bulletin, clubs, and conferences. Teachers should modify and revised curriculum and teaching methodology in accordance with students' interest. In-class activities can be organized to motivate and inspire students during PE hours. Teachers should also motivate and encourage students in PE class to help them understand the role of PE. Sport clubs, e.g. badminton, volleyball, football or basketball, should be established to increase peer-to-peer support after PE class hours.

## REFERENCE:

- [1] Haskell, W. L., Lee, I.-M., Pate, R. R., Powell, K. E., Blair, S. N., Franklin, B. A., Bauman, A. (2007). *Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Circulation, 116* (9), 1081.
- [2] Shewchuk, R., Richards, J. S., & Elliott, T. (1998). Dynamic processes in health outcomes among caregivers of patients with spinal cord injuries. *Health Psychology, 17*, 125-129.
- [3] Spielberger, C. D. (1989). *State-Trait Anxiety Inventory: Bibliography* (2nd ed.). Palo Alto, CA: Consulting Psychologists Press.
- [4] Spielberger, C. D., Gorsuch, R. L., Lushene, R., Vagg, P. R., & Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.
- [5] Organization, W. H. (2000). *The world health report 2000: health systems: improving performance*: World Health Organization.
- [6] Hoang Thi Huong (2016), Solutions to increasing motivation in PE classes for students of University of Labour-Society (Giải pháp nâng cao hứng thú trong giờ học Giáo dục thể chất chính khóa cho sinh viên trường Đại học Lao động - Xã hội), Đại học Lao động - Xã hội Publisher.
- [7] Nguyen Xuan Hien, Chun-Hsien Su (2015), *The Relationship between Physical Activity and Health Status in Collegiate Students at The University of Danang in Vietnam*. Asian Journal of Physical Education and computer science in sports. No: ISSN 0975-7732 Volume No.12, No.1. Pages: 107-113. Year 2015.
- [8] Nguyen Xuan Hien, Nguyen Thi Hang Phuong, Vo Dinh Hop (2015), *How to improve the quality of sports competition for students at The University DaNang*, Asian Journal of physical education and computer science in sports, Vol 13 No.1, Half yearly, July 2015 to December 2015 (p.64-67)

- [9] Nguyen Thi Hang Phuong, Nguyen Xuan Hien, Vo Dinh Hop, (2016), Trainers' perceptions of the relation between stress and sport competition activities among students at the University of Danang. *International Journal Of Health, Physical Education & Computer Science In Sports*; Vol 21; 135-139
- [10] Pham The Hoang, (2015). Current status and elements affecting extracurricular sport of students of Ha Noi University of Culture (Thực trạng và những nhân tố ảnh hưởng đến hoạt động thể thao ngoại khóa của sinh viên Đại học Văn hóa Hà Nội). *Journal of Scientific training and Sport*.
- [11] Pham The Hoang (2012). Role of exercising towards human's well-being (*Vai trò của việc luyện tập thể dục thể thao đối với sức khỏe con người*), *Journal of science*, Bac Ninh University of Physical Education and Sport.



## PARENTS' PERCEPTION ABOUT ATTENTION DEFICIT HYPERACTIVITY DISORDER IN CHILDREN AND THE INFLUENCE ELEMENTS

Nguyen Thi Phuong Trang, MA<sup>1</sup>  
Bui Thi Thanh Dieu, PhD Student<sup>2</sup>

<sup>1,2</sup> *Psychology and Education Department – University of Education – The University of Danang – Vietnam*  
*Corresponding authors–E–mail address: phuongtrangtld@gmail.com*

### ABSTRACT

This paper describes the parents' perception about Attention Deficit Hyperactivity Disorder (ADHD) in children under the influence of the elements such as gender, occupation, educational degree and time for children per day. Parents' awareness about ADHD is one of the factors that have an important role, giving timely and effectively diagnosis and intervention for children with this syndrome. Research on 310 parents of pupils from five elementary schools in Da Nang city (Vietnam) showed that most parents had misconception about the familial activities in supporting children with ADHD. Result also indicated that parents' occupation did not correlate to their perception while their gender, educational degree and time they spent on children per day had a profound effect on their attitude and action in caring and teaching children with ADHD.

**KEYWORDS:** ADHD, children with ADHD, parents.

## INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a common mental disorder in children, especially children in elementary and middle school age. This disorder can continue in their adulthood. If children with ADHD is not detecting early and treating promptly, they will have difficulties in social relationships, and have to face with many obstacles in their development process.

In The United States of American, the American Psychiatric Association (APA, 2000) showed that the ratio of boys and girls with ADHD is 4: 1. In 2010, The Centers for Disease Control and Prevention had announced the increase of ADHD from 7.8% (2003) to 9.5% (2007) and to 22% (2010). In the United Kingdom, studies by Taylor and Hemsley from the National Center for Health Research or the Ministry of Education of Northern Ireland (2005) found that the proportion of children with ADHD ranged from 0.5 to 1%. The ratio of ADHD in 7-11-year-old children was highest. In Australia, a research based on the evaluation and diagnosis of 10,438 children at the age 5-15 showed that 3.6% of boys and 0.85% of girls had ADHD (Ha, 2013).

In Vietnam, Nguyen Cong Khanh (Khanh, 2002) in his study "Initial Adaptation of Conners Scales on Elementary and Secondary Students" adapted the Conners' scales to diagnosis ADHD in elementary and middle school students. After that, many researches on ADHD were conducted in Hanoi and Ho Chi Minh City: Nguyen Thi Van Thanh (Thanh, 2010), Le Thi Minh Ha (Ha, 2013) ... The results indicated that 1-4% of elementary school children having this syndrome.

Children with ADHD are more likely to have problems with social skills, such as social interaction and forming and maintaining friendships. They also encounter troubles such as managing anger, being poor in handwriting, and delaying in speech, language and motor development... (AAP, 2011). Therefore, they need special support from the family, namely parents. Their parents' perception is one of the most important determinants. For that reason, researching on parents' awareness about ADHD is needed. The result can be useful for adjusting parents' manner in caring and educating children with ADHD at home.

## MATERIALS AND METHODS

This survey was proceeded on 310 parents (103 fathers and 207 mothers) of pupils from 05 primary schools in Thanh Khe district - Da Nang city in the period from January 2016 to December 2016. The sample research is shown in the following table.

Table 1. Description about parents surveyed

Occupation	Amount	%	Educational Degree	Amount	%
Doctor / pharmacist / nurse	9	2,9	Under high school	108	34,8
Police	11	3,5	Vocational school	89	28,7
Functionary	52	16,8	College/University	95	30,6
Worker	49	15,8	Upper University	18	5,9
Chef	4	1,3	<b>Time for children per day</b>		
Teacher	51	16,5	Less than 2 hours	27	8,7
Engineer	16	5,2	About 2-6 hours	232	74,8
Business	22	7,1	More than 6 hours	51	16,5
Journalist	4	1,3			
Office employee	48	15,5			
Housewife	44	14,2			
<b>Total</b>	<b>310</b>	<b>100,0</b>	<b>Total</b>	<b>310</b>	<b>100,0</b>

The questionnaire was used as the main method in order to finding out how the parents had perceived about Attention Deficit Hyperactivity Disorder (ADHD) in children and how they had supported children with ADHD.

In addition to, interviews and observations methods were also used to collect additional information to clarify the results obtaining from the questionnaire survey. The data were processed by SPSS 20.0 software.

### 3. RESULTS AND DISCUSSION

#### 3.1. Activities of parents in caring and educating children with ADHD at home

The following table 2 indicated the results of parents' vision about familial activities in caring and educating children with ADHD at home.

Table 2. Options of parents in supporting children with ADHD at home

Serial	Activity	Yes		Not sure		No	
		Amount	%	Amount	%	Amount	%
1	Giving child an appropriate diet	278	89,7	23	7,5	8	2,8
2	Know the child's limitations and needs to provide the best care and education	257	82,7	40	12,9	13	4,4
3	<i>A child with ADHD does not required special education</i>	227	73,2	64	20,6	19	6,3
4	Set a quiet place to keep children from scattering (while doing homework or other tasks)	170	54,8	99	31,8	41	13,4
5	Give child adequate sleep (minimum 8-9 hours a day, and naptime should be given during the day)	296	95,5	8	2,6	6	1,9
6	<i>Punish if necessary to make child behave well</i>	265	85,4	20	6,5	25	8,2
7	Reward (toys, food, outings...) if the child gets good results even if small	165	53,2	131	42,1	14	4,7
8	Give child the short, simple, specific words instead of general instructions	209	67,4	46	14,8	55	17,7
9	Help children to set regular habits by regularly feeding them, prompting them to go to sleep, and waking them up in time...	247	79,7	46	15,0	17	5,4
10	<i>Let children watch television, talk, or see strange attractive objects while they are on duty.</i>	211	67,9	71	22,9	28	9,2
11	Parents learn the knowledge and skills to care of children	143	46,2	110	35,5	59	18,4
12	Give child simple tasks in the form of repeated games	178	57,5	109	35,2	22	7,4
13	Parents exercise emotional control to be able to handle their own problems	127	40,9	122	39,3	61	19,8
14	Punish actively the wrong behaviors of children	149	48,1	119	38,4	42	13,6
15	Ignore or divert behaviors that parents do not want to encourage	183	59,0	113	36,5	14	4,5
16	Always encourage children	284	91,5	12	3,9	14	4,7
17	<i>Limit children to participate in collective activities, play outdoor sports or practice martial arts</i>	268	86,5	26	8,4	16	5,1

**For the correct states about ADHD (items 1, 2, 4, 5, 7, 9, 11, 12, 13, 14, 15 and 16) :**

Parents give the most accurate evaluation (choose "right" about 80% to over 95%, choose "wrong" less than 5%) on items related to daily child care such as "Giving child an appropriate diet", "Know the child's limitations and needs to provide the best care and education", "Give child adequate sleep (minimum 8-9 hours a day, and naptime should be given during the day)", "Help children to set regular habits by regularly feeding them, prompting them to go to sleep, and waking them up in time...", and "Always encourage children". These

are things that almost parents do for children, but they are especially needed in care of children with ADHD at home.

Activities that involved ADHD in children, such as “Set a quiet place to keep children from scattering (while doing homework or other tasks)”, “Reward (toys, food, outings...) if the child gets good results even if small”, “Punish actively the wrong behaviors of children”, “Give child simple tasks in the form of repeated games”... were less “right” chosen (about 50%), and more “not sure” chosen (about 30% to 40%). While these are very effective measures that parents need to do regularly at home to help children with ADHD establishing proper behaviors.

With statements about self-cultivation of knowledge, skills and mental health of parents such as “Parents learn the knowledge and skills to care of children”, “Parents exercise emotional control to be able to handle their own problems”, the percentage of parents agreeing is low compared to the other right options (46,2% and 40,9%, respectively). This indicates that parents are not interested in cultivating their knowledge and skills in general (eg, emotional control skills) or directly related to ADHD. This can lead to the risk that parents will take the wrong way in supporting their child, and will impact negatively on children with ADHD.

#### **For the incorrect states about ADHD (items 3, 6, 10 and 17) :**

There was 73,2% of parents said that “A child with ADHD does not required special education” (item 3), while the amount not sure about and disagreed with this state was 20,6% and 6,3%. It can be said that parents have made very wrong judgment on this matter, because children with ADHD really need special education, not the separation of children from their peers, but the best form is inclusive education for them.

In education individuals with ADHD, the advice is absolutely not to scold the child in any case, but to act in a positive way. Experts also advise parents not to let child watch TV, talk to, or put strange objects in front of their children while the child are on duty. But parents did not really understand this. Data show that 85,4% of parents think that “Punish if necessary to make child behave well” (item 6), and 67,9% agree with “Let children watch television, talk, or see strange attractive objects while they are on duty” (item 10). In addition, collective activities, outdoor sports or martial arts should also be encouraged because participating in these activities helps children to improve their communication skills. Meanwhile, 86,5% of parents chose “right” for the item “Limit children to participate in collective activities, play outdoor sports or practice martial arts” (item 17).

### **3.2. The influence of gender, occupation, educational degree and time for children per day on parents’ perception about ADHD**

The Table 3 below presents the correlation between parents’s perception to their gender, occupation, educational degree and time they spent for children per day.

Table 3. Parents’s perception in relation to their gender, occupation, educational degree and time for children per day

Elements		N	M	SD	r	Sig. (2-tailed)
<b>Gender</b>	Male	103	1,51	0,409	-0,712*	0,022
	Female	207	2,63	0,786		
<b>Occupation</b>	Doctor / pharmacist / nurse	9	2,80	0,432	0,584	0,524
	Police	11	1,17	0,314		
	Functionary	52	1,43	0,592		
	Worker	49	1,94	0,360		
	Chef	4	1,60	0,890		
	Teacher	51	2,81	0,672		
	Engineer	16	1,49	0,741		
	Business	22	1,90	0,832		
	Journalist	4	1,32	0,812		
	Office employee	48	2,67	0,725		
	Housewife	44	2,78	0,618		
<b>Educational degree</b>	Under high school	108	1,32	0,833	-0,667**	0,001
	Vocational school	89	1,94	0,770		
	College/University	95	2,42	0,625		
	Upper University	18	2,83	0,714		
	Less than 2 hours	27	1,35	0,543	0,711*	0,036

<b>Time for</b>	About 2-6 hours	232	2,11	0,812
<b>children per day</b>	More than 6 hours	51	2,79	0,469

*Note:*

*N: total amount of options; M: Mean; SD: Standard deviation; r: Pearson Correlation*

*The higher Mean (M), the better perception and vice versa.*

*Pearson Correlation: correlation coefficient (\*\*: Strong correlation)*

*Sig. (2-tailed): real correlation coefficient (Sig.<0,05: the difference between the correlation coefficients was statistically significant).*

About the element gender, the data showed that the mean score of perceptions of men is lower than that of women, having correlation and the difference was statistically significant ( $r=0,712^*$ ;  $\text{sig.}=0,022<0,05$ ). That mean fathers were less exact aware than mothers and vice versa. In other words, the gender factor made difference in the perception of parents about ADHD.

About the element occupation, although there was difference in mean score of the Doctor/pharmacist/nurse ( $M=2,80$ ;  $SD=0,432$ ), Teacher ( $M=2,81$ ;  $SD=0,672$ ), Office employee ( $M=2,67$ ;  $SD=0,725$ ), and Housewife ( $M=2,78$ ;  $SD=0,618$ ) with the remaining occupations, but data did not show statistically significant differences ( $r=0,584$ ;  $\text{sig.}=0,524>0,05$ ). That mean parents in this group of occupations were not sure more correct percept than the other occupations and vice versa. In other words, the occupation factor did not have any impact on parents' perception about ADHD.

About the element educational degree, the mean scores of perception increased from low to high relative to the educational degree, and the difference was statistically significant ( $r=0,667^{**}$ ;  $\text{sig.}=0,001<0,05$ ). People with low educational level tend to have less accurate assessment of ADHD than high educated people and vice versa. That mean the educational degree had a strong influence on the perceptions and actions of parents.

About the element parents' time for children per day, the result indicated that the mean score of the parents' perception decreased proportionally with the decrease of the time for children, and the difference was statistically significant ( $r=0,711^*$ ;  $\text{sig.}=0,036<0,05$ ). This mean the less time parents spent on their children, the less correct parents aware of ADHD in their children. Thus, besides the gender and educational degree factors, the time for children per day also had a definite meaning for parents thinking and activities.

## CONCLUSION

Children with ADHD really need the special supporting from their family. Parents are the best people who can understand, care of and educate their ADHD children well. For children with ADHD, the care and education of the family is considered one of the most effective determinants which decide the quality of evaluation, diagnosis and intervention for child. Therefore, parents' perception is very important. However, this research had shown that many parents do not really understand family function in supporting children with ADHD. Therefore, it is necessary to have solutions for changing the perception of parents, helping children with ADHD to be cared of and educated effectively, thereby giving them better opportunity to develop.

Testing the correlation between parents' perception to their gender, occupation, educational degree and time they spent for their child lead to conclusion that the occupation factor did not make difference in the perception of parents while gender, educational degree and the time for children had a strong influence on the perceptions and actions of parents. The suggestion is that parents (especially the fathers) need to spend more time on their children and pay attention to improving knowledge and skills related to ADHD so that they can support their children with ADHD in the best way at home.

## ACKNOWLEDGEMENTS

The authors would like to thank to Rajabhat Maha Sarakham University – Thailand for inviting and welcoming us to attend the 7<sup>th</sup> International Conference on Sciences and Social Sciences (ICSSS2017): “Innovation Research to Stability, Prosperity and Sustainability”.

We gratefully acknowledge also the experts who read and recommended our research paper.

This report would not have been possible had it not been for the invaluable inputs of many colleagues and students from Psychology and Education Department – University of Education – The University of Danang and the individuals that had participated in the survey.

## REFERENCES

- Le Thi Minh Ha. (2013). "The current state of children with ADHD in Ho Chi Minh City", *Journal of Science*, Vietnam Academy of Education, Vietnam, No. 7/2013, p.24-28.
- Nguyen Cong Khanh. (2002). *Initial adaptation of Conners' scales on elementary and middle school students*, Vietnam Institute of Educational Sciences, Hanoi, Vietnam.
- Nguyen Thi Van Thanh. (2010). *Clinical features of primary school children with ADHD*, PhD thesis in Psychology, Vietnam Institute of Psychology, Hanoi, Vietnam.
- American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders*, 4th Edn. Washington: American Psychiatric Association, p.85–93.
- American Academy of Pediatrics. (2011). *ADHD: Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents*. Illinois, p.11–17.
- C. Keith Conners. (2014). *Conners 3rd Edition DSM-V Update*. New York: Multi-Health Systems Inc (MHS).

**SUPPORTING CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER AT  
SCHOOL – TEACHER’S OPINION**Nguyen Thi Phuong Trang, MA<sup>1</sup>Nguyen Thi Hang Phuong, PhD<sup>2</sup><sup>1,2</sup> *Psychology and Education Department – University of Education – The University of Danang – Vietnam**Corresponding authors–E-mail address: phuongtrangtld@gmail.com***ABSTRACT**

Caring and educating children who have Attention Deficit Hyperactivity Disorder (ADHD) at school is very important, and this work depends largely on the perception of the teachers who take main responsibility for teaching children. Therefore, researching on teachers’ opinion about this syndrome will be very helpful for taking care of and teaching pupils in school. This article is about activities for supporting children with ADHD at school, and how the teacher use them. The authors using questionnaire would like to evaluate how the teacher support children in order to improve educational management. Testing the awareness of 143 teachers at five elementary schools in Da Nang city (Vietnam) indicated that many of them had misconception about school activities and not used the best method in supporting pupils with ADHD. The prevalence of the option “Yes” is quite large (about 60-90%) in group of statements described to organization the learning activities, assessments methods as well as encouragement and supporting for children with ADHD in school. Teachers chose “No” option very much (over 70%) in the statements refer to the need for a special education for children with ADHD.

**KEYWORDS:** activities of teachers, ADHD, pupils with ADHD, supporting children, teacher’s opinion.



## INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a common mental disorder in children, especially children in elementary and middle school age. This disorder can continue in their adulthood. If children with ADHD is not detecting early and treating promptly, they will have difficulties in social relationships, and have to face with many obstacles in their development process.

In The United States of American, the American Psychiatric Association (APA, 2000) showed that the ratio of boys and girls with ADHD is 4: 1. In 2010, The Centers for Disease Control and Prevention had announced the increase of ADHD from 7.8% (2003) to 9.5% (2007) and to 22% (2010). In the United Kingdom, studies by Taylor and Hemsley from the National Center for Health Research or the Ministry of Education of Northern Ireland (2005) found that the proportion of children with ADHD ranged from 0.5 to 1%. The ratio of ADHD in 7-11-year-old children was highest. In Australia, a research based on the evaluation and diagnosis of 10,438 children at the age 5-15 showed that 3.6% of boys and 0.85% of girls had ADHD (Ha, 2013).

In Vietnam, Nguyen Cong Khanh (Khanh, 2002) in his study "Initial Adaptation of Conners Scales on Elementary and Secondary Students" adapted the Conners' scales to diagnosis ADHD in elementary and middle school students. After that, many researches on ADHD were conducted in Hanoi and Ho Chi Minh City: Nguyen Thi Van Thanh (Thanh, 2010), Le Thi Minh Ha (Ha, 2013) ... The results indicated that 1-4% of elementary school children having this syndrome.

Children with ADHD are more likely to have problems with social skills, such as social interaction and forming and maintaining friendships. They also encounter troubles such as managing anger, being poor in handwriting, and delaying in speech, language and motor development... (AAP, 2011). Therefore, they need special support from the school, namely teachers. Their teachers' perception toward the school activities in supporting infants with ADHD is one of the most important determinants. For that reason, researching on how the teachers helping pupils with ADHD is needed. The result can be useful for adjusting teachers' manner in caring and educating children with ADHD at school.

## MATERIALS AND METHODS

This study was conducted on 340 pupils (176 boys accounted for 51.8% and 164 girls accounted for 48.2%, and the average age was 8.52), and 143 teachers (47 males and 96 females) from 05 primary schools in Thanh Khe district - Da Nang city in the period from January 2016 to December 2016. The sample research is shown in the following table.

Table 1. *Description about teachers surveyed*

Educational degree	Amount	%	Teach time	Amount	%
Under BA	34	23,8	Less than 1 year	15	10,5
BA	95	66,4	From 2 to 5 years	41	28,7
Upper BA	14	9,8	From 5 to 10 years	73	51,0
			Over 10 years	14	9,8
<b>Total</b>	<b>143</b>	<b>100,0</b>	<b>Total</b>	<b>143</b>	<b>100,0</b>

In order to understanding how the teachers helping pupils with ADHD at school, we used the questionnaire for teachers.

In addition to, interviews and observations methods were also used to collect additional information to clarify the results obtaining from the questionnaire survey. The data were processed by SPSS 20.0 software.

## RESULTS AND DISCUSSION

With the total 340 children surveyed, the proportion of children having signs of ADHD symptoms and associated disorders accounted about 4-5%. The most common type of ADHD in children was mixed ADHD, then attention-deficit ADHD and hyperactivity ADHD. The most common type of disorder associated with ADHD was both accompanying disorders (oppositional-defiant and anxiety disorders).

### 1. Activities of teachers in caring and educationing children with ADHD at school

Table 2 below indicated the options of teachers in caring and educationing children with ADHD at school.

Table 2. *Options of teachers in supporting children with ADHD at school*

Serial	Activities	Yes		Wonder		No	
		Amount	%	Amount	%	Amount	%
1	Specify and repeat the requestment in the learning (about content, about behavior...) for child to know clearly	129	90,2	8	5,6	6	4,2
2	Give child the short, simple, specific words instead of general instructions	133	93,0	7	4,9	3	2,1
3	Require the child to arrange his/her toys, desk, room... every day	135	94,4	6	4,2	2	1,4
4	<i>May be give the child multiple requests at the same time so that he/she can exercise his/her attention</i>	73	51,0	35	24,5	35	24,5
5	Let the child sit as near the teacher's desk as possible in class	130	90,9	8	5,6	5	3,5
6	<i>Maybe let children with ADHD sit near doors or windows</i>	16	11,2	17	11,9	110	76,9
7	Arrange the exemplary classmates sitting around ADHD children to encourage ADHD children to learn from friend and cooperate.	129	90,2	10	7,0	4	2,8
8	<i>Change activities, schedule, position... for children with ADHD constantly</i>	25	17,5	16	11,2	102	71,3
9	Check the child for knowledge, not for the ability to pay attention.	90	62,9	31	21,7	22	15,4
10	Add more time for certain tasks because ADHD children may work more slowly	131	91,6	5	3,5	7	4,9
11	<i>Limit the child's ability and focus on the teacher's needs</i>	87	60,8	23	16,1	33	23,1
12	Avoid scolding and disparaging the child in front of his/her friends, but respect and preserve his/her self-esteem.	138	96,5	2	1,4	3	2,1
13	Parents learn the knowledge and skills to teach children with ADHD	88	61,5	46	32,2	9	6,3
14	<i>A child with ADHD does not required special education</i>	16	11,2	22	15,4	105	73,4
15	Ask the child what he or she wants your child to do instead of telling the child what you do not want him to do	91	63,6	38	26,6	14	9,8
16	Know the child's limitations and needs to provide the best care and education	132	92,3	5	3,5	6	4,2
17	<i>Punish if necessary to make child behave well</i>	86	60,1	24	16,8	33	23,1
18	<i>Limit children to participate in collective activities, play outdoor sports or practice martial arts</i>	78	54,5	46	32,2	19	13,3

**For the correct states about supporting children with ADHD at school (items 1, 2, 3, 5, 7, 9, 10, 12, 13, 15 and 16):**

The ratio of the option "Yes" (ie, the teacher had correct understanding of ADHD and used the right solution in supporting children with ADHD at school) is quite large in group of these reviews: excepting items 9, 13, and 15 had about 60% "Yes" choice, the remain items had very high ratio "Yes" choice (over 90%) and very low "No" choice (under 5%). This was positive signs, because the above statements described to organization the

learning activities, arrangement seating, assessments methods as well as encouragement and supporting for children with ADHD in school. It was very important for the development of children with ADHD.

**For the incorrect states about supporting children with ADHD at school (items 4, 6, 8, 11, 14, 17 and 18):**

Teachers chose “No” option (ie, they had understood correctly about ADHD) very much (over 70%) in the statements “Maybe let children with ADHD sit near doors or windows” (item 6), “Change activities, schedule, position... for children with ADHD constantly item” (item 8) and “A child with ADHD does not required special education” (item 14). For example, about statement “A child with ADHD does not required special education” (item 14), only 11.2% of teachers agreed with this statement, 15.4% were wondered and 73.4% thought this had been wrong. Thus, teachers have assessed accurately the need for a special education for children with ADHD.

About the wrong statements remaining (items 4, 11, 17 and 18), the teacher had chosen the “No” choice decreasingly the “Yes” choice increasingly. This mean that the teacher did not apply appropriate solutions in supporting children with ADHD at school. Specifically for item 4 “May be give the child multiple requests at the same time so that he/she can exercise his/her attention” and item 18 “Limit children to participate in collective activities, play outdoor sports or practice martial arts”, the rate of teachers agreed were 51% and 54.5% respectively. This mean that more than half of teachers believed that teachers might give multiple requirements for children at the same time, or restricting the participation of children in sports. In fact, in the caring and educationing for children with ADHD, giving multiple requirements at one time for a child would hamper his/her attention and preven him/her from fulfilling duties. Furthermore, experts said that collective activities and playing outdoor sports should be encouraged rather than prohibited.

For item 11, “Limit the child's ability and focus on the teacher's needs” and item 17 “Punish if necessary to make child behave well”, the rate of teachers agreed were over 60% (60.8% and 60.1% respectively). Children with ADHD, as well as all other students, had their own abilities and interests. If they had the opportunity to be cared of, nurtured, encouraged their talents, interests or strengths, they would be more successful in life (American Academy of Pediatrics, 2011). Unfortunately, people easily recognized the shortcomings of ADHD children and had negative actions such as beating, scolding children more. Therefore, teachers need to create as many opportunities for their children to express their abilities and interests as possible, and must avoid being scolded at all times so that ADHD children could participate well in learning activities, having fun, and being confidence in life.

**3.2. The correlation between teachers’ activities with their educational degree and their teaching experience**

These following Table 3 and Table 4 presented testing result about the correlation between teachers’ activities with their educational degree and their teaching experience.

Table 3. The correlation between teachers’ activities with their educational degree

		Teachers’ activities	
Teachers’ degree	Under BA	Pearson Correlation	1,872
		Sig. (2-tailed)	0,105
	BA	Pearson Correlation	0,645*
		Sig. (2-tailed)	0,200
	Upper BA	Pearson Correlation	1,243
		Sig. (2-tailed)	0,178

Note:

Pearson Correlation: correlation coefficient (\*: Weak correlation)

Sig. (2-tailed): real correlation coefficient (Sig <0,05; the difference between the correlation coefficients was statistically significant)

According to Table 3, teachers’ activities were not correlated with their educational degree. In other words, how teachers evaluated about ADHD and supported children with ADHD did not depend on whether if they were under BA, BA, or upper BA. This result was different from the findings that the higher degree teacher

had, the better they supported children (Ha, 2013) (Thanh, 2010). Because academic knowledge teacher got from their degree is not the only factor that decided into the way they teach children.

In whatever way, testing result indicated that teachers' activities were strong correlated with their teaching experience (Table 4). This mean the longer teachers worked at school, the better they understood about ADHD and the more effective they supported children with ADHD. Maybe had been being long time with children helped teachers take experience about educating children with ADHD.

Table 4. *The correlation between teachers' activities with their teaching experience*

Teachers' experience	Less than 1 year	Teachers' activities	
		Pearson Correlation	0,874*
		Sig. (2-tailed)	0,021
	From 2 to 5 years	Pearson Correlation	0,685**
		Sig. (2-tailed)	0,010
	From 5 to 10 years	Pearson Correlation	0,714**
		Sig. (2-tailed)	0,000
	Over 10 years	Pearson Correlation	0,625**
		Sig. (2-tailed)	0,000

Note:

Pearson Correlation: correlation coefficient (\*\*: Strong correlation)

Sig. (2-tailed): real correlation coefficient (Sig <0.05: the difference between the correlation coefficients was statistically significant)

## CONCLUSION

Many teachers were well aware of how to support for children with ADHD at school such as organization learning activities, arrangement pupils' seating, assessment pupils' learning achievement as well as respecting, encouraging, and supporting. The teachers also appreciated learning and equipping their knowledge and skills to educate children with ADHD. It is very important for the development of children with ADHD, especially in learning. However, teacher sometimes used the wrong way in helping children with ADHD. For example, more than half of teachers believe that they might be give children multiple requirements at the same time, restrict pupils' participation in sports, limit the child's ability and focus on the teacher's needs, or must punish if necessary to make child behave well. In addition to, testing result indicated that teachers' activities were not correlated with their educational degree, but were strong correlated with their teaching experience.

In conclusion, the screening results showed that the rate of children with ADHD were about 4-5%. These students need to be subsequent assessed and intervened. They also need special help from the teachers and school. Teachers play a very important role in the management and education of students with ADHD symptoms. Along with the child's family, the teachers is very close to children, and they have condition to observe, coordinate with the experts to detect the strengths, weaknesses in learning and in other activities of the child, so that they can assist effectively the intervention. Therefore, teachers' awareness and how they support for ADHD children were very important factor. Meanwhile, there were still many issues related to ADHD that teachers were not aware of properly, so they sometimes treated children unsuitably. For that reasons, it is necessary to have some impact to change the perception and activities of teachers, thus helping children with ADHD to be cared for and educated effectively, giving them the best development.

## ACKNOWLEDGEMENTS

The authors would like to thank to Rajabhat Maha Sarakham University – Thailand for inviting and welcoming us to attend the 7th International Conference on Sciences and Social Sciences (ICSSS2017): "Innovation Research to Stability, Prosperity and Sustainability".

We gratefully acknowledge also the experts who read and recommended our research paper.

This report would not have been possible had it not been for the invaluable inputs of many colleagues and students from Psychology and Education Department – University of Education – The University of Danang and the individuals that had participated in the survey.

## REFERENCES

- Le Thi Minh Ha. (2013). "The current state of children with ADHD in Ho Chi Minh City", *Journal of Science*, Vietnam Academy of Education, Vietnam, No. 7/2013, p.24-28.
- Nguyen Cong Khanh. (2002). *Initial adaptation of Conners' scales on elementary and middle school students*, Vietnam Institute of Educational Sciences, Hanoi, Vietnam.
- Nguyen Thi Van Thanh. (2010). *Clinical features of primary school children with ADHD*, PhD thesis in Psychology, Vietnam Institute of Psychology, Hanoi, Vietnam.
- American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders*, 4th Edn. Washington: American Psychiatric Association, p.85–93.
- American Academy of Pediatrics. (2011). *ADHD: Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents*. Illinois, p.11–17.
- Barkley R.A. (2006). *Attention-deficit hyperactivity disorder – A Handbook for Diagnosis and Treatment*. New York: Guilford Press.

**BREAKING THE DETECTIVE GENRE OF PAUL AUSTER  
IN THE NEW YORK TRILOGY**

Nguyen Thi Thanh Hieu

*Faculty of Literary Education, Vinh University, Viet Nam**\* Corresponding author. Tel: 0084-0912884185**E-mail address: thanhhieuv.kv@gmail.com***ABSTRACT**

Paul Auster was a noble postmodern writer of the contemporary American literature. One of the early readable novels of Auster was *The New York Trilogy*. It was the trilogy of *City of Glass*, *Ghosts* and *The Locked Room*. This article's purposes showed the creations of the author in resolving the genres. In the form of detective novels, Paul Auster had made new innovations beyond the framework of the genre. *The New York Trilogy* was the anti-detective, compared to tradition. The structure of the detective work was broken. The character of the detective work had many variations. The writer's purpose was not simply to "retell" the detective stories, expressed his talent in "detective analyzing"... These innovations were to convey the fresh and meaningful stories of the contemporary writer - Paul Auster.

**KEYWORDS:** detective genre, anti-detective, Paul Auster, The New York Trilogy



## INTRODUCTION

Paul Auster is one of the most remarkable writers of contemporary American literature. Anyone who has ever read a work of Paul Auster, will certainly be interested in finding the second or the third book, finding out what Paul Auster has written or the articles that criticized, interviewed him. Paul Auster has received many prestigious literary awards for his great contributions to American literature and postmodern literature of the world. Many novels have been translated and introduced in Vietnam such as *The New York Trilogy*, *The Man in the Dark*, *The Music of Chance*, *Moon Palace*. The simple, subtly textured, metaphorical and symbolic meanings have made the appeal difficult. In his career, *The New York Trilogy* played an important part. It consisted of *City of Glass*, *Ghosts* and *The Locked Room* which were composed separately, and then the writer gathered. On the whole, the readers easily understood that these were detective novels with rather typical elements and motifs. However, these were not genuine, usual detective novels. Auster borrowed this genre to show the issues of humanity, existence, and literature. In other words, *The New York Trilogy* was an anti-detective novel. The research history of Paul Auster's novels Paul Auster in general and *The New York Trilogy* in particular has been relatively experienced. Firstly, these works were composed in the last decade of the twentieth century, so it was enough time for the researchers to evaluate. Secondly, the works themselves were valuable in thought and art, so the choice of scholars is natural. Related to this specific issue, we are interested in two articles, one is by Alison Russell - *Deconstructing The New York Trilogy: Paul Auster's Anti-Detective Fiction* in Bloom's Modern Critical Views - Paul Auster, and the other is Alike Varvogli in *The World that is the Book*. Alison Russell said that "all three employ and deconstruct the conventional elements of the detective story, resulting in a recursive linguistic investigation of the nature function, and the meaning of languages. The trilogy also parodies and subverts the Romances, realistic fiction, and autobiography, thereby exploding the narrative traditions associated with these genres. By denying conventional expectations of fiction, linear movement, realistic representation, and closure - Auster's novels also deconstruct logocentrism, and the primary subject of Derrida's subversions" [4,p.498]. And Alike Varvogli commented: "It's hard to say that Auster comes to a very different conclusions, but what needs to be stressed is that, to bring these writers (Emerson, Hawthorne's daughter Rose, Walt Whitman) into his own work, he shifts the emphasis from an author-based model, away from certainty, to an investigation which is rooted in the fictive, the textual. This is not to deny the existence of an extra-textual world, and therefore to be caught in a circle of self-referentially, but rather to recognize mediation as a necessary condition for the act of perception and interpretation" [5,p.23]. These consideration are really meaningful, suggesting a lot of important ideas for us to interpret our topic. However, we know that the articles are still sketchy, they do not point out the concrete expressions of "detective" factor as well as its artistic significance. Apparently, *The New York Trilogy* is a "metaphysical detective novel", a "non-fiction and anti-detective", "a strange detective genre". Understanding this problem, our effort is to point out Paul Auster's innovations and the efficacy of them in making the attractiveness of this literary work. In other words, our research question is: Why did Paul Auster demolish detective genre in *The New York Trilogy*?

## MATERIALS AND METHODS

In order to answer the research question, we combine many methods, as important tools of the research process, in which descriptive statistics and interdisciplinary analysis method are preferred. In specific analyzes, the descriptive statistical method exerts its effect when the evidence is validated. The interdisciplinary approaching takes an advantage in illuminating the knowledge of many fields, especially the knowledge surrounding the detective stories. We choice the Paul Auster's *The New York Trilogy* as the materials of this article. It consists of *City of Glass*, *Ghosts* and *The Locked Room*. Besides, I compare to his others.

## RESULTS

T.Todorov in the *The Typology of Detective Fiction* wrote: The best detective novel is not a novel that violates the rules of the genre, but adheres to these rules. Accordingly, *The New York Trilogy* violated the rules of detective novels. It also means that the value of the work is not only in the "detective" but mainly in the "novel".

First of all, *The New York Trilogy* embodied the form of detective novels. In all three stories, the detectives (or somebody related to detective) were prominent as the main characters: Quinn in *City of Glass*; Blue in the *Ghosts*; the unknown narrator and Quinn in *The Locked Room*. They urgently watched, verified, searched for the secret, just like in the usual detective novels. The flow of the novel was the process of discovering secrets that had been hidden. The story, therefore, gave a sense of anticipation, euphoria, curiosity to



get rid of the truth quickly. In this respect, Auster has used detective novels as a powerful genre, with a fascinating, charismatic style.

Unlike other detective novels, however, Auster borrowed only the “frame” of detective novels, while the rest was his own creation. He overcame the rules of the genre to address the general issues.

In the traditional detective novel, the reader was drawn to two stories: the killer’s crime and the journey of the detective finding the murderer. Maybe among them the first story was presented first, followed by the second story, or maybe the second story coincided with the first story, the narrative story went with the action. In *The New York Trilogy*, the three stories are also three searching and finding, their structure was another version of detective story, its title from motif of detective novels. But the more the detective searched, the harder finding the object was. The detective fell into a terrible, obsessive state. He changed his environment to facilitate his work. And from that point, he was drawn into that life and could not escape from it. The detective’s hurt was mainly mental hurt. He was not an invincible type. On the contrary, he fell into a vicious circle.

In *City of Glass*, Quinn appeared as a detective novelist, with the pseudonym William Wilson. From a confused calling at night, Quinn experimented in a new world, like world of games that was deliberately arranged by another: Finding and watching a man named Peter Stillman, to prevent him from having violent behavior towards his child. At this time, Quinn has become a detective, the “Max Work”, the detective character he created in the detective novels. Quinn followed Peter-father step by step. He drew up the road map of the old man, took notes of his dull work carefully in a red book that he always carried with. By the time Peter had disappeared, Quinn accepted his life for a few months soaking by the rain and by the sun, starving by the pile of rubbish just to watch Peter’s house, in case Peter’s father reappeared. Exhaustedly, he came home, but the apartment was not belong to him. Quinn was also told that Peter-father had jumped to death, Peter-son and his wife had disappeared. Throughout the novel, the stories of the father and the son same name Peter Stillman were the protagonists, but we cared about the writer-detective Quinn, with the meaningless search.

In *Ghosts*, the happening of the story was almost like that. Gray was hired by Black to track down Black and had to send a report to White every week. But Black did not have a clue of the suspicion. He spent time writing, sometimes went out. Gray did everything to approach. In the end, Gray discovered that White was also Black. Hiring Gray to follow him, it was also the time Black perceived his existence through the existence of another.

The last was the unknown narrator in *The Locked Room*. He found his friend, Fanshawe, through his literary works and relationships. Searching so long, Fanshawe finally revealed, but it was also the moment Fanshawe liberated himself by death. The motif of this story was close to the usual detective novels: a corpse was found in a locked room. From the beginning of this novel, Fanshawe grew up to become a writer. The narrator said that in retrospect, he found that his friend’s inwardness almost seemed to demand it. But Fanshawe made no effort to publish. It was different from the other writers. Sophie regreted her husband’s characteristics. The important event was Fanshawe’s disappear. Sophie approached his best friend to ask him to determine the fate of her husband’s works. The best friend became the narrator –author of *The Locked Room*. The narrator read all the works, organized their publish, and started writing essays about them. Their success was a boon to his literary career. He was the discover of an American genius whose works brought financial security to himself and his family, Sophia and Ben... Fanshawe had his hiding places. For Fanshawe, the secrecy of the grave was a matter of self-abnegation and responsibility, of his feeling beholden to the other. In other words, it was the matter of ethics. For the narrator, the secrecy of his mailbox was the matter of his own power, enjoyment, autonomy and freedom. He thought that he must meet his friend at all costs.

All the search of the protagonists was very difficult. They had suffered enough. They had to move their familiar space to adapt to the searching object. As a result, they isolated themselves from society, becoming exiles in New York City. Their previous state of existence has disappeared, the old traces were gone, and the characters followed their new mission: learning about the others, discovering the truth. But different from the traditional detective novels, reading *The New York Trilogy*, we do not care much about the searching of the main character. The core here is that in new spaces, new functions, the characters discovered themselves, reflected the lives of others in their lives. This is a meaningful searching in the chaotic life. “The detective is one who looks, who listens, who moves through this morass of objects and events in search of thought, the idea that will pull all these things together and makes sense of them” [1,p.18]. The detectives of Paul Auster made long journeys for the meaning of existence. However, behind those grueling journeys, we still recognize Paul Auster’s parody of detectives. As a follower of others, obviously, they have not finished their duties. It means the humor of the writer for the whole genre of detective.

In Paul Auster’s novel, people who were searched also appeared differently. These were not monitored. Moreover, they were active for leading detective. They were the ones who created the search. In *Ghosts*, White hired Gray to track Black, but that was White’s conspiracy. What White needed was not the result of a following

–the weekly reports –its was the experience of feeling someone who lives in the glimpse of others. Finally, when Gray asked, “Needed me for what?”, he said “To remind me of what I was supposed to be doing. I looked up, you were there, watching me, following me, always in sight, boring into me with your eyes. You were the world to me, Blue, and I turned you into my death” [2,p.21]. In some ways, the person who being watched has become the follower of the detectives, making the searches tied together. And every search was to determine its identity in the world. The sequence of events in *The Locked Room* is almost the same. Fanshawe was missing. When his friend, the storyteller began to settle down with Sophie, Fanshawe’s wife, Fanshawe wrote a letter to him. From the beginning to the end of the book were efforts to find Fanshawe, by examining the literary works, autographs, old relationships, Fanshawe’s childhood. Finally, the short conversation of two friends makes us wonder about the relationship between the detective and the person being searched. The searchers turn out changed the roles, as detectives. Fanshawe admitted that he followed “me”, watched Sophie and the baby. Even so, there was a time when Fanshawe lived near their home, in two or three weeks, maybe a month. Sometimes, he also bumped into “me” in the street, face to face. It means the person that “I” was trying to find out was next to him, and followed him, he became the subject of the track. Compared to conventional detective novels, these are Auster’s own creations. The relationship of “search and seek” makes the characters appear in two ways: the object and the subject; the detective and the criminal. In those two roles, they have a multifaceted view of themselves, discovering the innermost parts of the material and spiritual life that sometimes are often obscured. In addition, *The New York Trilogy* is also the stories of literature. Paul Auster has demolished the limitation of the genre. The writing style, especially the language, was discussed hotly with the sharp and accurate assessment. These were also special detections: finding the nature of the language, the relationship between the signifier and the signified, the nature of the logocentrism - the feature of traditional Western thinking. This is the depth of Paul Auster’s detective novel that traditional ones have not got. The owner of these statements, was not the detective but the person was watched. This was one of the Peter Stillman’s: “Language does not adapt to new reality”. Black used to tell the stories of American writers of the last century, such as Walt Whitman, Hawthorne... Fanshawe was the famous author of many valuable works which were published and received. So, in addition to finding and verifying their external relationships, detectives must uncover another secrets: the intelligence, the knowledge, the assessment of the subject. It also means that detectives need wide and deep cultural foundation, knowledge of intertextuality in order to find the nature of the locked stories. Detective, in this case, is similar to postmodern reader.

Reading all stories, we still see the continuity, although they are different. This is reflected in “recurring characters” such as Quinn, Henry Dark, Peter Stillman, and especially the red book which stores information during tracking of the detective. The book was written down by Quinn, Gray and Fanshawe. But the strange thing was that there were nothing worth mentioning. They were extremely monotonous and boring: Stillman wandered around the city every day, picking up filthy and useless things; Black all day sat in the room for writing; it’s also the journeys of Fanshawe walking, going to the desert, sleeping outside, sometimes living with the Indian race... The value of the red book is this point. The book is not worth talking about in terms of “material reality” but in its expressive nature, the literary value. In the last story, the notebook was read by the storyteller. He read continuously, in the dark, on a quiet platform. The book was full of strokes erased and strangely arranged. But he felt that everything was very clear and fresh. It also was our feeling of *The New York Trilogy*. Auster has written with a generous and alert mind. The fictitious nature of detective novel is not unfamiliar, separated from the people who are full of anxiety, unhappiness in their life.

In the anti-detective novels, detective character is not an omniscience. His perception is also frail, vague. In the end, the detective himself have not understood the nature of the stories yet. He is only a witness, like the other characters. Non-centralized writing is a remarkable sign of postmodern literature. No one takes on the central role: Quinn, William Wilson, Max Work to Paul Auster... (*City of Glass*); from Gray, Brown, Black to White (*Ghosts*), from I to Quinn (*The Locked Room*). The novels of Paul Auster in general, the *New York Trilogy* in particular are open novels. The writer creates unfinished endings, leaving the space for the reader to reflect and think. Leaving Peter Stillman’s house, where did Quinn go? What about Gray after meeting Black? Did the narrator meet again Sophie and the children? The open endings are not the choices of traditional detective novels. This is also another point of the *New York Trilogy*.

## CONCLUSIONS AND DISCUSSION

Within the framework of the article, we have not mentioned other interesting issues such as: What is the difference in breaking detective genre between Paul Auster and other writers? How has the journey of the American detective novels ever changed? Are other novels by Paul Auster continuing this trend?... These are big issues, so we just put in this article, as a suggestion, discussion.

*The New York Trilogy* is a good example of how Paul Auster reconciles realism with experiment, and sociology with writing that has a physical dimension. It has been described as a postmodern detective story, like Umberto Eco, Bogges... before him. Paul Auster borrows some factors from detective novels and uses his own writing to explore the nature and expose the limitations of the genre, and to ask questions of a more philosophical nature concerning perception, interpretation, and the availability of truth, or meaning.

American detective novels are derived from works composed of the “fantastic” of Edgar Poe. After a long time, it has developed well, along with the detective European countries, making a modern stream of detective novels. Famous writers are Harlan Coben, Michael Connelly, Ian Rankin... who contributed to attracting the attention of the masses. With *The New York Trilogy*, Paul Auster has refreshed American detective novels. These are anti-detective novels, which the writers ridiculed their genres, blurring the line between “detective” and “literature”. Thereby, it reveals an endless search for the essence, identity and meaning of existence. The readers are fascinated by the detective and literary factors. The “truth” in *The New York Trilogy* is finding the identity. And the search for it will never end...

#### REFERENCES

- [1] Auster, Paul (1987). *City of Glass*, New York: Penguin.
- [2] Auster, Paul (1987). *Ghosts*, New York: Penguin.
- [3] Auster, Paul (1988). *The Locked Room*, New York: Penguin.
- [4] Russell, Alison (2004). *Deconstructing The New York Trilogy: Auster's Anti-Detective Fiction*, Bloom's Modern Critical Views-Paul Auster, Chelsea House Publishers.
- [5] Varvogli, Alik (2001). *The World That is the Book*, Liverpool University Press

**HEDGING IN ACADEMIC WRITING OF GRADUATE STUDENTS**

Pissamai Khunsri

*Ramkhamhaeng University, Bangkok, Thailand**Corresponding E-mail: [pissamai.k@gmail.com](mailto:pissamai.k@gmail.com) Phone no. 089-693-9008***ABSTRACT**

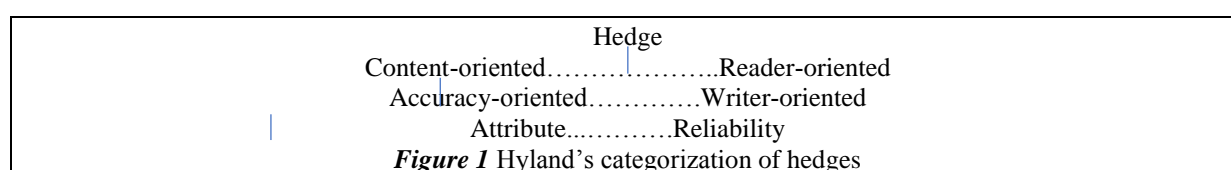
This study aimed to explore “hedges” and to analyze functions of hedges used in academic writing by graduate students whose fields of study are English, Science, and Business Administration. This study also aimed to investigate whether or not there were any significant differences between the types of functions of hedges used in academic writing in these three fields. Additionally, the study aimed to reveal the hedges used in each function. To achieve these aims, a descriptive qualitative-quantitative approach was employed. Fifteen academic writings, selected by purposive sampling from the central library of Ramkhamhaeng University. The data received were analyzed by adopting Salager-Meyer’s (1997) taxonomy of hedges and Hyland’s (1998) classification of hedges. The results indicated that hedges were employed in these three fields, most of them were found in English theses, followed by Business Administration, and the least in Science theses. Modal auxiliary verbs and approximators were two popular forms of hedges employed in English and Business Administration’s academic writing, meanwhile adverbs and modal auxiliary verbs were two popular forms employed the most in academic writing of Science. In the matter of the functions of hedges, the distribution of hedging functions in academic writing constructed by the three field of studies were the same pattern; that was reliability hedges had the highest frequency, followed by attribute hedges, writer- oriented hedges, and reader-oriented hedges, respectively. The chi-square test has proven of statistic significant difference ( $p < .05$ ) between the functions of hedges in these three fields. Also, this study revealed the hedges used in each function.

**KEYWORDS:** Hedging, Taxonomy of Hedges, Classification of Hedges, Academic Writing

## INTRODUCTION

Academic writing has been accepted as a medium of written expression that students and researchers use to share ideas and research findings with other academics and with the public. An article or a research report may contain supporting views and contradicting opinions. With awareness of the chance of receiving disagreement and strong criticism, it is necessary for writers to employ hedging in their writing, as it is important for two reasons. Firstly, “it allows claims to be made with due caution, modesty, and humility, and the status of such claims to be diplomatically negotiated when referring to the work of colleagues and competitors” (Hyland 1994, p. 241). Secondly, Salager-Meyer (1994) adds that writers use hedges to “convey (purposive) vagueness and tentativeness and to make sentences more acceptable to the reader, thus increasing the chance of ratification and reducing the risk of negation” (p. 150). With its importance, studying hedges has widened in many aspects. The aspect of forms and functions of hedges has been receiving enormous scholarly attention; Hyland (1996) studies form of hedges in scientific research, presenting hedges in relation to their grammatical categories.

Additionally, Salager-Meyer (1997) proposed a taxonomy of hedges after studying hedges in different rhetorical sections of two medical genres: case reports and research papers. She also mentioned that discussion sections are the most heavily hedged sections. Furthermore, Hyland (1998) made a further study of the functions of hedges, and proposed a pragmatic function model as shown in Figure 1.



Note: From Hyland, K. (1998). *Hedging in scientific research articles*. Amsterdam: John Benjamin.

This model was adopted by Musa (2014) in his study titled “Hedging in Academic Writing: A Pragmatic Analysis of English and Chemistry Master’s Theses in a Ghanaian University”. The results demonstrate that functions of hedges vary in English and chemistry masters’ theses. Chemistry theses employ primarily accuracy-oriented hedges and reader-oriented hedges, whereas English theses employ accuracy-oriented hedges and writer-oriented hedges. Reliability hedges have the highest frequency in both fields.

In addition, Sri Wahyuningsih and Ahmad Sofwan (2014) conducted the study titled “Hedging in Abstracts of Graduate Students of Semarang State University”. Having chosen to work on 25 abstracts of graduate students’ theses, they investigated the use of hedges in five study programs, which comprise English, mathematics, science, social management, and education management. The results reveal that the distribution of hedges varies in those five study programs. Hedges are used heavily in English theses, followed by social management and education management theses, and science and mathematics theses use the least hedging. In addition, the results show that modal auxiliaries are used most in English and education management, whereas epistemic lexical verbs are used most often in mathematics, science, and social management.

In another research work, *The Use of Hedging in Discussion Sections of Applied Linguistics Research Articles with Varied Research Methods*, conducted by Hashemi & Shirzadi (2016), the discussion sections of 150 research articles are analyzed manually to explore functions of hedges in the discussion sections of applied linguistics research articles that utilized qualitative, quantitative, and mixed method approaches. The results reveal that the distribution of hedging functions are the same pattern in research articles that utilized quantitative and mixed method; that is, reliability hedges have the highest frequency, followed by writer-oriented hedges, attribute hedges, and reader-oriented hedges, respectively.

In the research discussed above, hedges have been studied across disciplines or genres, and method approaches. Also, their findings revealed that the discussion section is the part that most frequently uses hedges. Since a high density of hedges in discussion section has been found in the above studies, this study aims to extend the knowledge about hedges and functions of hedges in academic writing according to different fields of study, which are English, Science, and Business Administration. These three fields are different in nature. The nature of the English field is prone to a writing style of explaining and expressing thoughts, ideas and emotions, whereas the field of Science prefers to inform the readers about new discoveries, and it deals with numerical data, measurement and calculation. The business field is similar to the English field, in that it is concerned with explaining, but on different topics. Writing in the business field is largely in the writing style of explaining a situation or event.

## MATERIALS AND METHODS

This study is conducted with five specific purposes: firstly, to examine academic writing to discover how hedges are performed in academic writing and to identify them, based on Salager-Meyer's taxonomy of hedges; secondly, to examine which functions of hedges are used in academic writing; thirdly, to explain how hedges perform their functions in academic writing; fourthly, to find any significant differences between the types of functions of hedges used in the discussion sections of academic writing, according to the three fields; and fifthly, to identify the forms of hedges used in each function.

Based on the purposes of the study, the following research questions have been selected:

RQ 1: What are the hedges used in academic writing?

RQ 2: What are the functions of hedges used in academic writing?

RQ 3: How do the functions of hedges perform in academic writing?

RQ 4: Is there any significant difference between the functions of hedges used in the discussion sections of written works in the three academic fields?

RQ 5: What are forms of hedges used in each function?

Firstly, fifteen discussion sections from theses written during 2012-2016 are the corpus of the study, five for each of field of study. To ensure that each academic writing has an equal and independent chance of being selected, the writings were selected randomly from the book shelf in the central library of Ramkhamhaeng University. All the selected writings were then examined and only those with a purposive discussion section were selected.

Secondly, the words that were consistent with the taxonomy and epistemic hedging items were marked, and then the propositions containing these words were collected to the table set for a native reader to verify. A native reader was given the table to identify whether the marked items are hedges; if the answer was "yes", the native reader would ask what type of function the marked items served in the proposition. In this stage, Hyland's pragmatic functions of hedges were employed as the model for categorizing the type of function of the hedge. With this model, the native speaker was provided four main functions: attribute hedges, reliability hedges, writer-oriented hedges, and reader-oriented hedges.

Thirdly, the frequency of each type of function was counted and calculated by way of descriptive statistics in order to find any difference between the types of functions used in academic writing in the three fields. Also, the chi-square test was employed to prove the significant difference.

Finally, the forms of hedges that performed each type of function were observed.

## RESULTS

Hedge words were analyzed and classified into seven forms, and the distribution of forms of hedges, as shown in Table 1.

**Table 1** Frequency of Forms of Hedges in English, Science, and Business Administration Academic Writing

Functions of Hedges English Science Business administration	Field of Study			
	Frequency %	Frequency %	Frequency %	Frequency %
Modal auxiliary verbs	80 35.40	36 20.45	77	38.50
Modal lexical verbs	25 11.06	5 14.20	13.	00
Adjectival, adverbial and nominal modal phrases	30 13.27	46 26.14	31	15.50
Approximators	74 32.74	35 19.89	46	23.00
Introductory phrases	3 1.33	19 10.80	4	2.00
"If" clauses	3 1.33	0 0	3	1.50
Compound hedges	11 4.87	15 8.52	13	6.50
<b>Total</b>	<b>226 100.00</b>	<b>176 100.00</b>	<b>200</b>	<b>100.00</b>

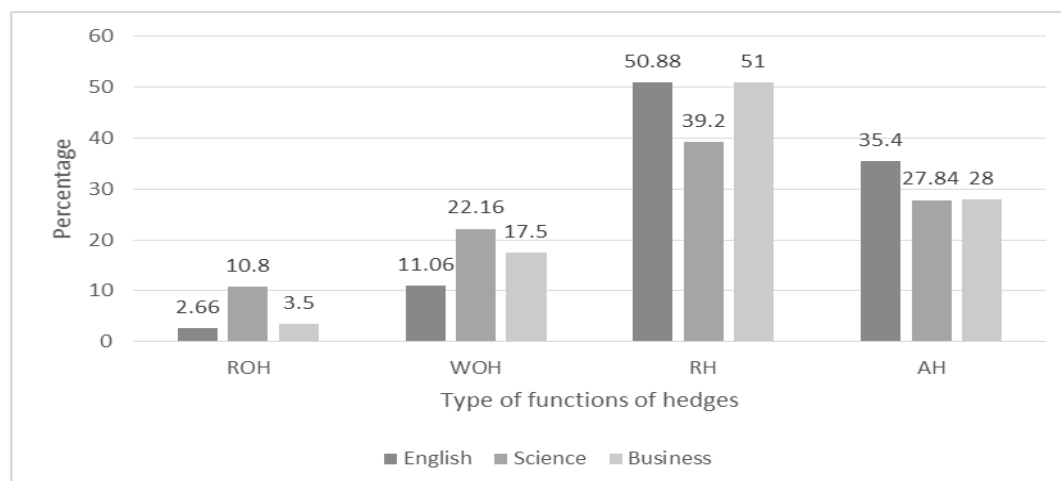
The findings revealed that a variety of hedges were used in the discussion sections of Master theses constructed in three fields of studies: English, Science, and Business Administration. Hedges were used most in English theses, followed by Business Administration, and hedges were used the least in Science theses. Also, the findings showed that the use of hedging forms in English and Business Administration theses were similar; the three most frequently used hedging forms were modal auxiliary verbs, approximators, and adverbs. Meanwhile, the three most frequently used hedging forms applied in Science theses were adverbs, modal



auxiliary verbs, and approximators. In addition, the present study found that hedges conveyed the writer's uncertainty and indicated that the writers inserted the personal idea. Additionally, hedges could be words or phrases, such as "many", "can", and "it is said that". Hedges found in this present study could be realized through seven forms, according to Salager-Meyer (1997).

In the matter of the functions of hedges, there were four type of functions of hedges as outlined by Hyland (1998) found in the corpus of the study: reader-oriented hedges, writer-oriented hedges, reliability hedges, and attribute hedges. The preferences of the four functions of hedges in the three fields are shown in Figure 2.

**Figure 2** *Frequency of Functions of Hedges in English, Science, and Business Administration Academic Writing*



Note: ROH = Reader-oriented hedges; WOH = Writer-oriented hedges; RH = Reliability hedges; AH = Accuracy hedges

In Figure 2, beginning with the various distributions of hedges, it is observed that the first functional type, which is ROH, is employed most in Science (19 times, or 10.80%), followed by Business Administration (7 times, or 3.5%), and is employed the least in English (6 times, or 2.66%). The second type, which is WOH, is employed the most in Science (39 times, or 22.16%), but used least in English (25 times, or 11.06%). WOH is employed in Business Administration 35 times (17.5%). The third type, which is RH, is employed most in Business Administration (102 times, or 51%), but used the least in Science (69 times, or 39.20%). Notably, the percentage of RH in English is slightly different from that of Business Administration. The last function is AH; it is employed the most in English (80 times, 35.4%), and employed the least in Science (49 times, or 27.84%). Regarding the percentage of AH in Science and Business Administration, it is observed to be slightly different. With regard to the four types of functions of hedges, RH is employed most, and at a high frequency. The use of ROH is obviously different from that of other categories, especially RH.

According to the descriptive statistical analyses above, it suggests that, particularly with regard to frequency of occurrence, there are some differences between the categories in the three fields of study. In order to find the answer, a more formal statistical analysis, called a chi-square test, was employed, with the results in Table 2.

**Table 2** *Chi-square Test for the Frequencies of Functional Categories of Hedging*

Value	df	Asymptotic	Significance (2-sided)
Pearson Chi-Square	27.981 <sup>a</sup>	6	.000
Likelihood Ratio	26.797	6	.000
Linear-by-Linear Association	4.226	1	.040
N of Valid Cases	602		



The chi-square test discovers whether or not a statistically significant relationship exists between two variables. It found a statistically significant relationship between four functions of hedges and three fields of study. The results show that the observed differences between the frequencies of hedges in the four categories is significant:  $\chi^2 = 27.981$ ,  $df = 6$ ,  $p < .05$ .

Hedges are employed 602 times in the seven forms and four main functions. They are used in each function as shown in Table 3.

**Table 3** *Forms of Hedges Performed in Each Function of Hedges*

Functions	Forms of Hedges	Example of Hedge Words
Reader-oriented hedges	Introductory phrases	We know, I suggest, I hypothesize, We can conclude
	"If" clauses	If the answer is yes, then..., If the requirement is met
Writer-oriented hedges	Modal lexical verbs	suggest, argue, propose, indicate, imply, assume, know
	Compound hedges	It can be conclude that, It can be seen that
Reliability hedges	Modal auxiliary verbs	can (not), could, should (not), may (not), might, would
	Modal lexical verbs	seem, appear, tend
	Adverbs	apparently, clearly, significantly, largely, only, likely
	Adjective/ Noun	obvious, opportunity
	Compound hedges	It should be only, It may be only
Attribute hedges	Approximators	some (of), most (of), normally, occasionally, sometimes
	Adjectives	significant, common, major, regular, clear

## CONCLUSIONS AND DISCUSSION

It can be concluded here that hedges were used across academic writing in the three fields of study examined in this study. They were used in seven forms, which were modal auxiliary verbs, modal lexical verbs, adjectival, adverbial, and nominal modal phrases, approximators, introductory phrases, "if" clauses, and compound hedges. Furthermore, they were used for four purposes, which were reader-oriented hedges (ROH), writer-oriented hedges (WOH), reliability hedges (RH), and attribute hedges (AH). ROH was used for making a relationship with the readers; WOH was used for guarding against the negative impacts on writers if their statements are wrong; RH was used for marking the writers' uncertainty; and AH was used for the writers' description. The writers' preferences for forms and functions in these three fields were different. Notably, RH was employed most in three fields of study, which could mean that the writers in all three fields paid attention to precision. The result of chi-square test proved that there were significant similarities between the types of functions of hedges used in the three fields of study. With regard to the relation of forms and functions of hedges, some forms of hedges were used in two functions; for example, adjectives could function as attribute hedges and reliability hedges. Meanwhile, some forms of hedges performed one function; for instance, "if" clauses performed as reader-oriented hedges.

The findings of this study, as well as Wahyuningsih & Sofwan's (2014) findings, reveal that a variety of hedges are used across different field of study. However, there are some differences when looking at the forms of hedges used in Science theses, where adverbs are the most popular form found in this study, while the modal lexical verbs are the most popular form found in Wahyuningsih & Sofwan's research. This difference may be a result of studying hedges in different rhetorical sections; this study examines hedges in the discussion section, while Wahyuningsih & Sofwan consider hedges in abstracts. The difference could be explained by Salager-Meyer (1994), in that the different frequency is due to the choice of which hedges to use, which is associated with their communicative purpose. Additionally, the findings of this study show that hedges are used heavily in English theses, followed by Business Administration theses, and Science theses, which employ them the least. Similar to the findings of Wahyuningsih & Sofwan, the possible explanation for the different distributions between English and Science might be a result of the nature of each study program. English theses prefer a style of description that favors hedging more than the other two fields, while Science theses are based mainly on numerical data. Also, the writers' familiarity with using English could result in these different distributions, since the writers whose field of study is English may be more familiar with hedges than writers whose field of study is Science.

In the matter of functions of hedges, the findings of the present study are similar to findings by Musa (2014), and by Hashemi and Shirzadi (2016), which is that RH have the highest frequency in the three fields. However, some points in the findings of this study differ from Musa's work. Musa reported that writer of English and Science preferred RH and WOH, but this study revealed that writers of English theses as well as Science preferred RH and AH. These different findings are a result of using different sources. This study conducted hedges in only

discussion section, but Musa studied hedges in every section of theses. Also, the difference could be explained by the notion that, since different sections have different purposes, the use of hedges would differ, as well, according to Salager-Meyer (1994), as mentioned earlier.

### LIMITATIONS AND IMPLICATIONS OF THE STUDY

This study focuses on examining hedges, the functions of hedges, and explaining how hedges perform their function in academic writing. The corpora investigated in this study were only from the discussion part of the dissertations and theses written by university graduate students based on three different fields of study – English, Science, and Business Administration – during the years 2012-2016. The students are non-native English writers. This study employs Salager-Meyer's taxonomy of hedges for examining forms of hedges, and the functions of hedges are determined with regard to Hyland's function model. Only one native English speaker was used to verify the forms and functions of hedges and hedging words for this study. The research findings suggest that, generally, a variety of hedges are used across different fields of study. The results point to an important pedagogical implication in teaching English academic writing for graduate students. The findings of the present study show that linguistic knowledge plays an important role in helping writers to be able to express their views properly with hedging devices. In order to reinforce graduate students' understanding of hedging functions and strategies, they could be given tasks or exercises to identify the kinds of hedges employed in sample material and encourage them to exploit hedging devices appropriately. The instructors should encourage students to produce their own academic writing with appropriate use of hedges. In addition, the learners should offer feedback on one another's work. Such class activities ensure acquisition of pragmatic consequences and understanding of the importance of hedging devices.

### SIGNIFICANCE OF THE STUDY

The results of this study may provide guidance for instructors who design English writing courses for graduate students, so that they can make students aware of various hedging techniques employed in their particular field of study in order to suitably improve their writing skills, especially in the part of discussion section in academic writing. Additionally, the study aims to provide information and ideas about hedges for other scholars whose research involves hedges.

### RECOMMENDATIONS FOR FUTURE RESEARCH

The following recommendations are offered for improving other studies in the same field of this study, and for conducting future research.

Firstly, apart from Salager-Meyer's (1997) taxonomy of hedges, other taxonomies should be studied. In the process of identifying hedges, the researcher found that some propositions signaled hedges, but they did not fit any forms of Salager-Meyer's taxonomy. Therefore, using another taxonomy or combining some may result in a more comprehensive analysis of hedging in propositions.

Secondly, two native readers in language field to verify the forms and functions of hedging words as data of the study would be recommended; with two, they could support and validate the research findings more than one reader.

Thirdly, interviewing the writers about their reasons for hedging would make the study more reliable and more qualitative.

Fourthly, providing the entire document for hedging sources for the native language readers instead of putting only sentences into a table would save time in collecting the propositions, and the readers may be able to determine forms and functions more easily from the context.

### REFERENCES

- Hashemi, M. R., & Shirzadi, D. (2016). The use of hedging in discussion sections of applied linguistics research articles with varied research methods. *The Journal of Teaching Language Skills*, 35, 31-56.
- Hyland, K. (1994). Hedging in academic writing and EAP textbooks. *English for Specific Purposes*, 13, 239-256.

- Hyland, K. (1996). Talking to the academy: Forms of hedging in science research articles. *Written Communication*, 13, 251-281.
- Hyland, K. (1998). *Hedging in scientific research articles*. Amsterdam: John Benjamins.
- Musa, A. (2014). Hedging in academic writing: A pragmatic analysis of English and chemistry masters' theses in a Ghanaian University. *English for Scientific Purposes*, 42 (15), 1-26.
- Salager-Meyer, F. (1994). Hedges and textual communicative function in medical English written discourse. *English for Specific Purposes*, 13, 149-171.
- Salager-Meyer, F. (1997). I think that perhaps you should: A study of hedges in written scientific discourse. In T. Miller (Ed.), *Functional approaches to written text: Classroom applications* (pp. 105-118), Washington, D.C.: English Language Programs – United States Information Agency.
- Wahyuningsih, S., & Sofwan, A. (2014). Hedges in thesis abstracts of graduate students of Semarang state university. *English Education Journal*, 4, 75-81.

**THE INFLUENCE OF DEMOGRAPHIC FACTORS ON ENTREPRENEURIAL INTENTION OF THE  
FOURTH YEAR STUDENTS FACULTY OF MANGEMENT SCIENCE,  
SAKON NAKHON RAJABHAT UNIVERSITY IN  
AN ACADEMIC YEAR OF 2017**

Chaowarad Turongchang<sup>1,\*</sup>, Pathpoom Sansak<sup>2</sup>, Chadarporn Nabchid<sup>3</sup>,  
Jitti Kittilertpaisan<sup>4</sup>, and Kallaya Kittilertpaisan<sup>5</sup>

<sup>1</sup>*Business Economic Program, Faculty of Management Science, Sakon Nakhon Rajabhat University*

<sup>2,3</sup>*Business Administration Program, Faculty of Management Science, Sakon Nakhon Rajabhat University*

<sup>4</sup>*Industrial Technology Program, Faculty of Industrial Technology, Sakon Nakhon Rajabhat University*

<sup>5,\*</sup>*Development Administration Program, Faculty of Management Science, Sakon Nakhon Rajabhat University*

*Sakon Nakhon Rajabhat University, Nitayo Rd. Muang Sakon Nakhon, Thailand, 47000*

*\* Author for correspondence, e-mail : [jitti1998@hotmail.com](mailto:jitti1998@hotmail.com) Tel 0864163651 Fax 042970028*

**ABSTRACT**

The main purpose of the study was to evaluate the influence of demographic factors on entrepreneurial intention of the fourth year student of faculty of management science, Sakon Nakhon Rajabhat University. The sample consisted of 250 students from each field of study of faculty of management science, Sakon Nakhon Rajabhat University. The result shown that overall mean of students' entrepreneurial intention was in high level (Mean=3.78). Furthermore, there was significantly different effect between demographic factors and entrepreneurial intentions.

**KEYWORDS:** Demographic Factors, Entrepreneurial Intention, Sakon Nakhon Rajabhat University

## INTRODUCTION

When most students graduated from Thai universities, they had two important choices in their career seeking whether working as salaried worker in public or private sectors or through involving in their own businesses. Especially, Thai government supported all Thai universities to transplant and develop students to be entrepreneurs and take them off to the world of business. Also Thai government promoted small and medium-sized enterprises (SMEs) and startups to participate in economy. It had included the promotion of SMEs and startups in the national agenda. The main reason was that SMEs, and startups can be the best of employment source in Thai labor market. About 80% of all employment was done by SMEs. It can be concluded that benefit of entrepreneurs had contributed to job creation, flexibility and competitiveness, innovativeness and job satisfaction [1]. However, entrepreneurs (SMEs and startups) accept risks that come together with owning a business. Becoming an entrepreneur means one person chooses to be self-employed and starts, organizes, manages and assumes responsibility for a business, offers to face personal challenges.

In addition, Drucker (1985) and Gorman, Hanlon, and King (1997) recognized that entrepreneurs had been as the “engine of growth” that drives an economy of the nations. [4] concluded there is relationship between entrepreneurship and economic growth. Entrepreneurship was being recognized by public policy makers and they support entrepreneurship education to promote entrepreneurial activity [5].

According to [6], intention is an element which dominates the motivation factors in influencing individual behavior. The policy of faculty of management science, Sakon Nakhon Rajabhat University, tries to encourage most students in every field of study to indulge in the entrepreneurial field because it offers potential reward and personal satisfaction.

Therefore, it is important to measure the students’ entrepreneurial intention levels because through individual’s intention we can detect whether an action can be implemented or not. The objective of the study is to evaluate the influence demographic factors on entrepreneurial intention of the fourth year students of faculty of management science, Sakon Nakhon Rajabhat University.

## OBJECTIVES

The objective of the study is trying to to evaluate the influence demographic factors on entrepreneurial intention of the fourth year students of faculty of management science, Sakon Nakhon Rajabhat University.

## LITERATURE REVIEWS

### Entrepreneurship

[7] summarized the definition of entrepreneurship in that it is the process of creating new valuable business, which process some valuable things will be created from nothing by contributing time, work effort, money and risk to get intrinsic rewards and extrinsic rewards and by devoting the necessary time and effort. [8] said that entrepreneurs related with internal factors and external factors. Meanwhile, [9] defined entrepreneurship as a way of thinking that emphasizes opportunities over threats or a process of opportunity identification. This process is an intentional process. The intentional process is the cognitive state immediately prior to performing behavior [10]. Consequently, the entrepreneurial intention has been considered as the key element to understand the new-firm creation process [11].

### Entrepreneurial Intention (EI)

Entrepreneurial intention is defined as the growing conscious state of mind that a person desires to start a new business or create new core value in existing organization [12]. People do their business intentionally and how they become entrepreneurs is a result of decision making.

Entrepreneurial intention has proven to be used as a dependent variable in many studies [13], [14]. Researchers have confirmed that entrepreneurial intention effectively predicts entrepreneurial behavior, and attitudes toward entrepreneurship, in turn, predict entrepreneurial intentions [15].

Many studies in entrepreneurship focused on students’ intentions to become entrepreneurs. Therefore, educational system plays an important role in providing a variety of activities and courses for entrepreneur. Further, the study of [16] revealed that there was a positive relation between entrepreneurial education and entrepreneurial intention. This study finds a new approach to gain a comprehensive picture of entrepreneurship intention.

### CONCEPTUAL FRAMEWORK

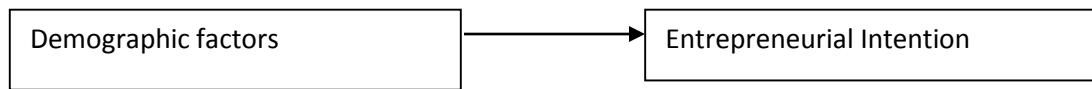


Figure 1: Conceptual Framework of This Study

Figure 1 presents the influence of demographic factors on entrepreneurship intention. The demographic factors are independent variable and entrepreneurial intention as dependent variable. The entrepreneurial intentions Questionnaire (EIQ) was based on the study of [17] with additional demographic factors. The demographic factors were gender, field of study and parents run business.

### RESEARCH DESIGN

This research is a descriptive study and a non-experimental research. The study uses the questionnaire as a survey instrument for collection of data and information. The data was collected from the fourth year student of faculty of management science, Sakon Nakhon Rajabhat University with a totally of 671 students in academic year of 2017. The sample consisted of 250 students by using the formula of [18] with a stratified random sampling shown in table 1. Respondents filled the questionnaire selected from difference field of study. The questionnaire allocation was distributed by field of study, including general management, marketing, banking and finance, accounting, computer business, business economics, public administration, communication and logistics. The survey aims at the individual level of the faculty of management science as the unit of analysis. A Number of students in the fourth year of the faculty of management science, Sakon Nakhon Rajabhat University with academic year of 2017 were shown in table 1.

Table 1: A Number of students in the 4<sup>th</sup> year of the faculty of management science, Sakon Nakhon Rajabhat University with academic year of 2017

Field of study	Number of students	Number of respondents
General management	149	56
Marketing	29	11
Banking and finance	44	16
Accounting	107	40
Computer business	62	23
Business economics	22	8
Public administration	182	68
Communication	31	11
Logistics	45	17
<b>Total</b>	<b>671</b>	<b>250</b>

From table 1, 250 respondents filled a questionnaire and returned to authors with a calculated responding rate of 100 percent. According to [19], the effective response rate for a mail-out survey without an appropriate follow-up procedure should be more than 20 percent, a range that is considered acceptable for data analysis. The questionnaire was designed to collect the response of students regarding their demographic information and entrepreneurial intention. The entrepreneurial intentions were applied from [20] with five items to determine the level of entrepreneurial intention. Likert-scale was used to measure the entrepreneurial intention elements, which used the anchors of 1 (Strongly disagree) to 5 (Strongly agree). The first section asked the respondents' demographic data. The next section asked on the respondents' views on the entrepreneurial intention. Reliability analysis was conducted to check stability and consistency of measurement and the Cronbach's alpha were calculated. The reliability analysis of entrepreneurial intention is 0.85, which is acceptable as the minimum level of 0.6 for further analysis [21]. The Cronbach's alpha was shown in table 2.

Table 2: The Cronbach's Alfa

Items	Cronbach Alfa
After graduating, I am already to be an entrepreneur.	.78
My professional goal is to be an entrepreneur.	.82
I will make every effort to start and run my own business.	.80
I have very seriously thought of starting a business in the future.	.86
No matter the environment factors, I continued to have an entrepreneurial intention.	.90
Total	.85

The influences of demographic factors on the entrepreneurial intention were compared. Three demographic factors were gender, field of study, and parents run business. T-test was used to test the effect of factors that consist only two different categories: gender and parents run business (yes/no). In ANOVA, the test of homogeneity of variances (Levene's test) of different groups was performed and the results showed that the assumption of homogeneity of variances of different groups was achieved (this assumption was not rejected at a level of 0.05).

## RESULTS

The instrument was then distributed to the respondents which were determined earlier of which 250 respondents were chosen in the study. As shown in table 3, the respondents of the study consist of 58 (23.2 %) male and 192 (76.8 %) female. There were 10 fields of study; however, most respondents came from 2 major field of study, which were general management and public administration. In addition, only 17.6 % of respondents had parents run business, while only 82.4 % of the respondents did not.

Table 3: Demographic characteristics of the population

Attribute	Demographic characteristics	n	(%)
Gender	Male	58	23.2
	Female	192	76.8
Field of study	General management	54	21.6
	Marketing	16	6.4
	Banking and finance	18	7.2
	Accounting	11	4.4
	Computer business	11	4.4
	Business economics	34	13.6
	Public administration	68	27.2
	Communication	15	6.0
	Logistics	23	9.2
Parents run business	Yes	44	17.6
	No	206	82.4

Next, the authors evaluated the level of entrepreneurial intending of students in each field of study. The findings of the study including the mean and the standard deviation of entrepreneurial intention variables are shown as below:

Table 4: Entrepreneurial intention of students in each field of study

Field of study	Mean	S.D.	Level
General management	3.74	.58	High
Marketing	3.91	.60	High
Banking and finance	3.35	.75	High
Accounting	3.69	.69	High
Computer business	3.71	.65	High
Business economics	3.81	.80	High
Public administration	3.85	.70	High
Communication arts	4.35	.22	High
Logistics	4.12	.58	High
Total	3.84	.51	High



In table 4, the mean score of students' entrepreneurial intention revealed that students from communication arts had the highest mean of entrepreneurial intention, while students from the field of banking and finance had the lowest mean of entrepreneurial intention. However, overall student of faculty of management science, Sakon Nakhon Rajabhat University was in high level of entrepreneurial intention. This result was in line with the study of [22].

Further, authors evaluated each item of entrepreneurial intention question as shown in table 5.

Table 5: Mean and Standard Deviation of Students Entrepreneurial Intention

Items	Mean	S.D.	Level
After graduating, I am already to be an entrepreneur.	4.06	.88	High
My professional goal is to be an entrepreneur.	3.82	.93	High
I will make every effort to start and run my own business.	3.80	.87	High
I have very seriously thought of starting a business in the future.	3.53	.82	High
No matter the environment factors, I continued to have an entrepreneurial intention.	3.68	.95	High
Total	3.78	.68	High

In table 5, the mean and standard deviation are high which means that the entrepreneurial intention is moderately high. For statistical analysis, to assess the impacts of gender on the students' entrepreneurial intentions, we conducted a t-test for gender. The results showed that gender had not impacted on entrepreneurial intentions. This finding shown in table 6 and is in line with the study of [23].

Table 6: Comparison between gender and Entrepreneurial intentions

Demographic characteristics	Gender	Mean	S.D.	t	Sig.
Entrepreneurial intentions	Male	3.86	.62	1.08	.28
	Female	3.75	.69		

Next, to evaluate of the impacts of parents run business on the students' entrepreneurial intentions, a t-test for parents run business will be conducted. The results showed that gender had not impacted on entrepreneurial intentions. This finding shown in table 7 and is in line with the study of [24].

Table 7: Comparison between gender and Entrepreneurial intentions

Demographic characteristics	Gender	Mean	S.D.	t	Sig.
Parents run business	Yes	3.85	.70	.775	.44
	No	3.76	.67		

Finally, One-way analysis of variance (ANOVA) would be conducted to test mean difference in field of study with students' entrepreneurial intentions. In table 8, the results showed that there was significant effect of field of study on entrepreneurial intentions ( $F=3.194$ , Sig. =.002). This result was in line with the study of [25]. Students from communication arts had the highest entrepreneurial intention and the lowest entrepreneurial intention was students from banking and finance.

Table 8: Comparison between field of study field of study and Entrepreneurial intentions

Source	SS	df	MS	F	Sig.
Between Groups	10.860	8	1.357	3.194	.002*
Within Groups	102.423	242	.425		
Total	113.283	250			

## CONCLUSION AND DISCUSSION

This study showed that demographic characteristics had an effect on entrepreneurial intention of the fourth year students of faculty of management science, Sakon Nakhon Rajabhat University. The overall mean score of entrepreneurial intention was in high level. Therefore, policy of faculty of management science should be involved in an early stage in the education in order to make them more aware of entrepreneurship as a career alternative.

For research finding, entrepreneurial intention was reported as high level which means that most students are interested to become entrepreneurs. This finding is consistent with [25] and [26] in that business students have a stronger inclination towards entrepreneurship, which can be seen a stronger intent for students enrolled in entrepreneurship programs. However, the uneasiness of students to become entrepreneurs could partly be attributed to the syllabus in used which was not effective in imparting entrepreneurial knowledge, skills and attributes. For future research it should focus on what factors help in realizing the intention to do business.

## ACKNOWLEDGEMENTS

This research was supported by a research fund of faculty of management science. We thank our colleagues in my faculty who provided insight and expertise that greatly assisted the research, although they may not agree with all of the interpretations/conclusions of this paper. Also we are immensely grateful to Asst. Nuntakan Kirdmalai, instructor of marketing program and Methvee Yeemin, instructor of general management program.

## REFERENCES

- [1] EIM (2011). Trendstudie MKB en Ondernemerschap; Ontwikkelingen, vooruitblik en beleids signalen (in Dutch), EIM Report A201103, Zoetermeer: EIM.
- [2] Drucker, P. (1985). Innovation and entrepreneurship. London: Heinemann.
- [3] Gorman, G., Hanlon, D., and King, W. (1997). Some research perspectives on entrepreneurship education, enterprise education and education for small business management: A ten year literature review. *International small business journal*, 15 (3), pp. 59-77.
- [4] Hebert, R., and Link, A. (1989). In Search of the Meaning of Entrepreneurship. *Small Business Economics*, 1, 39-49.
- [5] Linan, F. (2010). *Intention-based models of entrepreneurship education*. Dept. of Applied Economics (Economía Aplicada I), University of Seville, Av. Ramón y Cajal, 1, E-41018 Seville (Spain).
- [6] Ajzen, I. (1991). *The theory of planned behavior*, Organizational Behavior and Human Decision Processes, 50 (2), pp. 179-211.
- [7] Hisrich, R.D., and Peters, M.P. (2002). *Entrepreneurship*. USA: Irwin/McGraw-Hill
- [8] Vuong, Q. H. and Dung, T. T. (2009). The cultural dimensions of the Vietnamese private entrepreneurship. *The IUP Journal of Entrepreneurship and Development*, 6 (3), pp. 54-78.
- [9] Krueger, N.F. (2000). The cognitive infrastructure of opportunity emergence. *Entrepreneurship Theory & Practice*, 24 (3), pp. (5-23).
- [10] Krueger, N.F. (2003). The cognitive psychology of entrepreneurship, in: Handbook of entrepreneurship research, an interdisciplinary survey and introduction, Zoltan J.Acs (ed), School Of Public Policy, Georgia Mason University, pp. (105-140), Springer, Virginia.
- [11] Bird, B. (1988). Implementing entrepreneurial ideas: The case of intentions. *Academy of Management Review*, 13 (3), pp. 442-454.

- [12] Remeikiene, R. D. and Startiene, G. (2013). Explaining entrepreneurial intention of university students: The role of entrepreneurial education. *International Proceedings of the Management, Knowledge and Learning International Conference 2013*. [Online]. pp. 299-307. Available: <http://www.toknowpress.net/ISBN/978-961-6914-02-4/papers/ML13-258.pdf>
- [13] Autio, E., Keeley, R., Klofsten, M., & Ulfstedt, T. (1997). Entrepreneurial Intent among Students: Testing and Intent Model in Asia, Scandinavia, and USA. *Frontiers of Entrepreneurship research*. Available at <http://www.babson.edu/entrep/fer/papers97/autio/aut1.htm>.
- [14] Souitaris, V., Zerbinati, S., and Al-Laham, A. (2007). Do Entrepreneurship Programs Raise Entrepreneurial Intention of Science and Engineering students? The Effect of Learning, Inspiration and Resources. *Journal of Business Venturing*, 22, 566-591.
- [15] Ajzen, I. (2005). *Attitudes, Personality and Behavior*. Maidenhead, England ; New York: Open University Press.
- [16] Costa, T., Superior, E., and Empresariais, D. C. (2016). Student's entrepreneurial intention: ESCE and FEA comparison. *XXVI Jornadas Luso-Espanholas de Gestão Científica*.
- [17] Liñán, F., and Chen, Y. (2009). Development and Cross-Cultural Application of a Specific Instrument to Measure Entrepreneurial Intentions. *Entrepreneurship Theory and Practice*, 33 (3), pp. 593-617.
- [18] Yamane, T. (1973). *Statistics: An Introductory Analysis*. 3<sup>rd</sup> Ed. New York: Harper and Row Publications.
- [19] Aaker, D. A., V. Kumar and G. S. Day. 2001. *Marketing Research*. New York: John Wiley and Sons.
- [20] Nieuwenhuizen, C. and Swanepoel, E. (2015). Comparison of the entrepreneurial intent of master's business students in developing countries: South Africa and Poland. *Acta Commercii*, 15 (1).
- [21] Nunnally, J. C. (1978). *Psychometric Theory*. New York: McGraw-Hill.
- [22] Zain, Z. M., Akram, A. M., and Ghani, E. K. (2010). Entrepreneurship Intentions Among Malaysian Business Students. *Canadian Social Science*, 6 (3), pp. 34-44.
- [23] Indarti, N., and Langenberg, M. (2004). Factors affecting business success among SMEs: Empirical evidences from Indonesia. *Paper presented at the second biannual European Summer University*.
- [24] Thongpoon, S., Thongpoon, K., and Thangrattanasuwan, P. (2015). Entrepreneurial Intention among Undergraduate Students in Songkhla, Thailand. *The 7th International Conference on Humanities and Social Sciences* 6 June 2015 BP Simila Beach Hotel and Resort, Songkhla.
- [25] Karr, A.R. (1985). Labour letter. *The Wall Street Journal*, November 1.
- [26] Hart, M and Harrison, R. (1992). Encouraging enterprise in Northern Ireland: Constraints and opportunities. *Irish Business and Administrative Research*, (13), pp 104-116.

**CONCEPT AND LOCAL PLANT NAMES, AND CONVERSION, NON PHOO THONG, SUB-VILLAGE, THA CHANGKHLONG VILLAGE, PHA-KHAW DISTRICT, LOEI PROVINCE**

Krissana Yodmongkhon (Miss)

*Department of Bachelor Degree of English, Faculty of humanities and Social Sciences*

*Loei Rajabhat University, Thailand*

*Fax 042835230 Tel.0950439146*

*Corresponding email : Yodkrit.y@gmail.com*

**ABSTRACT**

This fundamental research had two objectives: 1) to study the relationship between concept of the callers and local plant names, and the plant status at Ban None Phuthong Sub-Village, Tha Chang-khlong Village, Phakhao District, Loei Province. 2) to study the conservation of Thai folk plant by the community members. The populations were the members of Tha Chang-Khlong Village and the target group was the local members of Ban None Phuthong Sub-Village. Convenient sampling was used for collecting the data from the informants who were at home by the time of field work. The instruments comprised of the interview objectives, the record forms and the cameras. According to the qualitative data, they were analyzed by content method. The research results:

The relationship between concept of the callers and Thai folk plant could be divided into 4 types. They were: 1) physical appearances, 2) Thai folk plant applications, 3) traditional superstition on plant, and 4) was unable to investigate the reasons. Another point was the plant status. It was found that the plants were received positive reaction and recognitions.

For local plant conservation, the community has conserved them along with their way of life, that is, the favorite ones which were decreased would usually be replanted. In cases of decreasing of the other ones, the new plants might be replaced.

**KEYWORDS:** Folk plants at Tha-chang khlong, Loei plant conservation human concept and folk plant name

## INTRODUCTION

In terms of Linguistics, no any single utterance is used without user's thought or concept in his mind. One word of any language contains both disclosed meaning and some of inside ones. Local plants' names are the representatives of these concepts which might be in the past or in the present date. These names may reveal some history, thought, culture, social events, etc. The assumption was explored at None PhuThong Sub-Village, Tha Chang-khlong Village, Pha Kha-khao District, Loai Province.

None PhuThong Sub-Village, is an aged sub-village almost 200 years. This community is closed to the national conservation forest (code: Loei 14). This forest is called Mediterranean characteristics (ป่าดิบ) which has various types of plants. In term of historical aspect, there has been cart tracks appeared. It is believed that they were done by the buffalo-trading people. Deep into the forest, there is an old medium-sized cave which the entrance has been closed by some big stones. The people in this area believe that the cave was conducted by the former buffalo-trading groups as the rest area. Some members of None Puthong sub-village bring their lives by consuming and selling forest-plant products at the market. Because of some historical tracks left, it is assumed that some plants' names might be able to investigate, too.

The Thai folk plants' names can be the concrete evidences of the thought of the callers: concept. Concept is interpreted to be "Ma-no that" in Thai. "Ma-no" means "thought or mind" and "that" is interpreted to be "visual being" (Dictionary of Royal Scholar Council 1999: p. 833 for "Ma-no", p 521 for "That"). A study on a relationship between human concept and folk plant names is aimed at what and why the people in the past thought of Thai folk plant. The research was based on Linguistics, culture and social sciences. It is believed that language is used to transfer the user's thought to communicate with the others.

As mentioned before, language usually contained cultural context, language dialect, belief history of place, social attitude, and others. An example is "ตื่นตื่นๆ" [ต๑๑ว ต๑๑ว ψY๑π]. The data from aged and native senior citizen, this plant could be interpreted as "being sleeping and awaken by some thing. So it shrinks itself." Another reason of the plant name with highly possibly is by the one from linguistic theory. Normally, E-sarn people has the consonant sound [ɲ] which is corresponds to [ψ] in central Tai dialect. The word [ต๑๑ว] in E-sarn means to be panicked and then shrinks its body. This manner is pronounced as [ɲY๑π]. Some of the new generation of E-sarn may be unfamiliar with this name but with [ต๑๑ว μαI-ψα] ρα๑π instead.

Thai folk plants, therefore, could be considered as E-sarn traditional reflections. It is a key to disclose some information in the past, such as history of places, the past activities and the past concept of people toward things. This research put the emphasis on the relationship between the concept and the folk plant names. The relationship between these two things should be studied immediately before the traces would be disappeared. The original Thai folk plants might be kept as the local plants but with the new names from other interferences. This issues could lead to the loss of some history, culture, and local wisdom issues. Rattana Jantao (2016) mentioned to what Cristal (200) and Suwilai Premssirat (2006) said:

*A loss of a single word leads to a loss of local wisdom, cultural identity of community. These causes might come from the new E-sarn generation do not learn the E-sarn culture as well as their negative attitude to their native culture. Some standard Thai words might be replaced or mixed with E-sarn words. This style of language usage was called as Lexical hybrid language by Sirirat Chuphan and Kallaya Tingsaphat (2006 p. 345.). They referred to a mixture of mother tongue language with other languages as hybrid dialect. That is, E-sarn dialect would be decreased its functions steadily.*

*(Rattana Jantao 2016:31)*

A relationship between the concept of the caller and Thai folk plants in E-sarn has an implication on original E-sarn dialect retention. Even a single word is worth to study in order to revealsw the E-sarn dialect status and hidden information in the findings at the present in the Northeast region. The study should be done seriously on these issues before the traces would be disappeared.

### Objectives

1. To study a relationship between the concept and Local plant names, and also the plants' status at None Phuthong sub-village, Thachang khlong village, Pha Khao District, Loei Province.
2. To study how the people at the target place conserve Local plants.

### Research Materials and Method

#### 1) Target area

The researcher studied related document and also did the field work by exploring the overall accessing areas at Tha-changkhlong Village. The emphasis was on Ban None Phuthong. This sub-village was a location of a national conservation forest: code Loei 14.

2) Preparation of questions for interviewing local people in the target area with the purposes of each question as follows:

- Plant names called by the villagers,
- Areas of planting was another factor. The consumption was based on how far the plants found from home. If the plants were important and used quite often, they would be grown near the homes.
- Reasons of naming the plants could disclose people belief about the plants,
- Plant consuming and using were the question which would like to find how the people get benefit, that is, as food or herb.
- The awareness and reception of increase or decrease of plant could signify the community's attitude towards the plant and its status.
- If the plant decreased, what the community would have any action on this issue. This question could lead to plant conservation of the community.

Form for data record

Before doing field work, the students who were interested in doing field work and they were also taking course in “An Introduction to Research”, were trained how to interview and observe, as well as taking the pictures. The students independently applied to join as data collecting team. This was useful in terms of data spread. For the students, moreover, they had opportunity to experience the qualitative data collecting. This data collecting process had been done since the beginning, that was, exploring the areas, determined the target area, collecting the data and rechecking in order to gathering more.

After the data collecting and analyzing processes, then the information were returned to the community. The field work was done 7 days on weekend for avoiding the students' classes. The field work was conducted 7 visiting. The field work team got 60 different plant names as shown in the table below. The data were analyzed by content analysis.

Example of Table of Plant Data Collecting

No.	Plant Name	Place found	Attribute	Number of plants after community recognition	Conservation Plan	Relation to Concept
1	Dao Inta (Herb)	Resident area	Herb for High Blood Pressure	Decreased	Find the new ones	Its shape is similar to a star
2	Tuen-yup Food and Herb	Forest	Herb of Headache	Decreased	-	It shrinks when to be touched
3	Fa Thalai Jone Herb	Resident area	Flue	Decreased	Find the new ones	Said in text that flu or fever like a robber and this herb came from haven to stop the bad things.
5	An-chan Food and Herb	Resident fences	Herb shampoo And Dessert	Decreased	Find new type of plants and replanting	Unknown

## RESULTS

The first objective was the relationship between the concept and the plant names. It was found that the relationship could be classified into 4 types: first was the concept towards the physical appearance. For example, Ton Phong Chu Rot (Oroxylum:science name) is called in Thai as “Mak Lin Fa (tongue to sky)” because its trunk is high and its flowers point up to sky. Its fruit, moreover, looks like human tongue.



Ton Mak Lin Fa (หมากลิ้นฟ้า, Oroxylum:science name)

The second was the plant usage, for example, “Ton Phong Choo Rot” or Monosodium Glutamate (seasoning poeder). It is called “Ton Phong Choo Rot” because the people feel that the food has good taste if they cook this leaves together with the food. It is possible that the people compare this tree as seasoning powder.



Ton Phong Chu Rot (ต้นผงชูรส, Monosodium Glutamate: science name)

The belief in doing rite, for example is “Ton Thong Phan Chang” (Gold weight One Thousand Chang (Old Thai measure about weight) There is nothing to show that it relate to gold but its meaning refers to richness.



Ton Thong Phan Chang (ต้นทองพันชั่ง)



The last one was unable to find its background. Even the one who grew the plant could not tell why. But they were grown in the house's area because the house owner loved to see strange plants.



Unknown by the owner

And also another point of the first objective, it could be summarized as follows. The plants at None Phuthong Sub-village receive positive attitude or in the other words, that is, it receives good status. It could be seen clearly at the fences of each house. So many species of plants were grown with the reason of their beautiful flowers or the strange physical appearances. The owners do not mind whether they know the names of the plants and their usefulness or not. If the place is available, the community members love to grow plants without any specific purposes. The pictures below are the pictures of fences with various kinds of plants.



For the second objective, this research would like to see how people at Ban None Phuthong Sub-village conserve the plants.

It was found that the people at Ban None Phuthong Sub-village conserve the plants naturally along with daily life. They would increase or replant if the favorite or necessary plants are decreased. If the common plants or not necessary plants are decreased or disappeared, they might replace by other plants. In terms of academic plan, the community does not have formal system to conserve plants physically.

### CONCLUSIONS

The first objective has two folds. The first one was about a relationship between the concept and the plants' names. It could summarize that the plants' names depend on their physical appearances, their attributes, their traditional belief, and the last one was uninvestigated. Another fold for the first objective was the plants' status. The plants' status were well recognized.

The second objective was plant conservation. The community members conserve the plants naturally along with their ways of life. Mostly, they would grow the plants which can be used as food ingredients or consume directly. Another reason is the usefulness of plants as herbs. Some plants, however, might be grown with one own reasons.

## DISCUSSION

A study of a relationship between concept and folk plants' names as well as the status and conservation is a backward research, that is, return to the past, about what the former people thought and reacted to the plants they met or used. There are some opinions on the results of this study.

First of all, it is a kind of a study about community context, their thought and overview to the world. Although the first one who named the plants could not be found, the present names could reveal some traces. One of the traces is the physical appearances of plants. The prominent features were concrete things which could be seen easily. The first sight might lead to the names of plants. It could say that the former people might have never seen the plants before so they might call after the physical appearances. After the familiarity, the plant attributes were transferred to the community members. It implied that the former people knew the plants and used them in various ways, for example, using as food directly or applying as herb. This step might be both physical appearance and learning how to take benefit from the plants, that is, both concrete and abstract thought. The abstract one, to say at the least, concerned the closed relationship between the former people and the plants through their thinking or concept. It reflected the people's belief and the traditional rites. The plants' names usually refer to good things, for example, Ton Thong Phan Chang. This plant's name could reflect some past social-events. We can infer as the following reasons. In term of economics, the most value object in the past might be gold because the plant was named as "tong (gold)". In term of historical aspect, the counting system in the past might be Phan (thousand) which implied as the highest value. It could lead to investigate the time whether the counting system was used in what reign because at present it has been changed the highest number as brilliant or more. The word "chang" was also an old unit of weight. It disclosed that the money shape in the past was not a note as present. They might be sticks or lumps or else, not bank note. "Ton tong phan chang" could be used to study for several purposes, that is, traditional culture, past history, and past economics.

These three evidences show that: 1) the plants' names might be established by sight-seeing, that is, physical appearance or concretely; 2) second point might be using. The people have learned how to use the plants. It reduced the distance from just seeing to using or applying. It showed the actions which included both concrete and abstract thinking for naming the plant names: both physical appearances and attributes; 3) the third one disclosed that the former people had some abstract concept towards the plants and named them as in the present day. We could not find why the plants were named as Ton Thong Phan Chang, Ton Dog Pud and others; 4) the last groups of plants' names could not investigated their histories because of long period of time of the plants' appearances and the later generations do not know the reasons.

In term of linguistics, even one name is worth to study because it can be used to investigate the past stories. It is similar to village names. If the village name begins with "None (โนน)" and "Dern (ดำน)", we could investigate that the village was situated on high land in the past and might be last to present. Another example was a village with the word "sam" (สาม). We can imagine that this village might have some water sources. The research on about local names of villages was conducted by Rung-a-run Thekhatian and Maliwan Burana Pattana (2003). As mentioned that even one word is worth to study, one type of plant was found only at Nahaew District, Loei Province. This research about water plant diversity was conducted by Petcharat Verukhamkul and La-or Ampornpan (2013). These two researches insisted that even just one finding is important for academic study. There are many plants at Ban None Phu Thong which their names are not known even by the planters. Moreover, Loei Rajabhat University students who helped to collect the data for this research did not know so many types of local plants. It can imply that local plants may be ignored, decreased and disappeared in the future of new generations.

For the conservation aspect, it might be said that the people of Ban None Phuthong love to have plants around homes. It seems that the plants will be never decreased but some of the members of this sub-village accepted that some plants have decreased and some have been disappeared. The community members, however, feel that they will not face the lack of plants because they have some products from a national conservation forest and some are around their places. The term "conservation" based on academic aspect may not the same term of keeping plants of the people. Another endanger plants is modern products which may replace the plant functions as in the past.

Referring to the words said by the mentioned scholars about "hybrid dialect" at the beginning, this concept may be apply to the folk plants also. New plants from other places have brought up in the village, for example. Diefferbachia which local people call "Ton Sethi Winsan" It is believed that this plant can give luck to the owner. Therefore, this plant was found in front of some houses in the village. This kind of belief and communication among neighbors may cause a "hybrid plants" (Sirirat Chuphan and Kallaya Tingsaphat 2006:345). We may have

“old plant with the new name”. It can be related to the culture change of the nation if language endanger is occurred, no matter in what fields. Unexpectedly, we may lost our own history, that is, our dignity by unexpected issues.

## REFERENCE

- [1] Krissana Yodmongkhon (2016) *A Study of Language Usage Written in Personal Experiences Note by Luang Pu Pan Tittatammo, Wat Pa Nampoo, Loei Province*. Research. Loei. Faculty of Humanity and Social Sciences. Loei Rajabhat University.
- [2] Rattana Jantao (2016) *Lost of E-sarn Vocabulary on Food Name*. Songkhla. Academic Journal Year 12th. Copy 2 in July-December 2017. Faculty of Humanities and Social Sciences. Songklanakharin University. Pattani Campus.
- [3] Unchalee Singh –noi Wong-wattana. (2014). *Thai Folk Plants' Names. Botanical Linguistics*. Bangkok. Chulalongkorn Publishing.
- [4] Suphaporn Bang-bai et.al. (2013). *Retention of Local plants at Nam Khek Watershed*. Phetchaboon Province. Phetchaboon Rajabhat university.
- [5] Petcharat Verukhamkul and La-or Ampornpan (2013). *Diversity of Plant in Water Shed Area* Nahaew District, Loei province. Burapa Science Journal 18.
- [6] Khantarot Wittayaphirom (2011). *Naming of Lawue Hill Tribe. Tambon Pa-pae. Mae Sariang District. Mae Hongson. Bangkok*. MA. Thesis. Institute of language and Culture for Rurak Development.
- [7] Krissana Yodmongkhon (2011). *Introduction to Linguistics. Linguistics Text*. Loei. Faculty of Humanity and Social Sciences. Loei Rajabhat University.
- [8] Krissana Yodmongkhon 2011) *Language Relation System and Context*. Loei. Faculty of Humanity and Social Sciences. Loei Rajabhat University.
- [9] Papatsara Khamwachirapitak. (2010). *Village Names in Chaiyaphum Province*. Chao-Phayon Journal. Year 2. Volume 21.
- [10] Jaran-wilai Jarunrote (2009). *Introduction to Linguistics*. Bangkok. Linguistics Department. Faculty of Humanities. Naresuan University.
- [11] Sorat Hongladarom. (2009). *Language Philosophy*. Bangkok. Chulalongkorn Publishing.
- [12] Juthapan (Jamjuri) Phadung Chiwit. (2008). *Culture of Communication and Identity*. Bangkok. Chulalongkorn University Press.
- [13] Thananant Tongdi et al (2008). *Culture of Language Using*. Mahasarakham. Faculty of Humanities and Social Sciences. Mahasarakham University.
- [14] Ammara Prasitrat-thasin (2005). *Language Used in Thai Society: Variety, Change, and Development*. Bangkok.. Chulalongkorn University.
- [15] Suwilai Premsrirat et al. (2004). *Language Dialects Map in Thailand*. Bangkok. Kurusapa Publishing.
- [16] Rung-a-run Thekhatian and Maliwan Burana Pattana (2003). *Village Names at Tha U-then District. Nakhon Phanom Province*. Bangkok. National Culture Agency. Ministry of Education.
- [17] Thawat Punnothog (1988). *Language Dialect*. Bangkok. Ramkhamhaeng University.
- [18] Khai Siri Pramoj N Ayuthaya. (1986). *Changing of Thai eLanguage and Proverbs*. Bangkok. Chulalongkorn University Press. Mahidol University. Language and Culture Journal. 2<sup>nd</sup> Copy of 30<sup>th</sup> Year (July-December).
- [19] Kanjana Nark-sakul (1981). *Thai Sound System*. 3<sup>rd</sup> Edition. Bangkok. Chulalongkorn University Press.
- [20] Jintakarn Ngam-sutha (-) Pli Bai Newsletter. *Bring Duriannon Home*. Article. Bangkok. Department of Agriculture.
- [21] Preecha Pinthong. (1989). *E-sarn-Thai-English Encyclopedia*. Ubonratchathani. Sitham Printing.
- [22] Thawatchai Santisuk. (1989) *Intanin Salao Tabaek*. Royal Council of Life Science. On Botany Field. Newsletter. Of the Royal Institute. 1<sup>st</sup> year. Volume 12 December 1989.
- [23] Surangkhanang Kaewnandee (1993). *Word Transformation of Plant Name*. Bangkok. MA. Thesis. Linguistic Major. Faculty of Arta. Chulalongkorn University. Chulalongkorn Publishing.
- [24] Halliday, M.A.K. and Ruqaiya Hasan. (1985). *Language, context, and text: aspects of language in a social-semiotic perspective*. : Oxford University Press.

**HIGH-TECH AGRICULTURAL DEVELOPMENT WITH TOURISM DEVELOPMENT IN NORTH  
CENTRAL COAST, VIETNAM**Tran Xuan Quang <sup>(1)</sup>Nguyen Thi Minh Phuong <sup>(2)</sup>Nguyen The Lan <sup>(3)</sup><sup>(1)</sup> *PhD student, Academy of Social Sciences of Vietnam*<sup>(2) (3)</sup> *PhD, lecturer at Economics Department of Vinh University**Corresponding Tel: 0942.726.777 Email: phuongntm@vinhuni.edu.vn***ABSTRACT**

The development of high-tech agriculture is the crucial trend of the agricultural countries and also the indispensable trend for Vietnam's agricultural sector in the integration period. Agritourism is becoming prevalent in many countries and regions with agricultural advantages. The purpose of this study was analyzing the development of high-tech agriculture in association with tourism development in the North Central Coast, Vietnam which can bring socio-economic efficiency, environmental protection and cultural linkage. This study focuses on four major phases in the agricultural value chain including planting, harvesting, processing and supplying. With the participation of information technology, environmental protection and resistance to climate change at each phase, the integration of tourism development will add more value to agricultural production. Tourism activities can invite tourists to visit any stages and participate in experiencing and shopping at those stages. These activities can create opportunities to attract visitors, increase farmer's income and benefit the community by combining high-tech agriculture with tourism through many services such as on - spot exporting agricultural products (selling to international tourists), providing catering or farming. Although there is a cooperation between tourism and agricultural production, this linkage is still spontaneous, not highly professional. Some areas of high-tech agricultural production started to establish some sight - seeing tours and research tours but the activities of these tours have not yet well - equipped. The concerned reason is not the lack of ideas but the lack of policy environment to support and promote the application of high technology in agriculture as well as incentive policies combining high-tech agriculture with sustainable tourism. The article suggests solutions to tackle the difficulties of developing high-tech agriculture associated with tourism development in North Central Coast, Vietnam.

**KEYWORD:** High tech agriculture, ecotourism, tourism development, tourism associated with agriculture, Vietnam.

## INTRODUCTION

Recent agricultural development and growth has been based on a broader scale of growth, on the basis of increased acreage, increased crop yields, and increased input material inputs (labor, capital and materials) natural resources and environmental deviations... According to Vietnam agriculture department of Vietnam agriculture Ministry, the model of broad-based growth has appeared many instabilities, the growth rate tends to decrease 4.83% (2000) down to 2.67% (2012) and 2016 - 0.18%; There is the risk of degradation of natural resources, water pollution and climate change, which are holding back the development and threatening sustainability. Urgent requirements for restructure the agricultural sector, in which "Agricultural development applying high technology..." is an important task to make a breakthrough in agricultural development, such as project on "Agricultural development for high technology application to 2020", approved by the Prime Minister.

In which, until 2020 each province has at least 10 enterprises, 10 agricultural production areas and 1 to 2 hi-tech agricultural area. Contributing to the proportion of agricultural production value which is applied high-technology, accounted for at least 25% of the total agricultural production value of the whole country..

North Central Area has six world heritages and natural reserves of the world: the Ho Lake (Thanh Hoa), the Nghe An West Biosphere Reserve (Nghe An) Phong Nha - Ke Bang (Quang Binh), Relics of the ancient capital of Hue, Hue royal court music (Thua Thien - Hue). All of region has more than 1,200 km of border with Laos and two international border gates of Cau Treo (Ha Tinh), Lao Bao (Quang Tri) and attached to East-West Economic Corridor. Thus, in the region, four of the six provinces have world heritage sites, the other two regions have international border gates connected to the economic exchanges center between countries in the region. North Central is also the originally place of the family line like Ho, Le, Nguyen, Trinh... and is the father land of many famous people such as Nguyen Du, Phan Boi Chau, Ho Chi Minh, Tran Phu, Vo Nguyen Giap... The area also focuses on many war relics and especially valuable revolutionary sites: Dong Loc Three-way crossroads, Xuan Son, Nhat Le, 20 Tran Quyen road, Vinh Moc tunnels, Quang Tri ancient citadel, Hien Luong bridge, Khe Sanh Street 9, Ho Chi Minh Trail... This is a favorable condition for the formation of tourism products with characteristic properties which other areas don't have. The North Central Coast has a coastline of 670km, with many beautiful beaches like Sam Son (Thanh Hoa), Cua Lo (Nghe An), Thien Cam (Ha Tinh), Nhat Le (Quang Binh), Cua Tung (Quang Tri) Thuan An (Thua Thien - Hue). Coastal islands can invest and develop the tourism such as Hon Me (Thanh Hoa), Yen Island (Ha Tinh), Ngu Island (Nghe An), Con Co (Quang Tri). North Central also focuses on high biodiversity, many speciality ecosystems in Ben En, Pu Mat, Vu Quang, Phong Nha - Ke Bang National Park, Bach Ma Nature Reserve, Pu Luong Nature Reserve, Pu Huong Nature Reserve, Ke Go. With rich ecological forest and sea potential, the North Central region has conditions to develop ecological tourism, resort and adventure sports.

## RESEARCH METHOD

### \* Methods of collection and processing :

Using the document research methodology aims to get an overview of the research related to the topic, and then there is the basis to build and reasoning formalize on the topic. On the other hand, through updating and studying the documents, policies, reports and statistics of the agencies, the author will capture the current status of agricultural activities in the provinces of North Central Vietnam, which offers solutions to develop agriculture in combination with tourism development.

### \* Quickly assessment method with participation of PRA (Participatory Rural Appraisal)

+ This method was carried out by collecting opinions of farmers, encouraged agriculture officers, officials in enterprises who participate in production and processing of agricultural products and local managers by answering the questionnaires.

+ Group discussion: for example, representatives of production households include about 10 people, to quickly assess the agricultural production status of the household, finding out the advantages and disadvantages of farmers or enterprises in production and business connected with tourism development. The results of the group discussion are the basis for the author to expand the examination for each subject, thereby providing solutions to develop suitable agriculture for the characteristics and advantages of the North Central.

+ Site selection to Investigate:

The author intends to select some areas with agricultural production activities combined with tourism of the provinces to investigate such as Thanh Hoa, Nghe An, Quang Binh.... each locality represents each different Ecological region so the characteristics of agriculture are also different.



**\* Economic statistical methods:**

Use this method aim to reflect the indicators, the results of the agricultural development. Through this, data are collected systematically to help describe and reflect on the extent, status and issues related to agricultural development, reflecting the dynamics as well as the relationship between factors in the development of agriculture associated with the development of local tourism.

In addition, the author also focuses on expert methods, it means we regularly consult, consult experts and scientists interested in the agricultural field to form assessment and analysis of Professional knowledge and make feasible and practical proposals and solutions to develop tourism of Vietnam.

**RESULTS AND DISCUSSION**

North-Central tourism despite the strong development, but to affirm the position need more international tourism brands with high competitiveness. In order to achieve this, each locality will face many difficulties in its individual activities, so it is necessary to have regional cooperation to create general power. At present, in the North Central region there is Hue Festival (ThuaThien Hue) which initially formed the brand for Hue tourism. However, because of this event is only for ThuaThien – Hue, way promotion organization, image and content are monotonous due to limited resources, lack of supporting products, competing with the region and not becoming motive forces for other localities in the region. Meanwhile, in the northern end of the area, ThanhHoa is home to the Ho is also the ancient capital of UNESCO recognized as a World Heritage site. To promote the link between Thang Long - the Ho Dynasty - the ancient capital of Hue to form a tourist route named Journey through ancient Vietnamese capitals combined with ecotourism products to explore nature, cultural tourism associated with the heritage and festivals, community tourism associated with the village... will certainly create a product with its own identity, creating a breakthrough in product development to have a basis for creating the brand.

One issue that needs close cooperation and cooperation in the region is the training and fostering of tourism human resources. The North Central Coast, in particular the management agencies and training institutions, should closely coordinate the training of human resources for tourism in the whole region. Create and train tourism with the corporations to increase the scale and improve the quality of vocational training. On the other hand, the provinces in the region should coordinate the development of the regional labor market, organizing intensive training programs on tourism, professional training and mutual learning between localities in the region to improve the quality of labor and to form a professional labor market.

But nowadays, agricultural tourism activities are spontaneous, small, many units, private enterprises operating in the field of agricultural tourism still have difficulties in developing products and Connect with tour operators, attract domestic and international tourists to visit, learn.

Most of the visitors coming to the farm are excited to enjoy the countryside specialties of western NgheAn or the caves in QuangBinh such as chicken hills, river fish, red calf... and vegetables from vegetable garden. Here, visitors try to fish with bamboo tools, grow and collect wild vegetables and herbs, see how to make honey, picking and dried tea, for ostriches, goats, rabbits, eat dairy cows or visit the tea gardens, the vast corn fields on the riverside... The exchange of dancing and dancing with the entertainment team of two ethnic minorities, clear, rich heart. Hospitality has made visitors surprise by the warm atmosphere.

Because it is not restricted by a closed program or simply as a traditional tour, it does not require the risk, such as modern travel so many international tourists expected.

According to the Department of Tourism of the North Central provinces, the demand for tourists looking to visit the farm experience increased every year from 20-30%; In particular, high-tech agricultural tourism products are receiving high attention. The number of visitors to this place is increasing every year, from 7,000 visitors in the first year, to 2016 has attracted more than 12,000 visitors. It is expected that by the end of 2017, it will reach about 15,000 people.

Farmers need to consciously protect their landscapes and habitats. Through agricultural tourism, they were given the opportunity to promote their agricultural products and, of course, part of their agricultural income also increased from tourism. At the same time, attention should be paid to exploiting the local resources available. International visitors should focus on Southeast Asia, especially those that do not have high-tech agriculture such as Laos, Cambodia and Myanmar. Agricultural development of high technology of these countries; at the same time, strengthen trade links the foreign units.

Therefore, upgrading infrastructure is necessary, but should only meet the most basic facilities for tourists, avoid the investment, spread. In addition, each unit needs to create specific features for the staff. They are the ones who convey the stories that appeal to customers without overlapping anywhere. In addition, the unit should have the link with local people, there is interaction, avoid the reaction of the people. Particularly, communication should be promoted on social media, with regular connections with customers. This is the most effective, most inexpensive channel that businesses should take advantage of. On the side of enterprises, the units also proposed that managers need to develop investment policies to develop and manage infrastructure systems for suburban areas to develop agricultural tourism; It is necessary to develop a standard set of agricultural tourism products including the content and form of operation so as not to be embarrassed in the management and promotion of products..

### REFERECS

- Central Institute for Economic Management (2014), *Agricultural Sector Restructuring to Enhance Competitiveness and Sustainable Development in the New Context*, Center for Information and Documentation, No. 7, Ha Cabinet.
- Financial Website (2012), *Experience of Israel for High-Tech Applications in Agricultural Production. Hi-Tech Agricultural Zone Management Board*, Thai Agricultural visits, 2016.
- Nguyen Dinh Long, Nguyen ThiHai Yen (2016), *Restructuring the Vietnamese agriculture*, *Journal of Social Sciences of Vietnam*, number 2/2016.
- Tran Duc Vien, Nguyen Viet Long (2015), *Towards high-tech agriculture and knowledge-building in the process of restructuring Vietnamese agriculture*, Scientific Seminar, Vietnam Agricultural Academy.



**THE HUMAN IN WILLIAM FAULKNER'S NOVELS:  
AN ECOLOGICAL ANTHROPOLOGY APPROACH**

Ho Thi Van Anh

*Faculty of Philology, Vinh University, Vietnam**Corresponding Email address: vananhdhv@gmail.com***ABSTRACT**

Discussing on the subject of human in William Faulkner's novels from ecological anthropology perspective, this study proposed a new approach to the non-strange issue in the history of Faulkner research. This approach required researchers to access the literary works from the relationships between human and their environment, in the sense of biophysical environment and cultural one. In this study, instead of describing and judging Faulkner's characters from sociological or psychological point of views as being done in previous researches, we focused on examining the complex interrelationship between the human characters with their ecology to find out how the human react and interact with their ecology. The result indicated that Faulkner's characters were the ample evidence of modern anthropology perception, which was to respect the equal roles of the human and the nature, of the human and the nonhuman and to realize the ecoambiguity between them. The result also suggested some new interpretations of Faulkner's conception of human. First, Faulkner conceived of the beauty associated with the primary and the innocence. Second, the bipolar state was always seen in Faulkner's characters, which could be illustrated in the two interactions of human to the nature and to the non-human. Finally, Faulkner had his own strategy of preserving the beauty, which was to enclose the beauty – the innocence, primary, into the metaphysical existences which could not be touched and ruined.

**KEYWORDS:** human, ecological anthropology, William Faulkner, novel, ecoambiguity

## INTRODUCTION

The idea of this study was bounced off when we were trying to plead for William Faulkner, the American Nobel prize writer, against André Gide's accusation. "There is not one of his characters who, properly speaking, has a soul"[1], the acclaimed French critic said. This condemnation is for Yoknapatawpha, the legendary land in Faulkner's literature, with full of sins, obsessions, destruction and trauma. This symbol, in previous researches, has been studied from the perspective of genre: it is seen as the dark theme Faulkner contributed to the innovation process of American gothic novel. However, from another perspective, another concern can be raised: How could the dark and horror writing come into reader's heart in such a gentle and natural way? Is there something inside those dark shapes of pain, evil and destruction that makes them strange and close, scary and sweet at the same time? At this point, we propose the ecological anthropology approach to study Faulkner's novels. In particular, the issue of human in Faulkner's novels is to be examined basing on their interrelationships with the ecology. The assumption set out is whether the "ecoambiguity" [5] is the decisive factor that erases the borders and leads to such dilemma in the reception of Faulkner.

The term "ecoambiguity", coined in 2012 by the ecologist Karen Thornber in her research named "Ecoambiguity: Environmental Crises and East Asian Literatures", refers to the ambiguous way human interactions with nonhuman beings portrayed in creative works, in other words, the complex interactions with full of conflicts between human and their environment. This concept denies all oversimplified views of human and nature which have been taken in traditional research. The ecological ambiguity, complicated and paradox by its nature, therefore, meets the modern approach of literature study. Even, it can be seen as the essential characteristic of artistic works written about the relationship between human beings and their environment. *The Sound and the Fury*, *Light in August*, along with other novels by Faulkner, all together leave us with an impression of those complex interactions.

This study set out to examine the relationships between the human and their ecology which are reflected in Faulkner's novels. There are two highlighted relationships which shape the human in Faulkner's literature: the relationship between the human and the nature and the one between the human and the nonhuman inside themselves. The results are to be the explanation for the question about the dilemma posed above. More importantly, the study aims to identify characteristics of the human in Faulkner's novels as well as the writer's concept of human.

## MATERIALS AND METHODS

### Research questions

The study aimed to seek the answers to the following questions: Is it the ecoambiguity, the complicated relationship between human and ecology, that leads to the dilemma when reading Faulkner's novels? If it is, how can those relationships be described and interpreted? Basing on the description of how human and ecology interact, what can we infer about main features of Faulkner's characters, and more importantly, of his concept of human and life?

### Materials

The novels examined in this study are *The Sound and the Fury* (1929) and *Light in August* (1932) by William Faulkner. Considered as two among the greatest masterpieces of this American writer, they are eligible to basically represent Faulkner's literary values. Also, the reason why they are chosen, more importantly, is due to the fact that the themes of the nature and the nonhuman are reflected in an impressive way in these two novels. During discussion, the other short stories or novels by Faulkner are also mentioned for comparison purpose.

### Methods

The study mainly adopts the survey and analysis methods. By survey and analysis in this case, we mean the work of finding, exploring and investigating the details in the novels. For each type of relationships mentioned above, for each novel, we are to search the ways how human react and interact with their counterpart (the nature, the nonhuman), illustrate the relationship, figure out the role of each subject in that relationship. After doing the survey and analysis, reasonable inference is to be drawn to conclude on some characteristics of Faulkner's literature. During discussion, comparison method which involves compares the two novels with each other and the two novels with other works by Faulkner was also employed. The following part of the study is to describe the result obtained during such procedure, starting with examining human in Faulkner's novels in relation with the nature, followed by the relation between the human and the nonhuman part inside themselves.

## RESULTS

**Human and Nature in Faulkner's novels**

Born in the era with the anxiety of environmental crises, ecological anthropology proposes a revolutionary usurpation: the human's throne is taken away, the idea of anthropocentrism is replaced by geocentrism, the conventional *human-centered approach* is substituted by the ground-breaking *earth-centered approach*. For centuries, human have taken the pride of being the center of the universe, the king of the world; conquering the natural world, hence, could be seen as the glory manifestation of their overwhelming authority. By contrast, ecological anthropology demolishes human's dominance, reconstructs the relationship between the human and the ecology. Human, from modern anthropologists' point of view, are no longer authoritative; they rather find themselves as a modest and equivalent factor among the natural environment.

In *The Sound and the Fury* and *Light in August*, the image of nature is portrayed humbly as the background of the story, even eclipsed by the artificial world – the main living environment of the characters. Artificial world is what all characters in *Light in August* are wrapped in. Leaving the countryside, Lena – the main character in the novel, sets out on a 600-page-journey through artificial background - barely sawmill, houses, railways and rusty machine: "...gaunt, staring, motionless wheels rising from mounds of brick rubble and ragged weeds with a quality profoundly astonishing, and gutted boilers lifting their rusting and unsmoking stacks with an air stubborn, baffled and bemused upon a stumpocked scene of profound and peaceful desolation, unplowed, untilled, gutting slowly into red and choked ravines beneath the long quiet rains of autumn and the galloping fury of vernal equinoxes." [2;6]

It is noteworthy that in *Light in August*, the artificial environment is both a refuge and a prison to the human. It is where people exist and are connected; at the same time, it is where people find themselves most isolated. Take the sign "house" as a typical example. A house, for the bitter outcasts such as the exiled minister Gail Hightower, the old woman Joanna Burden, the black-or-white Joe Christmas or the sly white guy Lucas Burch..., is always deprived from a key feature: the connection to the human. It is not where the people originally belong to; it is rather the place they refuge in after being rejected by their own community. Gail Hightower, for instance, in spite of being condemned and estranged by the folks, desperately clings to the town, nestles "in what the town calls his disgrace – the house unpainted, small, obscure, poorly lighted, mansmelling, manstale" [2;40]. The sign, carpentered his name neatly by himself with fading letters, exists as an evidence of his bitter yet patient effort to engrave his existence among community of mankind.

A house, the refuge, is therefore the place of shame, guilt and isolation complex. While the characters attempt to stick tightly to their house, they all desire to escape from it. It is no coincidence that "window", a typical sign in Faulkner's literature, appears with high density in *Light in August*. 114 times mentioned throughout the novel, the image of "window" is attached to characters' actions – opening the window (7 times), overlooking the world (24 times), sitting at the threshold (28 times), or climbing over the window (8 times). They are all driven by an unconscious desire of being connected to the real outside world.

That dilemma is even pushed to the extreme: the desire to connect is so strong and desperate that it transfers to the desire to destroy their living space. This might be the explanation for why Joe Christmas killed his white lover, Joanna Burden, who accommodated him in her wooden hut. Never in his life has he found himself belonged to Joanna's house: "One day he realized that she had never invited him inside the house proper", and even "he felt like a thief, a robber, even while he mounted to the bedroom where she waited" [2;184]. The complex of separation from a home combined with prejudice of race led to the bipolar reactions to the house: the attempt of being accepted, even dominating the house and the joy of destroying violently (the latter resulting in the action of burning the house). Both tendencies are not separated, rather keep invading each other rudely, creating an ambiguous inner voice inside character. That way, the human in *Light in August* are estranged from the nature and always insecure in their artificial environment.

In *The Sound and the Fury*, the concern about the relationship between human and their surrounding is reflected in the most obsessive way in the character named Quentin. Unlike Benjy, an idiot living permanently in the past or Jason, a pragmatist of civilization age, the Harvard intellectual Quentin finds himself stuck in the present. Quentin torments himself in the mournful memories of his lost sister Caddy. The concept of the present, to Quentin, therefore means the concept of the present, the civilization, the industrial society. He abominates the present to death. His fear and hate to present are reflected in his obsession of watch, which, in his view point, symbolizes the artificial world of mankind. That obsession is implied through metaphors such as "absurdum of all human experience", "Christ was not crucified: he was worn away by a minute clicking of little wheels"[3]. Quentin's state of being stuck in present is even expressed in an extreme form of writing: the irregular sentences with overlapping fragments: "never be got to drink wine himself, but he always said that a hamper what book did you read that in the one where Gerald's rowing suit of wine was a necessary part of any gentlemen's

picnic basket *did you love them Caddy did you love them When they touched me I died.*” [3]. This stream of consciousness writing style is wisely chosen to express the ambiguity and conflicts inside character’s psychology. Thus, it can be summarized that the two novels *Light in August* and *The Sound and the Fury* reflect bipolar status of human in relation with their nature environment. However, while *Light in August* focuses on the idea of primitive root of mankind, *The Sound and the Fury* leans towards the idea of the nature in contrary with the artificial world.

Faulkner, as well as the modernists, doesn’t innocently seek for a truly primitive and intact nature since it forever disappears. Instead, he proposes his own literary solution: he preserves the nature in a separated, non-material realm beyond physical time and space. The following part is to explore how it is done in the two novels. Back to *Light in August*, throughout the novel, hidden inside the fury of the artificial world is the internal serene, “beyond all time and all haste” [2;24]. The image of Lena, with her patient walk, serene pace, silent shadow on the endless path, seems entirely separated from the dusty and chaotic world in Jefferson, Mississippi. The nostalgia of tranquil nature is preserved in the biosphere surrounding this girl. To create the non-time, non-spatial nature to this biosphere, the author focuses on describing three signs including the light, the road and the face of Lena. While the other characters are wrapped in suffocating artificial space (as mentioned above), Lena are mainly described on the road. However, the road in Lena’s journey from Alabama through Jefferson to Tennessee mostly loses its physical features. All specific locations fade away because of the overwhelming light. The road is at last the road of light, the autumn light with various shades. Lena is always surprised after each stop: “My, my. A body does get around” [2;400]. Among “nameless faces and voices”, the anxiety or curiosity, she just keeps walking on, with a calm, serene and steady pace. That the details: “she had not looked back”, “she does not look at him”, “she is not listening” repeats many times even pushes her into the unreal world. The Lena’s road exists beyond the time, beginning from “the evocation of *far*, is a peaceful corridor paved with unflagging and tranquil faith” [2;8], extended by “a long monotonous succession of peaceful and undeviating changes from day to dark and dark to day again” [2;8] and still not ending.

The same method is also adopted by Faulkner in his novel *The Sound and the Fury*: he folds the beauty of nature into a symbolic character and keeps that character intact in an isolated world. That absent character is Caddy, the girl who “smells like trees” and “virgin as the honeysuckle in the rain”, appearing only through memories of her brothers. Keeping her in a space beyond physical limitation, Faulkner wishes to cherish that beauty and preserve it as an eternal value of nostalgia.

The consciousness of preserve the beauty of the wild nature is also proved convincingly through the character Benjy. Surrounding Benjy is the primitive biosphere which is pristine, intact and undestroyable. The concept of time in Benjy is visualized and replaced by the signs of nature. Instead of clock, only wild nature is mentioned as the sign of time: “the sun”, “the moon”, “the moonlight”, “the sunlight”, or “bright”, “dark”, “darkness”. Benjy seems to live in a world without knowing about the artificial time (time of clock); time, for Benjy, belongs entirely to the primitive nature with the circulation of the sun and the moon.

Besides time, mostly the surrounding environment is visualized by Benjy’s reception. Benjy feels daytime and nighttime through the moon and the sun. He feels the virgin of Caddy through the smell of trees... This way of thinking even exerts impact on his language, which is the preference of using specific nouns instead of abstract nouns or adjectives. For example, instead of saying “I felt cold”, or “It is dark”, he said “I could smell the cold”, or “I felt the darkness”. Similarly, he said “I could hear the roof”, “We ran up the steps and out of the bright cold, into the dark cold”. Even the ambiguous sense of death is visualized: “I could smell it”. All comes from instinctive feelings of a primitive guy. The atmosphere in Benjy’s chapter is therefore the one of the primitive and wild nature, when mankind had not even accessed the civilization.

It can be summarized that by *Light in August* and *The Sound and the Fury*, Faulkner proposes his concept on the relationship between the human and the nature. He asserts the truth that the artificial world is now existing as a powerful entity, even overwhelming the natural world. The thing is that he does not illusively deny the civilization. He rather understands the complex interrelationship between human and their material civilization: while they are fearful and dependent on the modern world, they always desire desperately to escape from it. Faulkner does not call for rebuilt the past, either. His solution is to preserve the beauty of nature in an eternal world, which is beyond all real limitations and never invaded.

### Human and Nonhuman in Faulkner’s novels

Seeing themselves as the creator of all knowledge, culture and science, the human, for ages, have extolled themselves as the superior of the universe. Inevitably, a moral distinction is marked: the human part along with its productions such as culture, science, knowledge, social features... is considered the truly “human”, the “human value”, which is worth honoring while what belongs to human’s primitive root such as instinct, greed,

reproduction,... is seen as non-human, contrary to human and therefore disparaged. That traditional distinction is now attacked by the new idea of ecological anthropology. From modern anthropologist's point of view, the human and nonhuman should be equally respected and evaluated. Faulkner, in his writing, contributes to reconstructing that relationship between human and the nonhuman part inside them.

Faulkner writes a lot about the evil. His fiction world appears to be one of the darkest and most alien to the "human value": the deranged, the fools, the criminals, the exiled priests, lots of moan, injuries, deaths, and lost... Reading *The Sound and the Fury*, Pham Cong Thien exclaimed: "astonished when realizing that I am coming into an extremely severe and dark world; yet it is unbelievable that in such world I see a lot of birds, clones, butterflies, trees, flowers, honeysuckles... Faulkner wrote such ruthless pages without forgetting a bird or a butterfly or ecstatic fragrance of honeysuckle." [4]. Indeed, what makes us scared or estranged in Faulkner's novels can leave us the feeling of peace and love. It is because the values of human and nonhuman in his novels are always interrelated to each other, shaping the so-called "ecoambiguity" in the legendary land Yoknapatawpha. In *Light in August*, that is mainly reflected through the relationship between human and their origin.

To begin with, all characters in *Light in August* torment themselves in the complex of thirst to have an origin combined with the fear and the hate of their origin. The world in the novel includes the people who are separated from their community and their root. Joe Christmas is an indistinct person, maybe half black and white, "there was something definitely rootless about him, as though no town nor city was his, no street, no walls, no square of earth his home" [2;27]. Gail Hightower, Joanna Burden, being rejected, live quietly in isolated hidden houses at the edge of the town. Lena, a pregnant woman, patiently finds the father for the baby. All those characters, to some extent, suffer from racial and moral prejudice. Christmas used to be taunted as "nigger" in the orphanage. Hightower is threatened because he accommodates a black maid. Burden is isolated by her family because of not discriminating the black and the white. Even Lena is also not empathized by people while walking among the voices of unnamed faces.

The story of a pregnant woman, calmly walking on the road to find the baby's father, is not the story of love, or honor, dignity or even not the story of feminism. It is none of such cultural or moral perspectives. Lena walks, in tranquility, under an innocent and steady impulse: the impulse to connect to and maintain her breed. Does she truly wish to find a specific Lucas Burch, as she says? We can take the answer from the man at the end of the story: "I think she was just travelling. I don't think she had any idea of finding whoever it was she was following. (...) And so I think she had just made up her mind to travel a little further and see as much as she could (...) and her looking out and watching the telephone poles and the fences passing like it was a circus parade." [2;399-400]. Lena's journey, as mentioned above, is a symbol, not a real and physical fact. Among fury and chaos, where people are tearing and destroying each other, Lena walks calmly, bringing inside her a life, promising a birth, desiring for connection and harmony with her species.

Unlike Lena who is living peacefully in her own space, Joe Christmas torments himself with inner conflicts between his instinct of racial origin and the racial prejudice. The fact that he cannot define his own race leads to his complex: he wishes to be accepted by the black community, and at the same time, he sees his black skin color as a stigma. His crime can be traced back to the pain of being rejected by both black and white communities. He desires to become a part of black community so desperately that after the murder, "he could smell negro" [2;94], "he smelled and saw negro dishes, negro food" [2;264]. But the prejudice to black skin color is the culprit of his crazy obsession, leading to his murder.

Thus, it can be seen that the nonhuman in *Light in August* is explored from perspective of origin, racial instinct. *The Sound and the Fury*, however, investigates the nonhuman from another angle: it is seen as the beauty of the wild, the primitive. While social prejudice is the contrary to the racial instinct in *Light in August*, artificial civil is seen as counterpart of the primitive beauty in *The Sound and the Fury*.

It is not coincidental when *The Sound and the Fury* starts with the narration of a fool, Benjy, who is dumb, mentally retarded and suffers trauma. From the very first chapter of the book, Benjy's stream of consciousness has created a completely strange world: various fragments of memories coincidentally appear, overlapping each other, fading the present away. The fiction world in *The Sound and the Fury* is therefore the world of the past from the beginning.

Benjy's chapter can be illustrated as two separate timelines (past – present) and more importantly, each type of time has different role in his consciousness. In present scenes, the factual time and the narrative time are almost equal in pace since Benjy mostly narrates the dialogues along with some affirmative sentences. Among which, 17 out of 32 scenes are merely dialogues reported without Benjy's subjective comments or description. Only in past scenes is there difference between the factual time and the narrative time. Many description and comments are given by Benjy, reducing the pace of narration "I could hear the clock, and I could hear Caddy standing behind me, and I could hear the roof It's still raining, Caddy said. I hate rain. I hate everything. And then



her head came into my lap and she was crying, holding me, and I began to cry. Then I looked at the fire again and the bright, smooth shapes went again. I could hear the clock and the roof and Caddy”[3]. This can be inferred that to Benjy, the present is dead, only the past is vivid with full of sounds and tastes. The past is real with “cold air”, “the slow bright shapes of sleep”, “ripping shawl of leaves”. The past is where Benjy can “smell the sick”, “hear the darkness”, “hear the fire and the roof”. That isolated past becomes his eternal continuous present – the present of consciousness. Benjy forever lives in the past, in the world of subconscious memories. Benjy, therefore, becomes a symbol of mankind’s past, the primitive past which will never come back, the ancient time which is not invaded by people’s civilization. That primitive past, when put in modern ecology, inevitably becomes a tragic existence.

Thus, from ecological anthropology approach, we can interpret the behaviors and emotions of Faulkner’s characters, not from prejudices of politics, social or moral codes, rather from more equal judgment on human. Faulkner, to certain extent, shows a sense of respect to the instinct – the element that we traditionally call the nonhuman, at the same time, he asks the human not to deny their responsibility for what they have done. Those like Joe Christmas, Gail Hightower, Joanna Burden are miserable and cruel because they are thirsty to be in harmony with community yet cannot accept mankind’s prejudice; Benjy, Quentin’s tragedy also stems from that they are too nostalgic to the past and cannot accept the reality. They are all tormenting themselves for such inner conflicts.

### CONCLUSIONS AND DISCUSSION

This study set out with the aim of implementing the ecological anthropology approach to examine the issue of human in Faulkner’s novels. From that perspective, this study accessed characters in novels by Faulkner mainly by focusing on the interrelationships between them and their ecology, in terms of their living environment as well as their nonhuman part. The two novels chosen for investigation were *The Sound and the Fury* and *Light in August*, with main characters analyzed in each literary work including Benjy, Quentin, Caddy and Joe Christmas, Gail Hightower, Lena respectively. Two types of relationships were studied: the interaction between people and the nature, and the relation between human and the nonhuman inside them.

The research drew the following conclusions:

First, in Faulkner’s perception, the beauty of human mainly means the primary and the innocence, either in the past or beyond the physical time, which is contrary to the modern civilization reality.

Second, there are complex interrelationships between human and the nature, between human and the nonhuman which are possibly called by the term of ecocriticism “ecoambiguity”. Basically, people in Faulkner’s novels are tormenting themselves by their inner conflicts. They are both passionate and disparaging their living environment; they are also thirsty for their instinct and estranged by it at the same time. That dipolar status makes Faulkner’s characters become far easy from interpretation.

Third, Faulkner proposes his own strategy of preserving the beauty of human and life, which is to enclose the beauty – the innocence, primary, into some symbolic characters in the isolated spaces which are eternally intact. This can be the explanation for the fact that readers usually face the dilemma when reading Faulkner’s novels: they are injured by so much darkness and evils in his works, but also are consoled by the hidden tranquility deeply inside the novels. Faulkner’s literature therefore doesn’t push readers into nihilism, rather offers them a refuge after so much trauma. Human, in Faulkner’s viewpoint, needs to know its humble role, not to be defeated, but to know how to, as he said in his Nobel speech, “endure”, and furthermore, to “prevail”.

The generalizability of these results is subject to certain limitations. For instance, since there were only two novels examined, the analyses drawn might not have been sufficient enough. Future research could be conducted with a bigger scale of Faulkner’s novels. Further studies should be included to confirm the feasibility of the result in a broader scope. Furthermore, examining the issue of human not only in Faulkner’s literature but also that in modern American literature in general is what the researchers in this study look forward to. Another suggestion to develop this study could be many other versions of interdisciplinary approach, for instance, relating this issue with sociology to evaluate and find solutions to some human issues in modern societies. It is therefore recommended that studying literature should never keep itself isolated; it rather should aim to put literature into reality to contribute to a better life.

### ACKNOWLEDGEMENTS

This research is funded by the Center for Research – Entrepreneurship Innovation, Vinh University, under contract No 02/2017/TTNCKNST.

## REFERENCES

- [1] Faulkner, W. (2013). *The Essential Faulkner*. M. Cowley Ed. New York, Random House Publishing.
- [2] Faulkner, W. (1972). *Light in August*. New York, Vintage Books.
- [3] Faulkner, W. (2000). *The Sound and the Fury*. London, Everyman Publishers.
- [4] Thien P. C., *New consciousness in literature and philosophy (Ý thức mới trong văn nghệ và triết học)*, <http://www.talawas.org/talaDB/showFile.php?res=8524&rb=08>
- [5] Thorner, K. (2013). Ecocritical and Literary Futures. In: S.C.Estok & Won-Chung Kim, Ed. *East Asian Ecocriticisms. A Critical Reader (Literatures, Cultures, and the Environment)*. New York, Palgrave MacMillan.
- [6] Richard L. Warms, R. Jon McGee. (2000). *Anthropology Theory: An Introductory History*. New York, McGraw-Hill.



**BRAND BUILDING STRATEGY FOR THAI FRAGRANCE TO GLOBAL BRAND**

Wasi Aschakulporn

*Communication Arts, Chulalongkorn University, Thailand  
Corresponding email : wasi.chula@gmail.com***ABSTRACT**

This research aims to study the building of lifestyle brands and communication strategies and to analyze the factors driving lifestyle brands and the elements that lead to the success of lifestyle branding. The research exclusively studied the cases of PAÑPURI and HARNN brands as they are the lifestyle brands that have long history and succeeded at both national and multi-national levels with regards to the researcher's access to the information. This thesis is the qualitative research employing documentary research method, in-depth interview with persons being in charge of brand building, store observation and participating the events organized by both brands. The study shows that both brands have strategies in building and communicating brands, which the process starts from: (1) defining the brand identity and its brand abstract concept. PAÑPURI has defined its brand essence as "Eastern Elegance Product" while HARNN has defined its brand essence as "Contemporary luxury Asian inspired lifestyle brand" (2) Communicating about the brand with the focuses on creating brand experiences and sharing the brands' lifestyles with the consumers. These communication strategies are typically adjusted according to investment size, distribution expansion and technology. (3) Persons who are key factors leading to the success of building lifestyle brands include visionary leaders and the staff who can reflect the brand identity as well as adopt the organizational cultures. The key factors of lifestyle branding compose of Building the brand by binding brand essence and brand story, creating the communication strategy by initiating the communication framework as well as the concrete brand encoding and communicating the brand through integrated communication tools, personal interactions and products.

**KEYWORDS:** Thai fragrance, Global brand

## INTRODUCTION

There is a lot of confusion around branding, there are multiple definitions, so what is branding? Decades ago branding was defined as a name, slogan, sign, symbol or design, or a combination of these elements that identify products or services of a company. The brand was identified of the elements that differentiated the goods and or service from the competition.

Today brand is a bit more complex, but even more important in today's world of marketing. It's the perception that a consumer has when they hear or think of your company name, service or product. That being said the word "brand" or "branding" is a moving target and evolves with the behavior of consumers, I think of it as the mental picture of who you as a company represents to consumers, it's influenced by the elements, words, and creativity that surround it.

Globally spa and wellness is poised to become the world's next trillion-dollar industry. This is according to US-based Women's Marketing 'Health & Wellness Industry Marketing Trends 2017' original consumer research designed to explore and explain the modern 'health and wellness' consumer mindset and delve into wellness trends. Wellness, the report said, is a mindset that has seeped into the lives of the everyday woman and has emerged as a lifestyle that is here to stay.

In addition to being one of the world's leading holiday destinations, Thailand has also earned its reputation as Asia's Spa Capital. The country boasts a significant number of spas and many of them are ranked as best in class worldwide, with Thailand's spa business growing exponentially year on year due to increased interest from key North Asian source markets.

Pañpuri is a modern day luxury skincare, wellness and home ambiance brand that takes pride on the best Eastern botanical ingredients and utilizes a wide range of ancient and rich plants, roots and flowers. Pañpuri products include skin care products for head to toe pampering, home ambiance, as well as luxury gifts and exclusive spa creations for aromatherapy and massage—all of which are based on ancient Eastern traditions of natural remedies for the betterment of the body, mind and soul.

At HARNN, they take pride in their heritage; the legacy of our ancestors is treasured and their wisdom has been embraced with gratitude. HARNN Heritage Spa focuses on restoring natural balance of body and mind.

Inspired by the practice of traditional Asian medicine and naturopathy, each HARNN treatment is thoughtfully designed to enrich your relaxing experience. Here, only the finest botanical ingredients are used to create and complete harmony between man and Mother Nature.

## MATERIALS AND METHODS

This research is a qualitative research (in-depth interview) by interviewing executives and individuals involved in the PAÑPURI and HARNN branding.

### 1. Brand building process

Duane E. Knapp (2000). How to process Branding It consists of 5 steps called D.R.E.A.M and described the 5-step branding as follows:

1. Differentiation is the difference between the consumer and the The brand is different from the competition.
2. Relevance is Build relationships or brand links with consumers. By branding certain attributes. I think that looks exactly. Consumers are connected to each other. Trade mark
3. Esteem is to create value or praise the brand. Valuable in itself. To get consumers to accept the brand. I feel that the brand is very important and valuable to consumers.
4. Awareness is the awareness of brand awareness. Consumers are aware of the difference in brand and value.
5. Mind's eye is the impression. The consumer is a good feeling for the consumer. Brand Impressions

### Brand building Strategy

Paul Temporal (2002) Firstly, a brand always has to be relevant to the changing needs and lifestyles of consumers, and sometimes new developments in technology can allow for large and disruptive market innovations. Secondly, re-invent your brand if necessary to keep it relevant to your particular customer group. Thirdly, never think from the inside out; always think from the outside in!

### 2. The concept of Brand Communication.

Feldwick (2009) said communication rebranded website is a process that will make the consumer experience and brand recognition in grand style. Perception will lead to satisfaction evaluation as an attitude towards the brand and will lead to future decisions.

Communication tools used to communicate the brand in Feldwick (2009)'s view are PR (Public Relations) is a tool used to communicate a tight budget. But be careful. Because the owner of the brand does not have the right to check articles that journalists are trying to offer.

New media or Internet media (New Media / Internet) is to communicate information through the Internet network, including web pages (Webpage) or website (Website) rebranded website that provides detailed information online social networks Social Networks like Facebook, Instagram, , Twitter , as well as broadcast and audio application sites such as Youtube. etc.

Product / Packaging Design ( Product / Packaging), Product and packaging design is critical to the brand's design criteria to produce P: good packaging, beautiful to engage consumers emotionally. And create a competitive advantage over competitors.

In addition to communication tools Brando's such a communication rebranded website to communicate more with new formats like the opportunity to tell consumers (Word of Mouth) Communications Employees (Employee / Brand culture and Standard Service Behavior)

Also in Temporal (2010)

1. Advertising
2. Point of sale
3. Permanent media
4. Correspondence
5. Literature
6. Public relations
7. Personal presentation
8. Impersonal presentation
9. Product/Packaging
10. Direct marketing
11. Sales promotion
12. Sponsorship
13. New media/Internet
14. Brand event
15. Customer relationship management

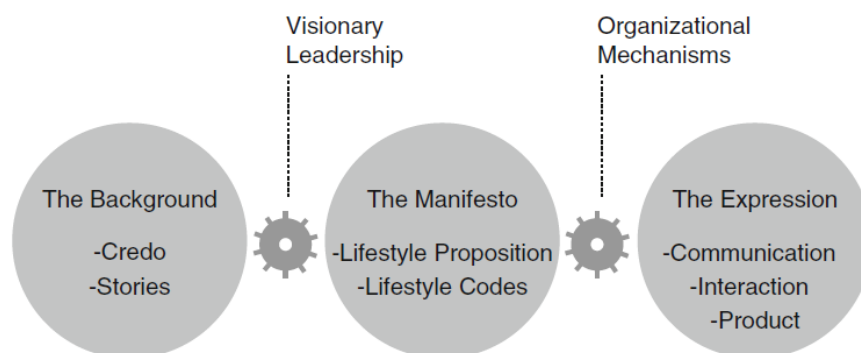
## Conclusion

Brand communications may do three things for a brand. They can:

- provide information about the brand;
- make a brand famous and familiar;
- create distinctive patterns of associations and meanings that make the brand more attractive and saleable.

## 3. Lifestyle and lifestyle brand approach

Saviolo and Marrazza 2013



A model for Lifestyle Brands  
Source : Saviolo and Marrazza 2013

## The Background

The Background of a Lifestyle Brand includes both its Credo and series of stories capable of involving its 'followers', fuelling the desirability and the brand mythology. The Credo is represented by a few simple, fundamental attributes that describe the unique and original perspective the brand has of the world.

### The Manifesto

If a Lifestyle Brand wants to represent an individual or a group of individuals, it needs to propose a distinctive and original perspective on the world and make it immediately recognisable through some codes that represent it. These two components constitute the Manifesto of the brand and can be defined as the Lifestyle Proposition and the Lifestyle Code respectively.

### The Expression

The Brand Manifesto becomes tangible through communication activities, direct interaction with the consumer, especially in-store, and through its products or services. These three components are the expression of the brand. Especially for products with a high symbolic content, the expression has increasingly moved towards the construction of a holistic experience across all touch points and relationships with the customer.

## RESULTS

Pañpuri is a modern-day luxury skincare, wellness and home ambiance brand that takes pride on the best Eastern botanical ingredients and utilizes a wide range of ancient and rich plants, roots and flowers. Pañpuri products include skin care products for head-to-toe pampering, home ambiance, as well as luxury gifts and exclusive spa creations for aromatherapy and massage—all of which are based on ancient Eastern traditions of natural remedies for the betterment of the body, mind and soul.

At HARNN, they take pride in our heritage; the legacy of our ancestors is treasured and their wisdom has been embraced with gratitude. HARNN Heritage Spa focuses on restoring natural balance of body and mind. Inspired by the practice of traditional Asian medicine and naturopathy, each HARNN treatment is thoughtfully designed to enrich your relaxing experience. Here, only the finest botanical ingredients are used to create and complete harmony between man and Mother Nature.

### Part 1: PANPURI and HARNN branding strategies are summarized as follows.

#### 1) Branding Strategy in Overview

Considering the origin of the two brands, it was found that HARNN before the brand was established in the form of contract manufacturing. Soap that uses raw materials from rice bran oil is sold by contract manufacturing. OEM To foreign customers after approx. 2 He started the year at Brandeis HARNN created in 2002 by the cancellation of OEM. All began producing K Bearing Aroma Therapy Spa with a rebranded website. HARNN, in line with the Auman (2009) concept, proposed that "before creating any brand. Will develop as a lifestyle brand. Should start branding with a single product category. To create clarity in the minds of consumers and be prepared to expand the brand in the future. "

The brand began branding PANPURI since 2003. Initially, it has a range of skincare products and toiletries Organic Spa. 2 brand new hotel was rebranded from scratch building a brand at all PANPURI and HARNN. The process is similar, starting from the private investment is not much.

2) Market Analysis Process This allows us to see business opportunities.

3) The identity of the brand, which is the foundation or heart of the product.

4) Communication to the brand's target audience.

5) The process of brand extension and restructuring Brando's new products to expand the system.

The process of building a brand at the above line with the strategic concept of Arnold (2002) and Keller (2008). But since PANPURI HARNN and was rebranded its Android-based lifestyle. It is based on an in-depth detail that is different from the general branding found by the scholars above. The identity of the brand's clear that reflect lifestyle. Including brand communication details based on the concept of Saviolo & Marazza (2013).

2. Strategy at Brandeis 2 rebranded website has analyzed the situation in the market by consumers, competitors and analyze their own analysis of the strengths, weaknesses, opportunities and threats which it's possible. In line with the concept of Aaker (1996)

When started building a brand. PANPURI offers products to represent the East. The essence of the brand is " Eastern Elegance Product " reflects the East. The raw material of natural vegetation that is 100% organic. Blend the elegance of the brand. HARNN presents products to represent Asia The core of the brand's "Contemporary Luxury Lifestyle Asia Brand" emphasizes contemporary luxury lifestyle hotel brand in Asia.

### 3 strategies to build brand Grand in determining the identity of at Brandeis.

The identification of the brand is the designation of the brand's components. (Credo) Or the essence of the brand. (Brand Essence) This will be the guideline for the product design framework. And branding (Brand Positioning) The unique formulation and rebranded website (Brand Identity). To communicate to the consumer. Identification of the essence. It shows the difference of goods. (Differentiate Product) Superior to competitors It reflects the brand personality (Brand Personality) And branding. Product Article Source (Source) or position the brand. Consistent with the Temporal 2010 concept.

The results showed that. The core provisions or 2 rebranded at a depth of more than just the presentation of the brand in duty (Functional. ) According to the concept of Saviolo & Marazza 2013 In terms of defining the identity of the product and the origin of the goods offered between revolutionaries Science and Culture of Eastern PANPURI and medicine Thailand, China and India HARNN consistent with the Brand Stories based on the concept of Saviolo & Marazza2013.

The placement of the two brand's positioning in the minds of consumers. In line with Arnold (1992) and Niche Market

The communication also affects Donna Luck's rebranded website. (Brand Identity) code or the brand (Brand Code) concrete so that consumers recognize as a color logo design. Is the identity of all products. Targeted through strategic brand communication based on the concept of Saviolo & Marazza 2013.

#### Part 2: Brand Communication Strategy

Results showed that the second batch Grand modify strategies based on the size of investment, technology and expand distribution conclusion PANPURI. Divide the brand communication strategy into 4 strategies.

1) Brand communication strategy through the product is the first phase, the use of Word of Mouth Brochures, leaflets were

2) Integrated communication strategies to convey the brand's target consumer communications activities to share experiences. It also uses storefronts and sales representatives to communicate the brand using other channels.

3) The communication strategy through the famous personalities who convey the brand's campaign.

4) Communication via integrated online and offline access to the consumer.

The HARNN brand communication strategy, specific target audiences. This communication is based on the model and size of the business at the beginning by using the Event Catalog Wheels and publicity. Including a storefront and employees is an important channel HARNN addition to strategic marketing communications, integrated both Above the Line and Below the Line.

Brand communication strategy both at Brandeis 2, details vary, but the two share a common point at the Grand same. Start a business with less money. It targets customers in the international market, thus emphasizing the international distributor that specializes in the area as an aid in the brand communication in the international market, so the 2 Brand's use of communication for the size of the investment. It focuses on integrated communication strategies using a variety of communication tools. Consistent with the concept of Saviolo & Marazza 2013, "Today's communication tools are complex. The presentation Brand owners must use multiple channels, integrate them properly. It is important to take into consideration the media type of the consumer. "

Part 3 driven at Brandeis.

Driven Brand's 2 rebranded website associated with the two Brandeis has its similarities, namely the executive has the vision, the strategic vision that rivals a rebranded website has staff strength to do so. a mechanism driven by the brand's vision manages to convey the identity of the brand's go-to target consumer groups. And the staff will be able to do that. The result of the management is effective management of personnel.

## CONCLUSIONS AND DISCUSSION

### 1. Strategy to build brand Grand.

First, create a brand. 2 rebranded website has studied the entire situation by analyzing market and competitor analysis, consumer branded themselves as having possibilities. In line with the concept of Aaker (1996). Strategies to build brand Grand 2 Grand Battle is a brand new and with a lifestyle based products. We create products that are differentiated according to the Knapp (2000), and to determine its position based on Arnold (1992). Customers and Niche Market was rebranded the Grand 2 is a Lifestyle Brand has rebranded By Dawn framework Lifestyle Brand Approach. Based on the concept Saviolo& Marazza2013. PANPURI by the provisions of your laws at Brandeis. (Credo) or the core of the brand is " Eastern Elegance Product "on the eastern part HARNN focus on Asia by the provisions of the Brandeis website (Credo), or the essence of the brand at the" Contemporary Luxury Lifestyle Asia Brand "2 rebranded website, featuring ingredients from nature. 100 %

**2. Communication Strategy** at Brandeis study found that 2 Brando at an early stage with limited funds. So do not focus on advertising on the Word of Mouth but later adjusted. Change strategy based on investment size. Communication technology from Below the Line is Above the Line. And the use of new communication media (New Media) marketing communications and new generation Outside in the communication to the target consumers.

**3 Driven Brando at Brando**, the two devices are the driving factors for the success of Brandt's rebranded by the end goals. By the executives who have the vision and the bugs work in organizations with experience and ability is a significant driver.

## DISCUSSION

Summary of research results. It is evident that the elements of branding, the lifestyle, the three elements are behind the brand, the framework or the branding approach. And presenting the brand through communication 2 Brand's concept of Saviolo & Marazza 2013 The researchers also pointed out that each brand elements work together in branding PANPURI and. Every part of HARNN is different. But do the same. I do not have any components. It concludes that all three elements of the brand are critical to the drive and success of the brand .

## ACKNOWLEDGEMENTS

This thesis was well done. With the help of Associate Professor Dr. Worawan Ongkrutraksa Thesis Advisor This is a great way to do research. It also helps solve the problems that occur during the operation. Thank you to All professors for advice and assistance in all aspects of research. In addition, thanks to friends in the faculty, everyone is encouraged. And help with this thesis. Finally, the researcher would like to thank the parents and family for the opportunity to study. The researcher always encourages and encourages the researcher.

## REFERENCES

- [1] Aaker, D. (1996). *Building strong brands*. New York: The free Press.
- [2] Arnold, D. (2003). *The handbook of brand management*. Reading, Mass: Perseus Books.
- [3] Clifton, R. and Ahmad, S. (2009). *Brands and branding*. New York: Bloomberg Press, pp.127-142.
- [4] Designing an MBA. (2017). *3 steps for building a lifestyle brand - Designing an MBA*. [online] Available at: <http://designinganmba.com/2010/12/02/lifestyle-brand/> [Accessed 18 Dec. 2017].
- [5] Keller, K. (2013). *Strategic brand management*. Harlow: Pearson.
- [6] Knapp, D. (2000). *The brand mindset*. London: McGraw-Hill.
- [7] Kotler, P. and Keller, K. (n.d.). *Marketing management*.
- [8] Saviolo, S. and Marazza, A. (2013). *Lifestyle brands*. Basingstoke [u.a.]: Palgrave Macmillan.
- [9] Temporal, P. (2010). *Advanced Brand Management*. Hoboken: Wiley.
- [10] Temporal, P. (2002). *Advanced brand management: From vision to valuation*. Singapore: John Wiley & Sons.



**INTERNAL FACTORS RELATED TO CUMMUNITY EMPOWERMENT OF A SELF-SUFFICIENT ECONOMY VILLAGE MODEL, KOH CHAN DISTRICT, CHONBURI PROVINCE**Ausanakorn Tavarom<sup>a,\*</sup>, Wisit Yimyam<sup>b</sup><sup>a</sup>*Graduate School of Public Administration, Burapha University, Chonburi, 20131*<sup>b</sup>*District Office of Nongyai, Chonburi, 20131, Thailand**\*Corresponding author. Tel.: 0944799628; fax: 038745851 Ext. 120 E-mail address: ausa.tavarom@gmail.com***ABSTRACT**

This study aimed to: 1) examine the level of community empowerment of the model Self-Sufficient Economy Village, Koh Chan District, Chonburi Province, and; 2) explore internal factors that affect the community empowerment of the model Self-Sufficient Economy Village, Koh Chan District, Chonburi Province. The quantitative research was conducted by gathering sets of questionnaires. The population of this study was 392 villagers whose names were registered in the Self-Sufficient Economy Village, Koh Chan District, Chonburi Province, and Multi-Stage sampling was employed to select the sampling. Frequency, percentage, mean, standard deviation, and Stepwise multiple regression analysis were applied as research instruments. The results revealed that the Self-Sufficient Economy Village, Koh Chan District, Chonburi Province, was in a high level of community empowerment ( $\bar{x} = 4.03$ , S.D. = 0.69). There are five major factors that affect community empowerment. Local wisdom and culture of the community (Beta=0.191\*\*) was the highest effect related to community empowerment, then management of community processes was at (Beta=0.190\*\*). Natural resources and environment (Beta=0.172\*\*), community leader (Beta=0.126\*\*), and participation of local people (Beta=0.123\*\*) followed in order of importance, respectively.

**KEYWORDS:** Community Empowerment; Internal Factors of Community; Self-Sufficient Economy Village Model; Chonburi Province



## INTRODUCTION

Chonburi province is a targeted area for investment in measures and policies of both the public and private sectors. Investment has stimulated rapid growth of economic and social systems in Chonburi province; it has affected people's lives in the area in terms of economy, society, politics, participation of the locals, and life and property safety.

Koh Chan district has also been affected by the expansion of the economy and society in Chonburi province like other districts. Even though they are located both in rural and urban areas that face many problems, some communities have prepared by adjusting themselves and determined to implement the Self-Sufficient Economy philosophy to develop their communities. Moreover, governments and the private sector support budgets and a body of knowledge to develop a Self-Sufficient Economy village model instead of having other communities set the regulations. Thus, several communities in Koh Chan district have undergone community empowerment. Members of the community have a good quality of life and live happily. Consequently, the researcher would like to study the internal factors that have impacted community empowerment of a model Self-Sufficient Economy village, Koh Chan district, Chonburi province.

This study aimed to: 1) identify the level of community empowerment of a model Self-Sufficient Economy Village, Koh Chan district, Chonburi province, and; 2) explore related internal factors that have affected community empowerment of a model Self-Sufficient Economy Village. This study helps to identify levels of community empowerment and the level of community empowerment of this model Self-Sufficient Economy Village in Koh Chan district, Chonburi province. In addition, it may provide related factors that affects community empowerment in the model village. The results could be useful to related organizations to utilize this data to support other communities for community empowerment, and it can be a guideline to develop community empowerment in other areas.

## MATERIALS AND METHODS

This study utilized quantitative research methods. The population was people whose names were registered in a model Self-Sufficient Economy village including 18 communities totaling 18,787 people. The samples included 392 people, which was calculated based on Taro Yamane's sample calculation with the error set at 0.05. Multi-stage sampling was applied in the second step. In stage 1, the villages were divided into 18 sets. In stage 2, the 18 villages were proportionally grouped by each village. In stage 3, random sampling was applied by selecting names from a list of people in the villages with the use of computer. The research instrument was a set of questionnaires, consisting of 3 parts: general information, internal factors of the community, and community empowerment.

First, general information of the sampling employed closed questions. The questions included age, duration of living in the village, income, education level, and career.

Second, part II dealt with internal community factors, and rating scales were utilized. The impact factors related to community empowerment were community leaders ( $\alpha=0.929$ ), people's participation ( $\alpha=0.793$ ), community management process ( $\alpha=0.944$ ), local wisdom and community cultures ( $\alpha=0.917$ ), and natural resources ( $\alpha=0.860$ ).

Part III focused on community empowerment, and rating scales were applied ( $\alpha=0.877$ ). The rating scales in Part II and Part III were divided into 5 levels: 1 (Slightly Agree), 2 (Partially Agree), 3 (Moderately Agree), 4 (Mostly Agree) and, 5 (Strongly Agree), respectively.

General information about the participants was analyzed using frequency and percentage. Mean and standard deviation were applied to analyze community empowerment and its related factors. Finally, Pearson's correlation coefficient and multiple linear regression (Stepwise method) were applied.

## RESULTS

The participants were aged around 44 years, and had lived in the village for an average of 36 years. The monthly income was around 9,803 Baht. The majority of villagers had education level of Prathomsuksa (Elementary or primary school level) (51/53%), and their careers were mostly part-time workers (37.50%). Based on the analysis, it was found that the community empowerment of the village in Koh Chan district was at a high level ( $\bar{x} = 4.03$ , S.D. = 0.69). Regarding the analysis of the villagers' opinions, the highest aspect was leaders of the community ( $\bar{x} = 4.13$ , S.D. = 0.52), local wisdom and community cultures ( $\bar{x} = 3.99$ , S.D. = 0.48), community management processes ( $\bar{x} = 3.98$ , S.D. = 0.46), participation ( $\bar{x} = 3.99$ , S.D. = 0.48), and natural resources and environment ( $\bar{x} = 3.92$ , S.D. = 0.54), respectively.

Comparing the 5 factors, correlation coefficients ranging from 0.52 to 0.62 were found with a positive relation and an overall statistical significance of 0.01. Comparing correlation coefficients for each of the 5

factors, it was revealed that correlation coefficients ranged from 0.52 to 0.76 with a positive relation and an overall statistical significance of 0.01. (See Table 1)

**Table 1** Correlation Coefficients between Internal Factor and Community Empowerment of a Model Self-Sufficient Economy Model, Koh Chan district using Pearson's correlation

Variables	Y	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>
Community empowerment (Y)	1.00	0.52	0.56	0.62	0.61	0.57
Leaders of the community (X <sub>1</sub> )		1.00	0.64	0.61	0.57	0.53
Participation (X <sub>2</sub> )			1.00	0.72	0.62	0.59
Community management processes (X <sub>3</sub> )				1.00	0.76	0.68
Local wisdom and community cultures (X <sub>4</sub> )					1.00	0.70
Natural resources and environment (X <sub>5</sub> )						1.00
$\bar{x}$	4.03	4.13	3.95	3.98	3.99	3.93
S.D.	0.50	0.52	0.49	0.46	0.48	0.50

\*\* p < 0.01

The analysis of Multiple Linear Regression using Stepwise method found that local wisdom and community cultures, community administration processes, natural resources and environment, community leaders, and people's participation had impacts on community empowerment with a level of statistical significance at 0.01. Factor loadings were 0.191, 0.190, 0.172, 0.126 and 0.123 respectively. Natural resources and environment impacted community empowerment the most. (See Table 2)

**Table 2** Factors Loading that Have Effects on Community Empowerment of a Self-Sufficient Economy Village Model, Koh Chan district using Stepwise Method.

Variable	Beta	b	Sig.
Constant		0.736**	0.000
Management processes of the community	0.190**	0.209**	0.005
Local wisdom and cultures of the community	0.191**	0.198**	0.003
Leaders of the community	0.126*	0.121*	0.014
Natural resources and environment	0.172**	0.141**	0.002
Participation	0.123*	0.125*	0.035

R = 0.685, R<sup>2</sup> = 0.469, S.E.est = .368, F = 68.128\*\*

\* p < 0.05, \*\* p < 0.01

## CONCLUSIONS AND DISCUSSION

1. Based on the study, it was found that people agreed that the model Self-Sufficient Economy, Koh Chan district, was at the highest level of community empowerment, which is related to their existing social capital. It can be said that the area is rich in natural resources and has a fruitful environment. There are trees, various kinds of plants, suitable lands for farming, dams for agriculture, and leaders who work for the people, and people who love one another and unite. When they have activities in their community, the locals always participate, such as local cultural traditions, making merit in the temples, laying community plans or making suggestions and finding solutions to local problems. In addition, their ways of life follow self-sufficiency economy principles. Villagers engage in mutual activities such as having extra jobs which are not only

agricultural, but join together to save money in the form of a Saving for Production Group (SPG) based on the Community Development Department's policies. The Community Development Department freely shared information for people who are interested in it. There are both savings options and low interest rate loans to support the villagers. The profits are their welfare. In addition, the government and private sector support the villagers with budgets, knowledge and activities to help increase their capacity for community empowerment, and help the people to stand on their own feet. Wannathum Kanjanasuwan (2010) also insisted that 7 things for community management processes leading to community empowerment included the participation of local people, knowledge exchange, restoration processes, reproducing successes, and creativity.

Moreover, the study showed that community empowerment in the village is at a high level (average 4.03). Amphai Sawangsri (2009) agreed that Sam Chuk market community, Sam Chuk district, Supanburi province, is also at a high level. On the other hand, Tatiya Kalsuwan (2003) revealed that Khao Hin Sorn Royal Development Study Center, Panoksarakarm District, Chachoengsao province, agreed that their community empowerment was at a moderate level.

2. The study found that local wisdom and community cultures is the main factor leading to community empowerment because the village at Koh Chan district, Chonburi province, is related to several previous studies. Paichon Tanud (2009) found that social capital, beliefs, traditions, cultures, and good support from the public and private sectors have a high impact on community development. Patcharawadee Trichai (2009) pointed out that one of the major factors that could turn a critically problematic society in many aspects to community empowerment and becoming independent is having social capital in several practical aspects such as love and unity, being in good relationships within a seniority system, local wisdom, and having a proactive attitude and making good products. Amphai Sawangsri (2009) found that local wisdom and community cultures (Beta=.427) were Sam Chuk market community's strength with a statistical significance of 0.05. Somboon Thumlungka (2013) also supported the idea that local wisdom, values, cultures, and traditions are aspects that have an impact on community empowerment.

3. The study suggests that community management processes led to community empowerment. The village in Koh Chan district set up its own internal organizations such as a village committee, Saving for Production Group (SPG), Farm Women's Group Association, carer group, and OTOP group, and the village committee clearly focus on their duties. They also set regulations in the village, identify work instructions, allow people's participation, exchange knowledge, and learn together. The community projects should emphasize working together, thinking together, presenting together, following up, and evaluating projects.

The results of the study are also related to information from the Community Development Department (2006) which suggested that an empowered community needs administrative and problem solving abilities within the community. There are 6 factors to manage as follows : (1) information; (2) places to share and exchange knowledge; (3) management to increase opportunities for people in the community to communicate with each other; (4) a community plan; (5) plan implementation or mutual activities presentation; (6) managing community funds and a model organization for leaders to develop community empowerment. There are many previous studies. Tatiya Kalsuwan (2003) pointed out the importance of internal community factors, including learning together in order to be independent and having their own careers, participation (thinking together, planning together, making it happen, and following up on the results). Thanachot Inthisaen (2005) revealed that the community management aspect (Beta=.163) has an impact on community empowerment with a statistical significance of 0.01. Parinya Singrueng (2008) pointed out that effective management reflects the abilities of interdependence and being accepted by others leading to community empowerment. Amphai Sawangsri (2009) suggested that community administration is also a factor related to community empowerment. Somboon Thumlungka (2013) suggested that learning processes have an impact on community empowerment with the local wisdom in Chiangrai province.

4. The study also revealed that natural resources and the environment is the third place that has an impact on the community empowerment. Since Koh Chan district is rich in natural resources, the villagers have been able to utilize natural resources for consumption in their daily lives. A model Self-Sufficient Economy village has activities to help preserve its natural resources and environment such as landscape improvement, waste segregation, and raising awareness of the importance of natural resources in the village and natural resources protection from destruction by others. This idea is related to the Office of the National Economics and Social Development Board (2011), where it is stated that natural resources are an important aspect that bring about economic expansion, and that natural resources can be utilized in many ways such as making more products or helping people with poverty problems.

Moreover, the results of this study revealed similarities to previous studies. Amphai Jantharakas (2000) pointed out that the presence of social capital in each community leads to community empowerment such as

cultural capital, natural resources, personnel, groups/organizations, relatives, and networks because a community uses the basic social capital to create social stability and lifelong community development for a community. Parinya Singrueng (2008) stated that natural resources and a comprehensively managed environment is a factor bringing about community empowerment of Ban Don Moo community. Wannathum Kanjanasuwan (2010) found that the processes leading to community empowerment management caused effectiveness of community development resulting in community empowerment, and community foundation is an aspect that is related to community empowerment. In addition, Vittaya Chandang (2011) emphasises resources management in a community based on a self-sufficient philosophy leading to community empowerment.

### ACKNOWLEDGEMENTS

This article would not have been completed without the help of various people who contributed valuable data, opinions and encouragement towards the success of this research. We would like to thank all the samples for their cooperation and assistance. Furthermore, we are grateful for the valuable input and the help in data collection from all the staff from the District Office of Kho Chan, Chonburi.

### REFERENCES

- [1] Chandang, V. (2011). The development for strengthened community management corresponding to sufficiency economy in the upper central provinces of Thailand. Bangkok: Valaya Alongkorn Rajabhat University.
- [2] Inthisaen, T. (2005). The Factors Affecting a Community Strength: A Case Study of Phurua District, Loei Province. Bangkok: Sukhothai Thammathirat Open University.
- [3] Janthrakas, A. (2000). *Social Capital Influencing Community's Strength*. Chiang Mai: Chiang Mai University.
- [4] Kalsuwan, T. (2003). The Factors Affecting a Community's Strength: A Specific Study of a Village around the Khao Hin Sorn Royal Development Study Center, Phanom Sarakarm District, Chachoengsao Province. Bangkok: Thammasart University.
- [5] Kanjanasuwan, W. (2010). Management Processes for Strengthening Communities Patterns, Factors and Indicators. *Thai Journal of Public Administration*. Vol. 8(2), 119-158.
- [6] Office of the National Economics and Social Development Board. (2011). *The Eleventh National Economic and Social Development Plan (2012-2016)*. Bangkok: Office of the Prime Minister.
- [7] Sawangsri, A. (2009). The Factors Affecting Community Strength of Samchuk Hundred Years Market in Samchuk District, Suphanburi Province. Bangkok: Sukhothai Thammathirat Open University.
- [8] Singrueng, P. (2008). Community's Strength: A Case Study of Ban Don Moo, Kam Pey Sub-District, Trakan Puechpol District, Ubon Ratchathani Province. Ubon Ratchathani: Ubon Ratchathani University.
- [9] Tanud, P. (2009). The Participation of Community Leaders and Citizen for a Strong and Livable Community Development: A Case Study of Muang Kanpattana Municipality, Mae Tang District, Chiang Mai Province. Chiang Mai: Chiang Mai University.
- [10] The Community Development, Department Ministry of Interior. (2006). *A Manual of Work Procedures Community Network based on Community Development Plan*. Bangkok: Department Ministry of Interior.
- [11] Thumlungka, S. (2013). Local Wisdom-Based Model to Build Up Community Strength in Chiang Rai Province. *Journal of Education Naresuan University*. Vol. 15(2), 58-66.
- [12] Trichai, P. (2009). An Analysis of Community Strength of Nongklangdong Community, Silaloi Sub district, Samroi yod District, Prachuap Khirikhan Province. *Romphruek Journal*. Vol.27 (1), 126-159.

**PHONETIC CHARACTERISTICS OF INTONATION SYSTEM OF TAI IN QUY HOP (NGHE AN)**Le Thi Sao Chi <sup>a,\*</sup> Nguyen Hoai Nguyen <sup>b</sup><sup>a</sup> Doctor, Vietnamese linguistics, Vinh university, 182 Le Duan, Vinh city, Nghe An province, Viet Nam country<sup>b</sup> Doctor, Vietnamese linguistics, Vinh university, 182 Le Duan, Vinh city, Nghe An province, Viet Nam country\* Corresponding author. Tel: 0986.878.868 E-mail address: [saochidhvinh@gmail.com](mailto:saochidhvinh@gmail.com)**ABSTRACT**

Quy Hop District (Nghe An Province) is the second most populated residence of the Tai Tay – Muong in Vietnam, only after Son La Province. As both Vietnamese and Tai Tay – Muong is monosyllabic, hence, sharing some similarities in the phonetics including the beginning sound, syllable and intonation but still existing certain differences. The intonation system of Tai Tay – Muong contains 5 tones which is different from Vietnamese tones but shares some similarities with the intonation system of local dialect in Nghe Tinh. This research focuses on the following contents: 1/ Describe the phonetic characteristics of intonation system of Tai Tay – Muong in Quy Hop (Nghe An); 2/ Select the visual-intonation display of Tai (due to the lack of diacritics in Tai transcription). The result is expected to support the conservation and development of Tai as well as the teaching and learning this language in mountainous districts of Nghe An.

**KEYWORDS:** Tai Tay - Muong language, phonetic, tone system, vocal range, syllable



## MATERIALS AND METHODOLOGY

The Tai people in Nghe An comprise three main groups: 1/ Tay Muong (also known as Tay Chieng, Tay Do, Hang Tong); 2/ Tay Thanh (also known as Man Thanh, Tay Nhai); 3/ Tay Muoi. Despite some minor phonetic distinctions, all of the above-mentioned groups speaks the Tai language (Quam Tay) in which the Tai Tay Muong (along with Lai-Tay) in Quy Hop District is the most typical one.

To describe the phonetic characteristics of intonation system of Tai in Nghe An, the researchers conducted field research on Tai Tay Muong group in Quy Hop, using headphones and recorders to record the accent of the following collaborators: (1) Sam Van Binh, 65, Yen Luom Hamlet (Chau Quang, Quy Hop), (2) Vi Hai Sung, 73, Tham Hamlet (Chau Cuong, Quy Hop), (3) Vi Ngoc Chan, 71, Tham Hamlet (Chau Cuong, Quy Hop), (4) Lo Duc Mau, 68, Yen Luom Hamlet (Chau Quang, Quy Hop), (5) Vi Kham Mun, 73, Yen Luom Hamlet (Chau Quang, Quy Hop).

Criteria for selecting collaborators include: (i) being aged 60 or over; (ii) being Tai people in Quy Hop; (iii) stably dwelling in Quy Hop. The collaborators pronounced some isolated words (syllables) which were recorded on computer via Labtech AM 222 microphone, 22.050 Hz sampling rate; 16-bit digital signal processor; materials were recorded, processed and analyzed by CECIL, ASAP and CoolEdit 2K softwares.

In terms of physics, tone is the movement of intonation contour of fundamental frequency (F0) during the syllable pronunciation. The path of F0 contour can be represented in form of curve such as the graph of sound wave during a time period. The fundamental frequency (F0) is relative but characteristic for each tone. The F0 contour is determined by the oscillation frequency variations of the vocal cords which are controlled by the laryngeal muscles and the pressure from the glottal airstream. Therefore, tone is the combination of pitch standards, the regulation of laryngeal muscles, and the glottal airstream to create various types of voice quality.

By using computer program WINCECIL to analyze the tones of Tai Quy Hop (Nghe An), we can determine the absolute pitch (in Hertz-Hz) at one point in time (measured by milisecond-MS = 1/1.000 second). However, when doing research on tonal languages, linguists assumed that the tones relate to relative pitches instead of absolute pitch. With CECIL and ASAP program, we can divide the pitch on logarithmic scale, in Semitone (St). The relationship between St and Hz is calculated by the formula:  $F0(St) = 39,86 \cdot \log(10) F(Hz) / 16,35$  [6].

The St scale is considered to be more appropriate in analyzing and describing the phonetic and phonological characteristics of pitch. To measure the tone contour, we determine the F0 values in St at the following points: Initial F0 (Int) is F0 value in St at the beginning of the syllable; Final F0 (Fin) is F0 value in St at the end of the syllable; Maximum F0 (Max) is F0 value in St at the highest point; Minimum F0 (Min) is F0 value in St at the lowest point. Therefore, when the tone contour descends,  $\Delta F01$  value is shown as positive; when the tone contour ascends, the  $\Delta F01$  value is shown as negative.  $\Delta F02$  value is the difference between Int and Max, or Min.  $\Delta F03$  value is the difference between Max, or Min and Fin.

After processing and analyzing collaborators' pronunciation by computer programs, we acquired phonological data about the type of sound wave, F0 contour, intensity, sound spectrum and variance of acoustic mass of the speech. These data helped us to identify and described the phonetic and phonological criteria of pitch and voice quality in the intonation system of Tai Quy Hop (Nghe An).

## RESULTS

### 1. Phonetic characteristics of intonation system of Tai Quy Hop (Nghe An)

#### 1.1. Criterion of pitch

The intonation system of Tai Quy Hop had 5 tones; based on results from processing and analyzing materials, we listed out some characteristics of pitch as follows:

- Tone 1. Collaborator number 1, 2, 4, 5 pronounced Tone 1 with the rising pitch contour: started from relatively high (4), ascended, ended at high (5); the difference between Int and Fin was not considerable. Tone 1 in Tai Quy Hop is comparable to Level Tone in Vietnamese and is similar to Vietnamese dialect spoken in Do Luong, Anh Son (Nghe An), Duc Tho (Ha Tinh). F0 values of Tone 1 measured when collaborator number 1 pronounced syllable *pay* (go) [pāj<sup>45</sup>] are indicated as below:

Int Fin  $\Delta F01$

37,5 39,2 -1,7

The Tone 1 contour, according to 5-level scale of Trieu Nguyen Nhiem, might possibly be [45].

For Collaborator number 3, the contour of Tone 1 descended (gradually) by the end of the syllable: started from relatively high (4), descended (gradually), ended at relatively low (3). This pronunciation is similar to the pronunciation of Level Tone in Vietnamese dialect in Thanh Chuong, Nghi Loc (Nghe An). F0 values of Tone 1 measured when collaborator number 3 pronounced syllable *na* (field) [na<sup>43</sup>] are indicated as below:

Int Fin  $\Delta F01$

47,1 43,8 3,3

- Tone 2. All collaborators pronounced Tone 2 with a falling pitch contour: started at relatively high (4), ended at relatively low (2). This tone is comparable to Hanging tone in Vietnamese. F0 values of Tone 2 measured when collaborator number 1 pronounced syllable *cay* (chicken) [kǎj<sup>42</sup>] are indicated as below:

Int Fin  $\Delta$ F01  
37,6 36,2 1,4

- Tone 3. All collaborators pronounced Tone 3 with a rising pitch contour starting at relatively high (3) and ending at high (5), which is equivalent to Sharp tone in Vietnamese. Its value according to 5-level scale of Trieu Nguyen Nhiem is [35]. F0 values measured when collaborator number 1 pronounced syllable *mo* (pot) [mɔ<sup>35</sup>] are indicated as below:

Int Fin  $\Delta$ F01  
36,1 48,7 -1,9

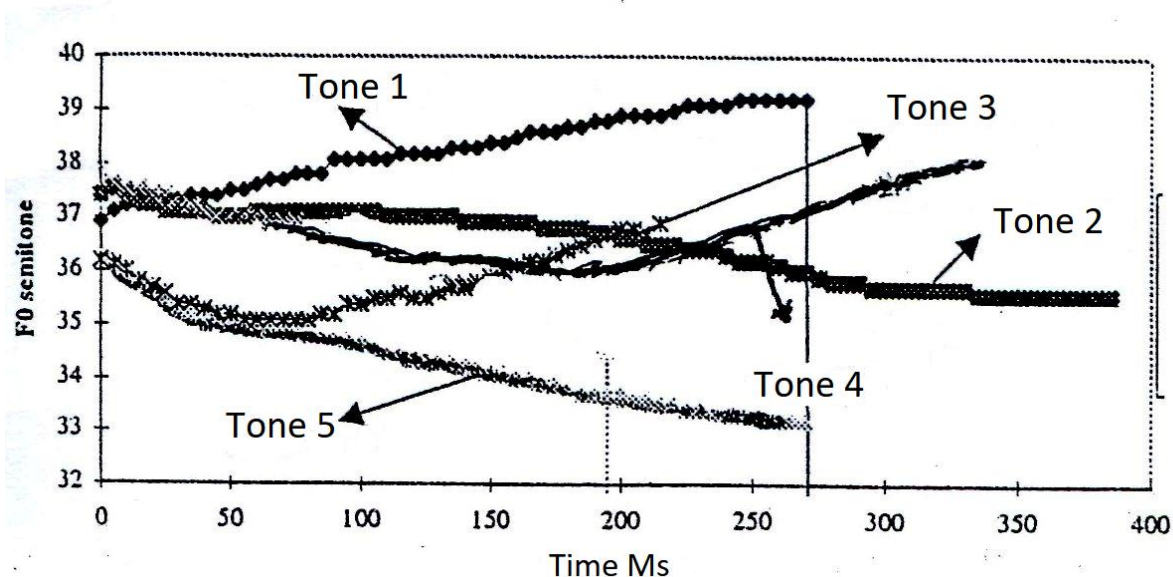
- Tone 4. All collaborators pronounced Tone 4 similar to Tone 3; starting at a lower pitch than Tone 3 (2); the pitch was remained or increased gradually at the beginning of the syllable, then rose (sharply) at the final and ended at relatively high (4). Its value according to 5-level scale of Trieu Nguyen Nhiem is [224]. F0 values measured when collaborator number 1 pronounced syllable *pêt* (duck) [pet<sup>224</sup>] are indicated as below:

Int Min Fin  $\Delta$ F02  $\Delta$ F03  
33,6 37,5 42,7 1,5 -3,9

- Tone 5. All collaborators pronounced Tone 5 with a falling contour at the end of the syllable: the pitch started at relatively high (3) and ended at relatively low (2). Tone 5 in Tai Quy Hop is comparable to Heavy Tone in Vietnamese. F0 values of Tone 5 measured when collaborator number 1 pronounced syllable *năm* (water) [nǎm<sup>32</sup>] are indicated as below:

Int Fin  $\Delta$ F01  
36,1 33,6 1,5

In summary, it is possible to present Tai Quy Hop tone system as the following graph:



### 1.2. Criteria of voice quality

According to Nguyen Van Loi, "In the narrow sense, the voice quality is the result of the regulation of vocal cords of laryngeal muscles during the vibration [6, 6]. In short, the changes in the vibrating type produce voice quality, or phonation types. When describing Vietnamese tones, some linguists also mentioned phonation types like laryngealization, glottalization, etc. as one of the pitch criteria. In case of the tone system of Tai Quy Hop, the results from data analysis allowed us to recognize some phonation types.

#### - Glottalization

In terms of articulatory - acoustic phonetics, the glottalization caused by finishing the syllable by voiceless glottal plosive; the pulmonic airstream is blocked due to the complete closure of the glottis along with an explosive noise in the glottis. The glottalization has some acoustic characteristics such as the sudden drop at



the end of the syllable on the spectrum; the enhancement of high frequency formant in the end of the syllable; syllable has short pitch (because of the sudden drop). The glottalization occurs in Tone 5 in Tai Quy Hop.

*- Laryngealization*

Laryngealization, also known as creaky voice, is the vibration of the vocal cord in which the arytenoid cartilages are pushed inward, holding the back portion of the vocal cord so that it can only vibrate at the other end (the soft muscular portion). Acoustic characteristics: clear formant on a wide sound spectrum with a narrower frequency range compared to modal voice quality; unequal spectral distribution and intensity decrease. Laryngealization occurs in Tone 4 in Tai Quy Hop.

### **1.3. Judgements**

#### *a. Identification criteria of intonation system of Tai Quy Hop*

Based on the analysis of the pitch and voice quality of Tai Quy Hop intonation system, some judgements can be formed as follows:

*- Characteristics of vocal range*

When describing the intonation system of a language, the researchers usually consider the opposition in vocal ranges of tones. Vocal range is defined as the difference in pitch levels in which intonation is realized in speech. According to Hoang Cao Cuong [2], vocal ranges are classified into generic and local vocal ranges. Generic vocal range is the pitch level at which all tones are realized and determined by the distance from all the tones' lowest to the highest point of F0. Local vocal range is the pitch level at which each tone is determined by the distance from the tone's lowest to the highest point of F0. In the intonation system of Thai Quy Hop, the distance from the highest (ending point of tone 1) and lowest point (ending point of tone 5) is not big, i.e. tones are realized within quite a narrow range (generic vocal range); it seems that tones are realized in one vocal range alone; the difference in local vocal ranges among tones is not significant. This is the most outstanding characteristic of the intonation system of Tai Quy Hop, which resembles many visual displays of intonation system of Vietnamese in the dialect in Nghe Tinh.

Theoretically, based on the local vocal range, tones are of phonology oppositions on vocal range when having the same contour and distinct local vocal range. Due to the fact that intonation system of Tai Quy Hop does not have tones with the same contour but distinct local vocal range, on the whole, vocal range is not an essential criterion to distinguish and identify tones. However, considering the pitch at the end of syllable, it is possible to classify Tai Quy Hop tones into two opposite vocal ranges: high tone group including tone 1, tone 3 and tone 4; low tone group including tone 2 and tone 5.

*- Characteristics of contour*

As described above, it can be seen that tones of Tai Quy Hop have near starting points: relatively high pitch (4), or mid (3); F0 progress of tones of first syllable does not see significant difference; but the ending points of tones may fall into different pitches: level (5) at tone 1 and tone 3; level (4) at tone 4; level (2) at tone 2 and tone 5. Hence, characteristics of the intonation contour (and even vocal range) of Tai Quy Hop are demonstrated mainly at the end of syllables. This fact proves that, in general, Tai Quy Hop tones are identified and distinguished based on the criterion of F0 contour: rising (tone 1, tone 3 and tone 4) and falling (tone 2 and tone 5).

*- Characteristics of voice quality*

In the intonation system of Tai Quy Hop, as regards phonology, tone 2 and tone 5 are falling tones; as regards phonetics, their contours F0 are slightly near, but distinguished from each other: while tone 5 is glottalized, tone 2 has a slack voice quality; tone 1, tone 3 and tone 4 are rising tones, in which tone 4 is characterized with laryngealization, tone 1 and tone 3 have modal voice. Hence, Tai Quy Hop intonations are identified and distinguished not only by criteria of pitch and contour but also by characteristics of voice quality: tone 1: rising contour, high, modal voice; tone 2: falling contour, low, modal voice; tone 4: rising contour, high, laryngealized ending; tone 5: falling contour down, low, glottalized ending.

#### *b. Intonation Tai Quy Hop in connection with Vietnamese dialects*

Actually, all Tai languages have intonations which originated from Proto-Tai [7]. Historically speaking, the formation and distribution of Tai intonations are different from that of Vietnamese. Generally speaking, Tai language in Tai groups in Vietnam, including Tai Quy Hop, has only 5 tones, whereas Vietnamese has 6 tones. In general, the phonetic characteristics of Tai language and Vietnamese intonations system are not totally similar but different in terms of vocal range, contour and phonation types. However, through description, we realize that the intonation system of Tai Quy Hop resembles the Vietnamese one regarding Nghe Tinh dialect. First, in terms of number, there are 5 tones in both Tai Quy Hop and Vietnamese Nghe Tinh dialect (tumbling tone merges with heavy tone): level tone, hanging tone, asking tone, sharp tone and heavy tone. Moreover, in Tai Quy Hop and other Nghe Tinh dialect, tones are realized in quite a narrow range (generic vocal range); it seems that tones are realized in the same vocal range; the difference in local vocal range among tones is not significant; tone contours

are quite simple and near. On a whole, the intonation system of Tai Quy Hop has lots of similarities with Vietnamese dialect in Nghe Tinh.

## 2. Selection of visual display method of Tai Quy Hop intonations

Tai language of Lai-Tay group also resembles Tai Quy Hop intonations. Tai Lai-Tay as well as other Tai languages are currently hard to use in daily conversations or for education or social communication purposes. Hence, Tai language needs to be transcribed into Vietnamese Latin letters based on the Vietnamese phonetics. However, 6 tones of Vietnamese are presented with 5 diacritics above its letters (hanging tone – “\”, tumbling tone – “~”, asking tone – “?””, sharp tone – “/”, heavy tone – “.” and level tone with no symbol), whereas Tai language in general and Tai Quy Hop in particular do not have diacritics above its letters. Hence, when transcribing Tai Quy Hop using Vietnamese Latin letters, it is necessary to determine the diacritics for 5 tones. The most simple way is to use the diacritics of Vietnamese to present Tai Quy Hop tones, meaning that, tone 1, as similar to Vietnamese level tone, has no diacritics; for example: *phom* (thin) [fɔm<sup>45</sup>], *thay* (plough) [kǎj<sup>45</sup>], *ta* (pathway) [ta<sup>45</sup>],...; tone 2, symbolized as hanging tone (as similar to Vietnamese hanging tone), e.g.: *nǎng* (white) [nǎŋ<sup>42</sup>], *xây* (egg) [sǎj<sup>42</sup>], *dìn* (land) [dɪt<sup>42</sup>],...; tone 3, symbolized as sharp tone, e.g.: *cói* (tie, tighten) [tɔj<sup>35</sup>], *mó* (cooker) [mɔ<sup>35</sup>], *pí* (you – male subject) [pi<sup>35</sup>],...; tone 4, symbolized as tumbling tone, e.g.: *nhām* (season) [muo<sup>224</sup>], *pết* (duck) [pet<sup>224</sup>], *côn* (human) [kon<sup>224</sup>],...; tone 5, symbolized as heavy tone (similar to Vietnamese heavy tone), e.g.: *nong* (you – younger subject) [nɔŋ<sup>32</sup>], *năm* (water) [nǎm<sup>32</sup>], *fà* (sky) [fa<sup>32</sup>], v.v..

## CONCLUSIONS

There are 5 tones in the intonation system of Tai Quy Hop. Tai Quy Hop tones are recognized and described based on the criteria of pitch, contour and voice quality. Field research points out that Tai Quy Hop intonation is quite simple, which is divided in to vocal ranges (high/low); contour of tones is of no significant difference, mainly presented and distinguished by the second syllable. The voice quality is various but plays an important role in identifying and distinguish tones.

Due to the fact that Tai language does not have any visual display method for intonation, when transcribing Tai Quy Hop into Vietnamese Latin letter, we propose a simple solution: to use Vietnamese diacritics to present the diacritics of Tai Quy Hop.

## ACKNOWLEDGEMENTS

This research is funded by the Center for Research - Entrepreneurship Innovation, Vinh University, under contract No 03 /2017/TTNCKNST.

## REFERENCES

- [1] James R. Chamberlain, *A new look at the history and classification of the Tai languages*, 1975.
- [2] Hoang Cao Cuong, *The intonation of Vietnamese via dialects on F0 materials*, Linguistics, 1989, Volume 4, 1-17.
- [3] Tran Tri Doi, *Onto the tone formation of certain Vietnamese-Muong dialects/languages*, Linguistics, 1991, volume 1, 67-72.
- [4] Tran Tri Doi, *Research issues: history and comparison between Vietnamese-Muong languages*, Hanoi National University Publishing House, H. 2011.
- [5] Phan Luong Hung, *Thai Van Mai Intonation: from general and historical views*, Linguistics and Life, 2001, volume 9.
- [6] Nguyen Van Loi, *Intonation of some Nghe An dialects from general and historical views*, Linguistics, 2002, volume 3, 1-11.
- [7] Graham Thurgood, *A comment on Gedney's proposal for another series of voiced initials in Proto-Tai revisited*, Studies in Southeast Asian languages, 2002.

**THE PHILOSOPHY OF EDUCATION IN VIET NAM NOWADAYS**

Tran Minh Hieu

*Faculty of Philosophy, University of Social Sciences and Humanities,  
Vietnam National University, Ha Noi, Viet Nam  
Corresponding author-E-mail address:hieu17blue@yahoo.com*

**ABSTRACT**

The philosophy of education is always essential issue of every education system. Over the past 70 years, depending on the stage of educational development, Vietnam's educational philosophy has existed and changed many times. So what is the educational philosophy in Vietnam nowadays? There are too many views on this. In this article, we present our views on this extremely important issue. The research results are based on the methodology of systematization, the methods of analysis – synthesis and comparison. We also use some conclusions of Vietnamese researchers as references. Indeed, Vietnam's educational philosophy can be divided into two periods: before 1945 and after 1945. Before 1945, Vietnam's educational philosophy was largely influenced by Confucianism, so ideal model was “quan tu” (true gentleman) people. After 1945, the country was independent, the philosophy of education was aimed at training the new socialist people. This change, one side, meets the requirement to maintain social stability, but the other side, is not paying attention to individual people and their creation. This leads to the crises of the whole education system, especially in the context of globalization and internationalization. The new context is setting new requirements for the educational philosophy of Vietnam. From a philosophical point of view, with reconsidering the human nature in general, we suppose that the new educational philosophy of Vietnam nowadays must be training freedom, creativity and bravery people, on the basis of a human. In this article, we will raise different views of many scholars about it and present our points of views on this extremely important issue. In this article, we will denote different conceptions of many scholars about it and take our view on this extremely important issue. Here after indicating the educational achievements of Vietnam in the past, we introduce the system of perceptions about the human in Vietnamese society today and regarding this as the basis for building the philosophy of education and showing the basic ideas of the educational philosophy, which exists in Vietnam nowadays. Finally, we state our views on this issue. It is a combination of ideas that are difficult to say a sentence.

**KEYWORDS:** Education, Educational philosophy, Viet Nam, at the present.

## INTRODUCTION

The education of every nations is built on five pillars, such as the educational philosophy or the educational goal; Content, curriculum, teaching methods, assessment organization, or what to learn and how to learn; Teaching staff or who teach ?; Facilities, equipment, financially...And finally, the educational management system, or how to learn? Therefore the philosophy of education is always the vital issue of every education. In this report, we will present the current philosophy of education in Vietnam. The article has 4 sections. Part 1 discusses the overview of the history of Vietnamese educational attitudes, Part 2 presents the way of looking at the human in Vietnamese society today, Part 3 discusses the basic ideas to build the educational philosophy for Vietnam in the future, part 4 is the conclusions and recommendations.

## MATERIALS AND METHODS

The first of all, we use the referral systems and supplementary tools such as computers to calculate the index, to draw the chart, questionnaires to ask students, educators and administrators about their views to the educational philosophy of Vietnam nowadays, as the principal materials. For research, we use the method of analysis and quantitative data from the questionnaires, writing synthesis, survey and evaluation results, discussion by the group and report partial results in the seminar and comparing the results of research theory with practice to draw conclusions.

## RESULTS

### 1. Overview of the history of Vietnamese educational attitudes

1.1. The Democratic Republic of Vietnam, today is the Socialist Republic of Vietnam was born in 1945. Modern Vietnamese education, as it began. Over the past 70 years, Vietnam's education has attained great achievements. From an unnamed country on the world map, 90% of the illiterate population, almost without any significant educational achievement, Vietnam became an independent country, out of poverty. More clearly, these are the following achievements [2], [5]: 1 / Development of education for all people; Increasing the scale of the school system. Today, in Viet Nam, on average, one in four people is in school; 2 / Implementing social equality and gender equality in education, providing policies for disadvantaged learners; 3 / The quality of training has been developing step by step; The teachers, increasing management staff and quality development, and education management policies are increasingly renewed; 4 / Better education facilities, Vietnam spends about 5% of GDP, 20% of total state budget for education ([1], see the figures 1, 2); 5 / International integration in education is better and broader.

Figure 1: Percentage of expenditure on education and formation compared to total public expenditure of Vietnam and compare it with some countries (%)

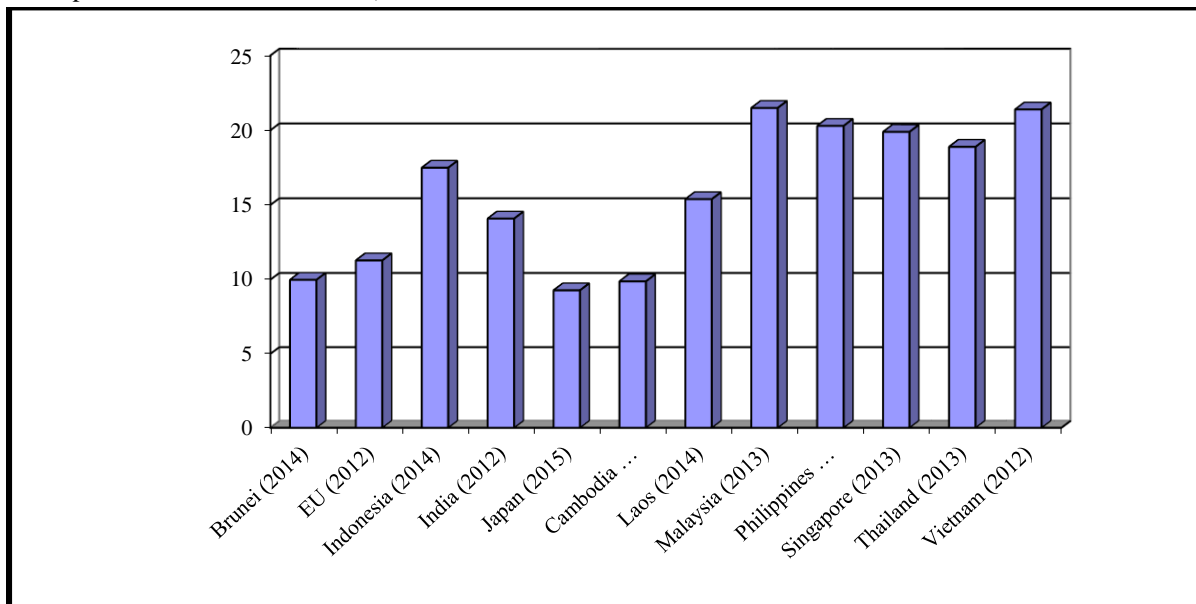
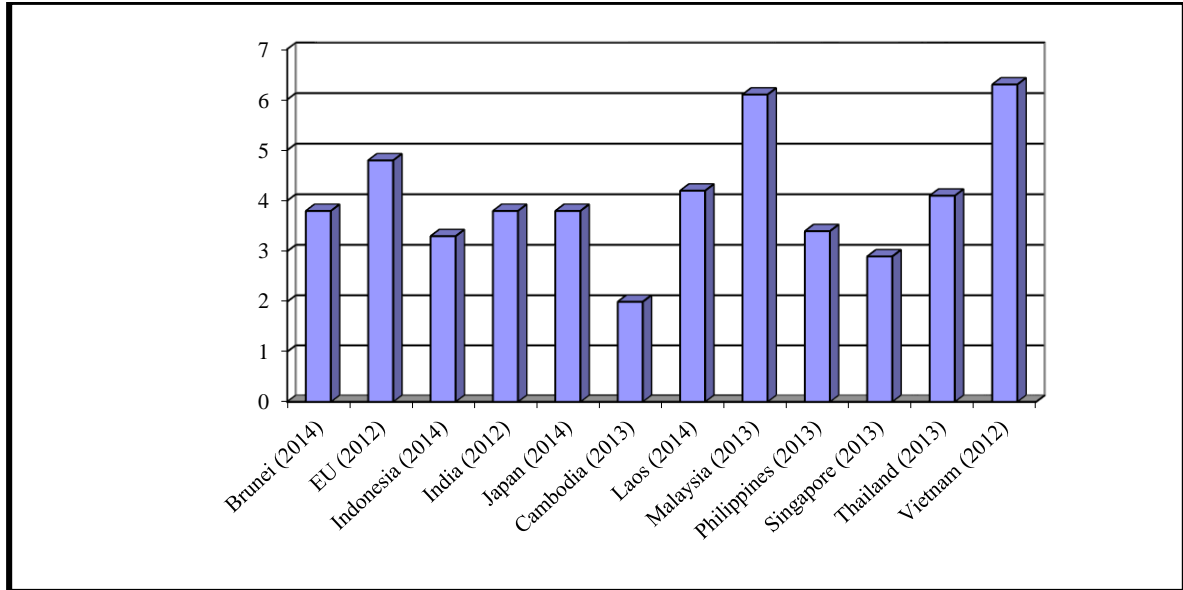


Figure 2: Percentage of expenditures for education and training compared to Vietnam's GDP and compare it with some countries (%)



Source: World Bank

But besides that, the weakness of education is also very high [6]: 1 / The education quality on a large scale, especially at the university level is low, methods of education are backwards, and slow innovation; 2 / The conditions to ensure development of education show still many inadequacies; 3/ There are many difficulties in accessing education, especially in higher education for children of poor families, low-income families and children of ethnic minorities; 4/. Some negative phenomena in education are slowly resolved (for example, extra teaching and extra-curricular activities, selling diplomas, achievement obsession,...); An education system to get a degree.; Studying for the exam. Even, these weaknesses caused the four major diseases of the Vietnamese education system are: a disease of achievement obsession, a disease of the level (egalitarianism), malnutrition and cheating disease [12], which partly due to disunited educational philosophy.

There are too many views on this issue. Some people think that Vietnam does not have any educational philosophy [10]. Some people say that "Vietnam has an educational philosophy. But only that, we do not have the quotes to be canonical [15]". Someone say: "If we assemble together representatives of educational administrators, teachers, students, somebody in the same examination room and ask them to describe the Vietnamese educational philosophy, then we will obtain many things which are very different. Someone can write something. And some will probably return the blank paper. "It's too funny. Until recently, there are still research papers like "What is the philosophy of education in Vietnam?", "The journey to find the modern education philosophy in Vietnam". If it was there and it was clear enough, consistent, persuasive, what would it be? It had to be printed in some book or document. So it may be that it has not yet been, or has been, but not sufficiently clear, consistent, persuasive to be a fundamental system of education. Where is this philosophy of education? It is not in the goodness that we declare, but in the practice of everyday education. This practice is due to the demands of society.

**1.2.** Analyzing more carefully, some people think that: Looking back on the history of Vietnamese education, in the Confucian education system, the philosophy of education is encapsulated in an output product, namely: it trained the honest to do Mandarin. It is through this philosophy that the Confucian education system has existed for over two thousand years. Only when the model of the honest, that is the output of this system, is no longer suitable for the new era, this system of education has just collapsed. But since Viet Nam gained independence in 1945, Vietnam's educational philosophy has never been so explicit and concise in education reforms, except for a previous official

statement: training new socialist people. But what is the new socialist human being? This is the ideal man, no real model.

The educational philosophy, in the most general sense, is to be brief, directional, and is foundation of thinking, in accordance with the culture or stage of history. In this sense, several people see that: The Vietnamese philosophy carries on the systematic defects; those disabilities cannot be repaired in sundry, patchy, but "thinking back" starting from a systematic approach; The core essence of this thinking flow is: Returning the autonomy of education, and the State only performs the function of macro management, science and education system need to be restructured on an autonomous basis. This is a necessary objectivity, on the path of reform from a command economy to a market economy [16], [20].

**1.3.** It's hard to imagine an education that lacks an educational philosophy. And the phrase that the education of Vietnam has no educational philosophy, is also difficult to accept. But if Vietnamese education has an educational philosophy, how does that philosophy reveal?, and what's included? Nowadays, there are still so many diverse ideas and debates. The viewpoints that Vietnam has an educational philosophy often illustrated by the following examples: "First is good manners, Second is knowledge", "Learning with practice", "You do not make a fool of yourself," "To go through, they must be bridged. For the children study well, must love the teacher". "For the sake of ten years, the tree must be planted. "An ignorant nation is a weak nation." In these sentences, some may be considered as educational philosophies, for example: "First is good manners, Second is knowledge", "Learning with practice". Some of the other sentences are not really educational philosophies, but they are about attitudes toward the job of teaching, teachers, and the importance of education and teachers.

Among sentences that can be considered as educational philosophies, there are ones that have existed for hundreds of years and have not yet been verified, affirmed they are still conformity with or not to the new era of education? "First is good manners, Second is knowledge", this is the idea of Confucian education, emphasizing the priority and importance of teaching ethics as compared to the teaching of knowledge and skills. Does this idea still fit the needs of lifelong learning? Does it fit the learning objectives of the "Learning to Know, Learn to Do, Learn to Live Together, Study for Self-Esteem" by UNESCO that we have also chosen?

**1.4.** Some people think: Vietnamese traditional society is the agricultural society of wet rice cultivation, and it is very nature of negative, with the basic characteristic is just desire to live quietly, and stably. In order to be stable, the society needs good and obedient men. Therefore, the traditional educational philosophy of Vietnam can be summed up in four words that all Vietnamese people, Vietnamese schools often use, "good children, excellent student." "Good children" are obedient ones (the child against the parent is a debauched child), "good student", should learn something by heart (question the teacher's mouth is usually "learned lessons ?"). In other words, it is a stable educational philosophy [12]. Once education has been oriented, it is difficult to exist without voluntarism. Therefore, the education cannot teach students the things life needs it only equips them with the will needs. Equally speaking, this educational philosophy has served very well to create stability in traditional Vietnamese society.

But today is different. Now is the era of industrialization, modernization and integration; society is not inward looking but needs to be extroverted; old stability achieved by standing still, looking back, and today a stable society must be developed society, looking to the future. Because of the unsuitable educational philosophy of "good children, good pupil" for the era and philosophy of education towards stability, which has created tragedy and caused obstacles in education in Vietnam today. First of all, it creates a society of desires to repute rather than learning. Desire to learn is a covetousness that urges us to have knowledges and use the things learned in life. While the Vietnamese students in school in the past only needed to pass the exam to have dignitary (in a stable society as the head is enough); but today if a student goes to school just to pass exams in order to obtain a degree and after leaving school, they forget all and work poorly, "desire to learn" in such a way, how can the country develop? The educational philosophy is stable then it is associated with a society where everything is subsidized; The subsidy of Vietnam has been long gone, but because it is rooted in culture, the subsidy phenomenon still exists: In the family, parents subsidize their children; at school, the teachers subsidize students; At the national level, the ministry subsidize for schools and the state subsidize the people. Social subsidizations lead to a mechanism of "ask - give". How can the country develop?

The educational philosophy towards stable consenting a view of the small farmers, only to see the goal very close. It spawns a lot of bad consequences. The goal of "good children, good pupil good" and vision of small farmers make the Vietnamese that when doing anything they also deal only, Include all questions about the types of sample exercises to teach how to solve. Therefore, in many international competitions, Vietnamese students often take good examinations. But life is not the test, and all solutions are not available in the sample exercises. Life requires creativity. The



educational philosophy of "good children, good pupils" leads to a very strange conception of limiting the size of textbooks. The curriculum of Vietnamese general education is limited to 70-80 pages and the textbook for university level is in the range of 200-300 pages. It is because of the influence of the educational philosophy of "good children, good pupils" that everywhere, we have restored the slogan "First is good manners, Second is knowledge".

**1.5.** Another approach can view the philosophy of education in Vietnam, first of all, is the philosophy of building a country rich people, strong country, democracy, justice, and literature. It is the building of the whole Vietnamese people, with good moral, good knowledge, good health, good sense of beauty, national spirit, patriotism and an international responsibility ". It is aimed at goals as UNESCO has set out (that is learning to know, learn to do, learn to self assert, learn to make a living). Saying that, since ancient times, our education has been directed to human beings - humanity, open mind but not root, that is the national self-respect, patriotic but not narrow-minded which is tied to the international consciousness regarding a consciousness of "global citizen" nowadays.

## **2. The conception of a human in Vietnamese society today**

**2.1.** Many studies of philosophy, society, and humanity usually start with human evaluation and analysis. In particular, to find the philosophy of education for a society, it is necessary to recognize the conception of the human [7]. Evolutionary theory holds that mankind is from apes. Karl Marx and many philosophers believe it, but there are others who do not believe. Some religions claim that man was created by God. The Buddhism teaches that people go through many lifetimes. According to Russian scientist Mundasep [13], humanity is now the 5th generation on The Earth, in which each generation lasts several tens of millions of years. Four previous generations have appeared and been destroyed. But the human was not completely destroyed, their race remained, passed from this generation to the other generation. However, for survival and development, the question of origin is not as important as existence of human beings, such as the purpose of life, the motive of life, and human rights.

**2.2.** there are many studies about human nature, from ancient times until now. In ancient Greece, Socrates said that "man does not want brutal cruelty," Plato notes, "Man is governed by greed." In ancient China, Confucianists said that "the human's primordial nature is good", and on the contrary, the legalist confirmed the sect advocates of law advocate see that "The origin of man is evil." Buddhism accepts that in every person has "Buddha nature". Besides, the eastern Philosophy states that "human life is the small universe". Recently, Edgar Morin, the French philosopher and anthropologist, wrote the book "Human characteristics", in which essentially represents the creation of human complexes.

**2.3.** Understanding the concept of "Human is small Universe" leads us to realize that the universe and man are made up of two parts, Material and Spirit. These two parts are closely intertwined in a unity. With humans, the material which makes up the body is the object of scientific research. Spirituality is the object of study of religion and of some mystical subjects. Astronomer Trinh Xuan Thuan [14] said: "To develop, science does not need spirituality, as well as spirituality, does not need science. But with humans, to develop comprehensively need to know both ". Thus, discussing human nature that ignores the spiritual part is not comprehensive. The spiritual part consists of information and energy.

**2.4.** Many people think that human nature is formed from two sources: "The at Anteriority" (The First) and "The after Anteriority" (The Later). The First is the human part that receives before birth, it is inherited from parents, breeders, and spiritual sources through generations. The Later is the receiving part and it's formed in life, it consists of a number of things, including relationships. Particularly about the relationship, there are four bonds. That is 1- relationship between man and nature; 2- relations between people and people; Self-relationships within each human being; 4. The relationship between human beings and the spiritual world [7]. For human beings, material forms the body. There are two types of body activities: conscious and unconscious. Conscious activity is commanded by the brain, which determines the wisdom, the foolishness, and the failure of man. Active unconsciousness which is uncontrolled by the brain is the activity of organs and biological systems, it determines health and life. Between these two types of activities, the connection bridge is the respiratory tract. The breath is active in both unconscious and conscious. It is possible to use conscious breathing exercises to regulate some unconscious activities thereby, improving health and curing diseases. The spiritual part of man how it is composed and how mysterious, even with modern science. But there are also many people feeling it, it is including energy and information. All of human information, temporarily called the Mind, consists of two parts. Consciousness and Subconscious. Consciousness belongs to on the activity of the brain with the reception of the information of the five senses. The Spiritual consciousness belongs to the spirit, part of it comes from the first heaven, other parts are received through the field of



halo. The epistemology of Buddhism says that the subconscious is stored in the so-called hidden part of consciousness. There is the exchange of information between the activity of the brain and the subconscious in that the transition from the brain into the subconscious is initiative, the subconscious transition into the brain is automatic (this transformation creates a premonition). Many people study about consciousness suppose that, it's like icebergs that the consciousness is the floating part of the water, it consists of very small parts, the subconscious mind is submerged in water, it consists of a large portion of the ice sheet. Consciousness, in addition to the usual functions that we have known it also the bridges connect between body and spirit, Just as breathing is the bridge between conscious and unconscious activity. Epistemology for that the main function of the brain is the operating organ, and most important human decisions are made from consciousness [7].

**2.5.** Karl Mark states that "human nature is the sum of social relationships" (The Complete Book, vol. 3, p.11). In my opinion, this concept is right but not sufficient because it only reflects a small part of human. The above Karl Mark's conclusions are based on social research and are especially influenced by the theory of evolution. If you understand social relations in a narrow scope, you can see that people who support this theory, often ignore many essential qualities of human nature. There are a number of views expanding our social relationships into relationships with nature and relationships with ourselves. In other hands, some people believe that social relations include human biological issues. But even if they deliberately expand the concept of social relations to enrich one's human notion as the sum of social relationships, it does not help us escape from the narrow view.

In organisms (including humans), anything that belongs to them is the result of the combination of two things: the variety and the environment in which the variety is decisive and the environment is very important. But the theory of evolution too much emphasis on the role of the environment, which is slightly considered in terms of species. We have been affected this concept and we have a short-sighted view of man, it was argued that social relations were the primary environment, determining the nature of human beings.

**2.6.** What is human nature? Many views on this matter [3], in that, Vietnam was greatly influenced by the concept of people from Buddhism and Chinese thinkers. The Buddhism considers man as the union between identity and identity (material and spiritual). The eternal life is Nirvana, where the human soul is liberated to become immortal. The Confucius conceived that: Human nature is governed by "the destiny giving by The God", virtue of "human" is the highest value of human beings, especially for the honest man. The Mencius has converged human nature into the innate capacity, due to the influence of customs, bad habits should be removed from the good. Therefore, through the thought and training to keep his moral. Yuan Zi (He was a Confucianist, Chinese thinker at the end of the Warring States Period) has said that the nature of human beings at birth is evil, but can be converted, must fight evil, human beings are good. Tung Chung-Shu (He was the idealist philosopher of the Western Han Dynasty, a typical representative of Confucianism) was the successor of Confucianism following the extreme idealistic trend. He conceives that Heaven and Man can understand each other (Heaven and Human are touched). Human life is determined by "the heavenly" ("the destiny giving by The God"). Lao Tzu (He was the main character in Chinese philosophy) saw the human being born from the "Moral Principle". Therefore, human beings need to live "doctrine of spontaneity" following nature principle, not anti-natural. It can be said that Eastern philosophy expresses the diversity and abundance of human beings but in the direction of human beings in political and moral relations. In general, the man in the Eastern philosophy expresses the idealism that blends innocent naivety in relation to nature and society. Apart from influences from the East, Vietnamese culture is heavily influenced by the Western philosophy of human notions. Christianity: Christianity conceives that human beings are corpses and souls. The body is lost, but the soul is eternal. Therefore, it is necessary to take care of the soul regularly to reach eternal Paradise. Ancient Greeks: Man is a small universe in the vast universe. The Middle Ages: Humans are the product of God. The earthly life is temporary, happiness is in the afterlife. Renaissance philosophy: Man is an intellectual entity. German Classical Philosophy: G.G.Hegel argues that man is the embodiment of "absolute thought", while L.Feuerbach has said that humans are the result of the development of nature. Man and nature are unified, inseparable.

**2.7.** So, man is a unified entity between the biological and social aspects: The biological aspect, which includes the body and the body needs and biological laws dominating the life of the human body. Social aspects include "the sum of social relationships", the social activities, the spiritual life of people. Man is the subject and the product of history: There is no natural world, no social history then no human beings. Therefore, man is the product of history, of the long evolution of the living world. But the most important is that man is always the subject of history - society. As a social entity, humanly operates in practice, human impacts on nature, change the natural world, it also promotes

the movement and development of social history. In the process of transforming the natural world, people also make history of themselves. Man is the product of history and the creator of the history of man himself. Human nature is not a closed system, but an open system, corresponding to the condition of human's existence.

From that it can be said: The most basic personality of man is personal, people always attach importance to, "ego". In human nature there is both good and evil seed, part from the at anteriority (The First), the other is sown from the after anteriority (The Laster). Good or evil, in which good or evil is suppressed, good or evil is developed that is because they get the conditions from the environment. Therefore, in order to develop human nature in a positive way, it is necessary to make the situation more and more human. Man receives the situation positively and reacts to the situation in difference many respects. It is the dialectic of the relationship between the person and the situation, at any stage of human social history.

### 3. Basic ideas to build Vietnam's educational philosophy in the future

**3.1.** In short, educational philosophy is a statement of thought, but concise, usually in one sentence, everyone understands and can do. As a result, the philosophy of education has become the guideline for all teaching and learning activities, and more broadly, all activities related to human development, in accordance with the culture or stage of history. Education philosophy is not far away, but at the output of the education system, that is, in the people that the education system produces. In other words, the educational philosophy will be found in answering the most important question: What are people which education system is directed towards training?

Given such importance, educational philosophy is not just ideological orientation, but also the soul, countenance of the whole system of education. Based on the educational philosophy that the entire educational system, as well as the activities, are designed, operation and adjustment. Being a soul, countenance, educational philosophy will automatically appear to all concerned. Then we will see the philosophy of education, feel the philosophy of education, be understanding the philosophy of education at a very subtle level, from student to teacher, to the parents in the house, not only the experts understand. Instead of training human of tools, education must shift the direction for training a free human. Then the creative human and human being will naturally appear.

In other words, when there is an educational philosophy, it will appear as natural as it is in everyday life and exist in all educational activities and is understood in the same way. If not, then some statements or studies on education, no matter how thorough elaboration, it is not the philosophy of education, but the philosophical theory of education, or the study of special of education.

In order to do so, the philosophy of education must be explicitly and convincingly addressed by the state administration itself, such as the Ministry of Education and Training. Otherwise, it will not have the righteousness to become the overall operating system for the whole system.

**3.2.** Vietnam education philosophy must conceive: Vietnam education is humane education. Human philosophy lays something down as a policy that man has an important place in this world; take the human as the root, take the life of man in this life as the basis; considering human beings as a means of life, not as a means or instrument for the purpose of any individual, partisan, or other organization. Human philosophy accepts the difference between individuals, but does not accept the use of that distinction for human evaluation, and does not accept discrimination or rich or poor, local or religious discrimination., race, etc. With the philosophy of humanity, people are equally valued and have the right to equal educational opportunities. The education in Vietnam is a national education. Education respects the traditional values of the nation in all activities related to family, occupation, and nation. Education must preserve and promote the essence or best traditions of the national culture. The cultural character of the culture must be known, preserved and promoted by generations, so as not to be lost or dissolved in other cultures. Vietnamese education is a liberal education. Nationalism is not necessarily conservative, not necessarily closed. In contrast, education must expand, to receive advanced scientific and technical knowledge in the world, receiving the spirit of democracy, development, the value of human culture to contribute to the modernization of the nation and society, make progressive society accessible to world civilization. Learning is to explore and be creative. Education is to provide learners with exploration and creativity; Educate people to love, share, unite, join hands to build the society, living in harmony with nature.

**3.3.** Vietnam has experienced many wars in the past, where compliance is at the forefront, it is a favourable environment for human as a tool (tool human) promotes effective. This circumstance makes training the tool human seem reasonable and suit the needs, without being questioned, in addition to the traditional Confucian culture of backwardness and orderliness, one-way adherence, this has contributed to the weakness of Vietnamese education

become serious. We are always taught in the understanding, know and behave in a predefined pattern. But now, before the challenge to innovate, especially when the 4.0 industrial revolution is staging impetuously, the training human as a tool must be questioned and removed. If without changing training from now on, the failure of the tool people will definitely sure, will be firm in hand. Why? Because with the speed of technology development in now, compete with humans act as a tool against machines, humans have no way of winning machines. Occupations that use too much human muscle will not survive. The automation chain that runs on rice and food at that time also disappears. In the factory, the robot arm will take over most of the work. Cars can drive themselves. Computer self-study. The tool people are not capable of creativity, they only know the stereotype of what has been taught. what will they do in that situation? So, absolutely, instead of training tool people, education must turn to training for a free human. Then, creative people, the human being will naturally appear. As long as that is not achieved, Vietnam's educational reform is still in the deadlock.

**3.4.** The core solution for education in Vietnam, of course, is to change the philosophy of education from the direction of stability to development, from "good children, good pupil" to brave children, creativity. Society wants to develop, culture must be positive about. That means that society must be truly democratic and operate under the rule of law, humans have to give up the village community instead, it is the person having stuff and sense of community. we must evaluate an honesty is more than a cute, clever. To have to take a sense of responsibility instead of relying on; To have to take the spirit of cooperation for the common rather than the appearances, face, join the faction, group; Have to have scientific and creative in place of coping, arbitrarily. These values must become the target that Vietnam's education reform needs to be awarded. From the philosophy of education and goals, we will consider issues such as the structure of education levels, programs, textbooks as appropriate and we will change fundamentally the method of teaching, evaluation; thinking, the work's way of the teachers and the educational management system of each school [12].

**3.5.** Education model must be changed. The current educational model consists of three components: family - school - society. And it has existed for over 50 years. They look at this model as a triangle with each element as a vertex. That's not true. This is the typical product of an educational philosophy of direction to the subsidized society when everyone is participating education, meanwhile, the object of education itself is completely forgotten, students are nothing in the educational model. In fact, the school is part of society; Society is part of the school and so is the relationship of the family to the school.

So, have to change and find a new model: The model may consist of five components, the most important of which, the central element is the object of education itself. The child must be gradually involved in education, ultimately self-determination, it must be the person most responsible for his / her learning. The Family, The School, The Society play the role of orientation, counseling, service, support. Finally, The State creates all institutional and legal frameworks... for the training of human beings. With such educational philosophy and educational model, everything will change, for example as over: The School is part of society and The Society is part of the school.

**3.6.** If everyone has the firm stuff the society will be diversified. Because of their bravery and stuff, everyone thinks differently. Learn one subject, but each will learn differently. Each person is a unique world no one like, not as robots are produced from the same factory. Diversification of society, diversity of thought, that is the real society of man. Diversity, but all together for the best purpose for society, not as Vietnam did in the past, training is a common pattern and when going to society, everyone is strong, but can not cooperate with each other. This is a difficult process. But overcome this difficulty, the education of Vietnam can get human beings, the educational system of "good children, good pupil" is replaced the educational system of "bravery child, creative pupil", is to create real human beings, is to develop learner capacity and is to teach people, is oriented towards quality and output rather than degrees of diploma [12].

**3.7.** There are experts said that Vietnam's education is discordant, not backward but discordance out of the world, on the other way, alone, and so there is no hope of being integrated into the world to be able to follow the world. Thus, it must be changed from the root [11]. We want to train free man, known thinking and independent thinkers, from these are creative people for a free and creative society or educate people who only implement, obedient, submissives, are easily commanded? There is a person or some people that they think everything for everyone and people just memorize it and follow it, follow them. It is the source of inadequacies of all educational issues. Therefore, to overcome this situation, even, in a way, this is a matter of survival for the development of nation and country [2], [17]. Have to modernize the education system. But how modern education? We believe that a modern educational system is first and foremost in the modernity of the educational philosophy that it pursues. And the philosophy of

modern education is to build an education in which is not meant to be Sophisticated machines charged with a huge memory knowledge as we are trying to make today but to create free people, know and dare to think independently, self-gaining knowledge, find out the truth, right by them-sefl, from that, they mastered their lives, their country and humanity. On the general situation, have to transfer the conception of "human beings" (original inhabitants) to the view of "human beings", It means that man belongs to all mankind, and not just to a nation [9].

**3.8.** An educational philosophy that aims to create a free person is also a requirement for an educational method that is different from the one we are currently doing in schools. This educational method first requires a maximum respect of the learner, students are not considered as insensitive jars, passive to allow us to pour knowledge into, they are creators, they have infinite creative potential, it should be elicited so that the potential is open and active, even when they are opened, it can be large, they are more creative than we expected, they surpass their teachers, over the books [9]. This is a liberal education.

**3.9.** History of Western countries shows only after the secularization of the school, separation of schools from the Catholic Church, modern science and technology have strong conditions to develop, at the same time, the Church does not thereby lose its spiritual position in society. To us, the ultimate goal of the nation is to be a rich people, a strong country, a democratic society, a fair, It also needed a similar solution for education that could open the way to make prosper of the country. has long been in our lives, it was demanding that the school must escape the ideological subsidy and rigid catechetical constraints, it is holding back, instead, it is necessary to enlighten the mind, should emphasize the humanities: personality training, intellectual qualities, sensory capacity, sense of community, as in every advanced school in the world. That is to teach people in the highest noble sense [2].

## CONCLUSIONS AND RECOMMENDATIONS

**1.** One of core solutions for the development of education in Vietnam is changing the philosophy of education from the direction of stability to development and from "good children" to children having bravery and students daring to create. It is Necessary to have educational philosophy with the goal above, before considering other issues of education. Particularly, in the first steps, to develop the university education to be the leader. Therefore, the biggest challenge of Vietnamese education nowadays is to modernize the university education, to promote scientific research to improve the quality of training [8], bring the higher education integrate truly into the on the path of development of the world. Have to throw away of the backward, stagnant pulling us, to move strongly following the model of higher education in the United States which is an advanced model that is being applied universally in the world. We can say that the success or failure of education reform in Vietnam today, a decisive part depends on the progress of this university education modernization.

**2.** Vietnam can refer to the foundations that the American Education philosophy has relied upon, that are the five core theories including Essentialism, Perennialism, Progressivism, Social Reconstructionism and Existentialism [4]. The Essentialism promotes the teaching of the substantive content of the classic knowledge and moral, encourage the school to return to the basics, based on a strong core education program and high standards of classics.

The Perennialism focuses on universal truths that are tested over time, encouraging students to read "The Great Books" to develop the perception of philosophical perspectives laying the groundwork for human knowledge.

The Progressivism requires that the content of the lectures at school be relevant to the students so that they wish to learn. The curriculum of the school follows this educational philosophy is built around the experience, interests, individual needs of students and create interest, passion for learning.

The Social Reconstructionism as the philosophy of education requires is the direct and timely attention to the evils, to bad habits in society, promote learning with action, based on the belief that education can and should improve and solve social problems.

The Existentialism comes from the point of view about freedom of consciousness of each person and the need for each person to create their own future. In a school, students are encouraged to understand and promote their own uniqueness and take responsibility for his own actions.

**3.** Education reform in Vietnam needs to be resolute, promptly, but not in a hurry, it is necessary to draw up a roadmap and a can concrete implementation plan. In the short term, to implement reforms at urgent stages, have to organize research on specific issues such as curriculum and textbooks for the general education level, teaching methods at all levels, testing innovation, etc. from a new thinking point of view. We know that in the situation of our country there are many difficulties, but this is also the opportunity to educate can change one's look, from a kind of education of dogmatic strongly, backward and out of place with the times and the world, moving on to the education

enlightened, healthy, honest, modern, accordance with the general trend of humanity and response the supreme benefits of the country, a liberal education to create the Vietnamese people having humanity, free, creation and integrate with the world [2], [17].

The wishes and suggestions we present above will surely come, it is possible to believe so through the citation system in our article, it's mostly taken from the Internet, meaning to say, the discussions on the search and development of the educational philosophy of Vietnam moved inspires freely.

The President Ho Chi Minh was the great leader of the Vietnamese people, has left the Vietnamese people and humanity a valuable truth, when He has asserted "There is nothing more precious than independence, freedom." So, In Vietnam was really independent, we will achieve all the next things, including, we will create an educational philosophy for Vietnam to develop together with humanity.

### ACKNOWLEDGEMENTS

The first of all, I would like to take this opportunity to express my gratitude to Rajabhat Maha Sarakham University, Thailand for kindly inviting us and allowing us to present my research results at Conference ICSSS 2017 organized by this University. And especially, I would like to thank so much of the referees for contributing their valuable suggestion and ideas to our article.

### REFERENCES

- [1]: Dinh Thi Nga: State investment in education and training: Current situation and some suggestions (in Vietnamese) Retrieved from <http://tapchitaichinh.vn/kinh-te-vi-mo/kinh-te-dau-tu/dau-tu-cua-nha-nuoc-cho-giao-duc-dao-tao-thuc-trang-va-mot-so-de-xuat-125673.html>
- [2]: Hoang Tuy: Outline of the educational reform (in Vietnamese) Retrieved from <https://hochienao.vn/2013/04/29/de-cuong-cai-cach-giao-duc-hoang-tuy/>
- [3]: Journal of Philosophy: Man and human nature (in Vietnamese) Retrieved from <http://www.triethoc.info/2014/04/con-nguoi-va-ban-chat-cua-con-nguoi.htm>
- [4]: Luong Hoai nam: What is the philosophy of education in Vietnam? (in Vietnamese) Retrieved from <https://vnexpress.net/tin-tuc/goc-nhin/triet-ly-giao-duc-viet-nam-la-gi-2984150.html>
- [5]: Ministry of Education and Training: Achievements of Vietnam Education and Training (to 2014) (in Vietnamese) Retrieved from <http://giaoducthoidai.vn/ket-noi/nhung-thanh-tuu-cua-gddt-viet-nam-74349.html>
- [6]: Ministry of Education nad Training: 5 achievements and 4 weaknesses of Vietnamese education (in Vietnamese) Retrieved from <https://tuoitre.vn/5-thanh-tuu-va-4-yeu-kem-cua-giao-duc-vn-54973.htm>
- [7]: Nguyen Dinh Cong, Facebook (in Vietnamese) Retrieved from <https://www.facebook.com/ngdinhcong/posts/1658374290850486>; <https://www.facebook.com/ngdinhcong/posts/1659302197424362>
- [8]: Nguyen Huynh Phan (2015) : Scientific Research in Universities of Vietnam in Present and Its Effects on Training Quality. Chinese Business Review, November 2015, Vol. 14, No. 11, 539-546
- [9]: Nguyen Ngoc: About the philosophy of education (in Vietnamese) Retrieved from [http://www.chungta.com/nd/tu-lieu-tra-cuu/ve\\_triet\\_ly\\_giao\\_duc.html](http://www.chungta.com/nd/tu-lieu-tra-cuu/ve_triet_ly_giao_duc.html)
- [10]: Nguyen Quoc Vuong: Do not see the philosophy of education of Viet Nam (in Vietnamese) Retrieved from <https://tuoitre.vn/khong-thay-co-triet-ly-giao-duc-1310622.htm>
- [11]: Sail Club: Prof. Hoang Tuy Talk about Vietnam Education at The Sail Club (in Vietnamese) Retrieved from <https://suphamk2dalat.wordpress.com/2013/11/22/gs-hoang-tuy-noi-ve-giao-duc-vn-tai-clb-can-huom/>
- [12]: Tran Ngoc Them: Education is damaged by the mistakes of the educational philosophy (in Vietnamese) Retrieved from <https://laodong.vn/lao-dong-cuoi-tuan/gstskh-tran-ngoc-them-giao-duc-hong-chinh-la-do-triet-ly-giao-duc-sai-lam-566901.bld>
- [13]: Tran Trung Phuong: *Mun-Da-Seep, a bridge between science and mysticism* (in Vietnamese) Retrieved from <https://sites.google.com/site/nangluongduongsinh/tin-tuc-bao-chi/mun-dha-sepchieccaunoigiuakhoahocvahuyenhoc>
- [14]: Trinh Xuan Thuan: Buddhism helps my days away from the country (in Vietnamese) Retrieved from <https://tuoitre.vn/gs-trinh-xuan-thuan-dao-phat-giup-toi-nhung-ngay-xa-to-quoc-1130077.htm>



- [15]: Vietnam Education Newspaper: Vietnam education philosophy through analysis of Deputy Prime Minister Vu Duc Dam (in Vietnamese) Retrieved from <http://giaoduc.net.vn/Giao-duc-24h/Triet-ly-giao-duc-Viet-Nam-qua-phan-tich-cua-Pho-Thu-tuong-Vu-Duc-Dam-post172529.gd>
- [16]: Vu Cao Đàm: Discussion about the standards of value in science at Vietnam today (in Vietnamese) Retrieved from <http://www.talawas.org/talaDB/showFile.php?res=9435&rb=0302>
- [17]: Hoang Tuy: Education: Let me be straight talk, (2012, reprinted in 2013), Tri Thuc Publishing House (in Vietnamese).
- [18]: Many Authors: Current educational issues: The views and the solutions, (2007), Tri Thuc Publishing House (in Vietnamese)
- [19]: Nguyễn Xuân Xanh chủ biên (2011): Đại học Humboldt 200 năm (1810-2010), nhà xuất bản Tri Thức
- [20]: Vu Cao Dam: Paradox and escape - Discussing the development philosophy of Vietnam Science and Education, World Publishing House, (2014) (in Vietnamese).

**AN ANALYSIS OF ENGLISH SPOKEN LANGUAGE AND THREE MINUTE THESIS (3 MT)  
PRESENTATION BY USING RHETORICAL STRUCTURE AND META-DISOURSE : A CASE STUDY  
OF THE UNDERGRADUATE STUDENTS OF UBON RATCHATHANI RAJABHAT UNIVERSITY**

*Ms.Wassana Khawpong*

In the present competitive academic world, the important task of being a scholar does not end with the enable to complete their study course. Another essential task for them is to present the meaningful and significant findings to the audience of a particular academic community. Besides presenting the study in the written form such as the thesis, the dissertation, and an article in journal or periodical, the fellow-scholars or students also has to orally present either to the small group of academic committees or to the large audience especially in a conference. The conference presentation (CP) becomes the major spoken experience that the students have to deal with in order to present their meaningful work (Rowley-Jolivet and Carter-Thomas, .(2005 Not only novice but also the teaching professions encounter with this kind of public speaking. Their major task is concerned with how to fulfill the expectation of the audience who are looking forward to the significant outcome of the studies by means of the comprehensible presentation.

Throughout this particular oral communication, the students tend to present what they have done, why they conduct the studies, how significant the studies are, and what they have found from their lessons. The speakers have to deliver well-organized presentation corresponding to the communicative purposes and use the appropriate linguistic features to make the presentation comprehensible. Moreover, they also employ the effective linguistic functions to represent their stance, interact with the audience and induce the listeners' engagement. The presenters need to arrange their intentional messages to suit the given time which is 15 – 20 minutes long. It is the common time offered for each presentation in the conferences. Actually, the longer presenting time enables the presenters to provide more details which contribute to the understanding in the topic among audience. Imagine, on the contrary, if a presenter has only 3 minutes, is it possible to present his or her research in such a short of time especially to the audience who are from the different disciplines and do not share the same background knowledge? How could the hundred-pages thesis be presented within 3 minutes? In fact, this extraordinary presentation has occurred as a kind of competition called "Three Minute Thesis (3MT) competition".

Three Minute Thesis (3MT) is a competition in academic field developed by The University of Queensland, Australia, since 3 .2008 MT allows to present the significance to their studies within three minutes to non-specialist audience. The main purpose for managing this typical challenge is to provide the opportunity for students to develop their presentation skill. The candidates will have a chance to learn how to convey their message effectively (Skrbis, .(2010 Now, the competition has been expanded to other universities in Australia and New Zealand. This concept is promoted to "at least 200 universities across more than 18 countries worldwide" (3MT website: <http://threeminute-thesis.org/about-3mt>). 3MT has a tendency to be adopted not only by inner circle countries where English is used as native language, but also outer circle countries where English not their mother tongue is used as official language such as Singapore and Hong Kong.

**KEYWORDS :** ENGLISH SPOKEN LANGUAGE, THREE MINUTE THESIS



## INTRODUCTION

As involving in presenting the research studies, 3 MT presentation should provide the same structure as presented in the CP. However, such time-limit presentation is unable to follow the conventional practice in ordinary CP. The presenters have to compress the details of the whole studies and determine which parts of the presentation should be emphasized: reason, significance, or finding of the certain research. In the meantime, the presenters have to prepare the well-organized scripts, be concerned with the use of language and also interact with the audience in order to create outstanding, attractive and understandable presentation. For example, they may use simple and short sentence, avoid technical terms and academic words, qualify unknown concepts, use suitable vocal range, or employ appropriate body language (Crews, (2011). It could be very interesting to learn how they organize their presentation. So, the non-specialist audience can understand the conveyed information which may be about unfamiliar disciplines. Unfortunately, because 3MT is recently established in academic world, there is no research investigating about the characteristic of this kind of presentation. It is still available for a researcher to investigate its particular features and adopt the beneficial results to use in academic field and general purposes. Therefore, the purpose of the present study is to explore the organized structure of the presentation and the use of linguistic function or meta-discourse to promote the understanding and perform the interactive function within the presentation. The finding of this study will provide the possible model used in the 3MT presentation. Thus, competitors who tend to participate in 3MT competition can apply this useful outcome to their presentations. In addition, the provided rhetorical structure and the revelation of functional language used can be adapted to enhance the effectiveness of the presentation.

There are four objectives of this research as shown below.

1. to develop the English skills, particular speaking and public speaking skills, of the students to compete with others in the ASEAN Economic Community effectively.
2. to explore the rhetorical structure of the 3MT presentation.
3. to investigate types of meta-discourse employed in the 3MT presentation.
4. to find out if certain meta-discourse features likely to appear with certain rhetorical moves.

And there are three research questions of this research as follows;

1. What are rhetorical patterns for presentations commonly found in the 3MT presentation?
2. What types of meta-discourse are used in the 3MT presentation?
3. How are meta-discourse features needed in different rhetorical moves?

## LITERATURE REVIEW

The present study aims to explore the rhetorical structure and the use of metadiscourse through the presentations of 3MT competition held by the undergraduate students who major in English at Ubon Ratchathani Rajabhat University. This section briefly reviews the previous study as follows.

### THREE MINUTE THESIS (3MT)

Three Minute Thesis (3MT) is a competition in academic field developed by the University of Queensland, Australia, since 2008. 3MT allows the students from various disciplines to present the progress of their academic research and its significance within three minutes to non-specialist audience. Along with the presentation, only one static PowerPoint slide is permitted. The main purpose for managing this typical challenge is to provide the opportunity for students to develop their presentation skill. The candidates will have a chance to learn how to convey their message effectively (Skrbis, 2010). According to 3MT regulation of the University of Queensland (3MT website: <http://threeminutethesis.org/about-3mt>), the competitors will be judged based on the judging criteria; Comprehension & Content and Engagement & Communication.

The popularity of 3MT competition has remarkably increased. It was not just an in-house activity. It becomes an international event. The number of participating universities rises from its origin in 2008 to over 200 universities worldwide in 2014. Even though English language is used as medium language in presenting 3MT, the competition is not restricted for English native speakers. It widely opens for non-native speakers who can communicate in English. In addition, 3MT competition has a tendency to be adopted by countries where English is taught as a foreign language, for example, Ritsumeikan University, Japan and University of Isfahan, Iran (<http://threeminutethesis.org/inter>

national). It seems to be more widespread in the future and the participants may need a useful guideline to help them organize the structure of presentation. Consequently, the organization of the 3MT presentation should be investigated so that the 3MT competitors can apply the beneficial finding to their effective presentation.

### MOVE ANALYSIS

Move analysis is an approach for investigating the structure of a particular discourse by focusing on the communicative purposes of discourse units occurred in the analyzed text. The discourse unit performing certain communicative purpose is defined as a “move”. Each move comprises of subunits called “steps” which provide relevant communicative functions. The sequence of moves forms the rhetorical structure commonly practiced in specific discourse genre. Thus, move analysis is a tool for revealing the rhetorical structure according to the aspect of communicative purposes conventionally applied in a certain genre. Swales’ (1990) move analysis model is extensively used as framework for discovering the organized structure of texts. The model originally identified the move structure of introduction section of research articles provides three basic moves known as the Create a Research Space (CARS) model and each move consists of a set of steps (Swales, 1990).

**Table 1:** CARS models for research article introduction, adapted from Swales (1990)

<b>Move 1:</b>	<b>Establishing a territory</b>	
	Step 1	Claiming centrality <b>and/or</b>
	Step 2	Making topic generalization (s) <b>and/or</b>
	Step 3	Reviewing items of previous research
<b>Move 2:</b>	<b>Establishing a niche</b>	
	Step 1A	Counter-claiming <b>or</b>
	Step 1B	Indicating a gap <b>or</b>
	Step 1C	Question raising <b>or</b>
	Step 1D	Continuing a tradition
<b>Move 3:</b>	<b>Occupying the niche</b>	
	Step 1A	Outlining purposes <b>or</b>
	Step 1B	Announcing present research
	Step 2	Announcing principal findings
	Step 3	Indicating research article structure

Source: Kanoksilapatham, 2007

This method of move types has been broadly applied as the framework for exploring move structures in various academic disciplines including biochemistry (Kanoksilapatham, 2005), computer science (Posteguillo, 1999) and medicine (William, 1999). Some studies about move structure of introduction section raise awareness of the differences across disciplines. A new step which is not normally occurred in other disciplines may play role in the rhetorical structure of the research article in a discipline. Kanoksilapatham (2007) indicates that because of the understanding of discipline-specific move structure, Swales (2004) has revised his CARS model by adding various descriptions within moves in order to be extensively applied in different research field as shown in table 2.

**Table 2:** Swales' revised model for introduction section of research article (2004)

<b>Move 1:</b>	<b>Establishing a territory (citations required) via Topic generalizations of increasing specificity</b>
<b>Move 2:</b>	<b>Establishing a niche (citation possible) via:</b> Step 1A: Indication a gap, <b>or</b> Step 1B: Adding to what is known Step 2: Presenting positive justification (optional)
<b>Move 3:</b>	<b>Presenting the present work via:</b> Step 1: Announcing present research descriptively and/or purposively (obligatory) Step 2: Presenting research questions or hypotheses* (optional) Step 3: Definitional clarifications* (optional) Step 4: Summarizing methods* (optional) Step 5: Announcing principal outcomes (optional) ** Step 6: Stating the value of the present research (optional) ** Step 7: Outlining the structure of the paper (optional) **

\* Step 2-4 are less fixed in their order of occurrence than the others.

\*\* Step 5-7 are probable in some fields but unlikely in others.

Source: Kanoksilapatham (2007)

Significantly, Kanoksilapatham (2005) investigated the rhetorical organization of research articles in biochemistry field. While Swales' work provides the move structure of introduction section of research articles in non-specific fields, Kanoksilapatham's study covers all four sections: the introduction, method, result, and discussion section. The findings provide the useful rhetorical structure involving moves and steps for writing and also understanding research articles in biochemistry discipline as present in table 3.

**Table 3:** Rhetorical moves of biochemistry research articles (Kanoksilapatham, 2005)

<b>Introduction</b>	procedures
<b>Move 1: Announcing the importance of the field</b>	Step 2: Detailing procedures
Step 1: Claiming the centrality of the topic	Step 3: Providing the background of the procedures
Step 2: Making topic generalizations	<b>Move 6: Detailing equipment</b> (optional)
Step 3: Reviewing previous research	<b>Move 7: Describing statistical procedures</b> (optional)
<b>Move 2: Preparing for the present study</b>	<b>Result</b>
Step 1: Indicating a gap	<b>Move 8: Stating procedures</b>
Step 2: Raising a question	Step 1: Describing aims and purposes
<b>Move 3: Introducing the present study</b>	Step 2: Stating research questions
Step 1: Stating purpose (s)	Step 3: Making hypotheses
Step 2: Describing procedures	Step 4: Listing procedures or Methodology techniques
Step 3: Presenting findings	<b>Move 9: Justifying procedures or methodology</b>
<b>Methods</b>	Step 1: Citing established knowledge of the procedure
<b>Move 4: Describing materials</b>	Step 2: Referring to previous research
Step 1: Listing materials	<b>Move 10: Stating results</b>
Step 2: Detailing the source of the materials	Step 1: Substantiating results
Step 3: Providing the background of the materials	Step 2: Invalidating results
<b>Move 5: Describing experimental procedures</b>	
Step 1: Documenting established	

---

**Move 11: Stating comments on the results**

Step 1: Explaining the results

Step 2: Making generalizations or  
interpretations of the results

Step 3: Evaluating the current findings

Step 4: Stating limitations

Step 5: Summarizing

**Discussion**

**Move 12: Contextualizing the study**

Step 1: Describing established knowledge

Step 2: Presenting generalizations, claims,  
deductions, or research gaps

**Move 13: Consolidating results**

Step 1: Restating methodology (purposed,  
research questions, hypotheses  
restated, and procedures)

Step 2: Stating selected findings

Step 3: Referring to previous literature

Step 4: Explaining differences in findings

Step 5: Making overt claims or  
generalizations

Step 6: Exemplifying

**Move 14: Stating limitations of the study**

Step 1: Limitations about the findings

Step 2: Limitations about the methodology

Step 3: Limitations about the claims made

**Move 15: Suggesting further research**  
(optional)

---

While a number of researchers explore move structure of written academic genre, Rowley-Jolivet and Carter-Thomas' work (2005) focuses on a kind of spoken genre, the conference presentation (CP), especially the introduction section. They conduct the move analysis of 44 conference presentations from geology, medicine and physics discipline to figure out how the presenters organize their presentation structure to facilitate the audience's understanding. Their study also investigates how the personal pronouns have been used to create the interpersonal relation between speakers and listeners. The identified features of CP are compared to the features found in corresponding research articles (same authors, topics, and event) published in the proceeding of physics conferences. Based on Swales (1990), Thompson (1994) and Dubois' (1980) study, the researchers propose the move structure of CP as shown in table 4.

**Table 4:** A move model for scientific conference presentation introductions (Rowley-Jolivet and Carter-Thomas (2005))

<b>A. Setting Up the Framework</b>	
Interpersonal framework and/or Discourse framework and/or	1a Listener orientation 1b Acknowledgements 2a Announce topic 2b Outline structure / Indicate scope
<b>B. Contextualizing the Topic</b>	
and/or	1a Conference context 1b General research context
<b>C. Research Rationale</b>	
Motivation and/or and/or Response and/or	1a Problems / Gaps / Counter-claims 1b Relevance / Centrality / Need 1c Continuation of previous work 2a Question-raising / Hypotheses 2b Preview results or solutions 3 Outline research goal

According to Swales' model (2004) and Kanoksilapatham's move model (2005) are suitable guideline for identifying move structures in the present study because they provide moves and steps that possibly occur in the 3MT presentation. The content provided in the structure of 3MT presentation should contain the information as required in the judging criteria of 3MT regulation including background of research question, its significance, result and conclusion. This expected information corresponds to what found in each section of common research articles. In other words, the identified moves and steps constructing the structure of 3MT presentation concern to move structure of research articles. In addition, Kanoksilapatham's move model provides move structures of all sections in a research article: introduction, method, results and discussion which may include moves and steps possibly occurred in 3MT presentation. However, this model was investigated from a certain discipline, biochemistry while 3MT presentation consists of various disciplines. The differences in disciplines influence the organized structure of research articles. Thus, Swales' revised model is also used as move model in this study because the modified model can be extensively applied in identifying move structures from different research field.

### META-DISCOURSE

In communication, the produced message is not only to convey intended information, but also reflect attitude, thought, assumption and personality of message senders (Hyland, 2005). Before sending the message, writers or speakers anticipate particular effects having on message receivers. For this reason, additional language feature apart from propositional content or information is used to create certain effect mostly involving perception and understanding of text. Those are writers or speakers employ language feature to facilitate audience comprehension, make text more interesting, and induce desired response from audiences. This concept of linguistic function is called meta-discourse.

The term "meta-discourse" was first introduced by Zellig Harris in 1959 to indicate another function of language besides conveying the intended information. It is "an important link between a text and its context as it

points to the expectations readers have for certain forms of interactions and engagement” (Hyland, 2005: 13). According to Hyland (2005), meta-discourse is an aspect of a text which writers or speakers place themselves into the text to cope with the intended communication in order to organize the discourse to help audiences understand text and guide audience response to text.

### PREVIOUS RESEARCH OF META-DISOURSE

Hyland (2009) investigated the use of meta-discourse a four-million-word corpus of 240 second language dissertations. The purpose of the study was to reveal the way writers in different disciplines project themselves in their texts. Six different fields were examined: electronic engineering, computer science, business studies, biology, applied linguistics, and public administration. Besides corpus data, the interview has been done to further explore differences and similarities among different communities. According to the findings, L2 students variously employed meta-discourse in their research to interact with their readers and the use of meta-discourse also varied across the disciplines.

Adel (2010) aims to identify the similarities and differences of meta-discourse between spoken and written discourse in academic context. The corpus of 30 spoken university lectures (255,000 words) and 130 essays by highly proficient graduate students (400,000 words) were explored for personal meta-discourse based on qualitative analysis. The researcher focused on the distribution to discourse function of spoken and written mode to find out the similarities and differences between them. The proposed meta-discourse taxonomy in the study consists of 23 functions divided into four main categories: Metalinguistic comments, Discourse organization, Speech act labels and References to the audience. The results show that both academic spoken and written discourse contained the meta-discourse provided in the proposed taxonomy. The variation of the use of meta-discourse was found between both modes. Such various uses were the result from the differences in the characteristic of speech and writing such as time constraint for planning and revision in speech and the presence of audience in spoken discourse. In addition, factors related to genre influence the variation in the use of meta-discourse.

In Yu's and Cadman's (2009) study, the use of textual and interpersonal meta-discourse in 40 presentations was investigated. The study was implemented in a tertiary course of Speech and Communication in English. The researchers aimed to find out how and why English language learners applied meta-discourse in their academic speech. Moreover, peer comments, self-evaluations and reflections were employed to acquire more information of students' attitudes towards their use of language to connect with their audiences. The findings reveal the effective use of meta-discourse so it can be applied to teaching English.

### METHODOLOGY

This research presents the rhetorical organization and meta-discursive markers employed in the 3MT presentation. Unfortunately, all methods will be proceeding in the semester 2/2560, these include the written language and the spoken language which are based on The Public Speaking; a subject for the sophomore students of Ubon Ratchathani Rajabhat University. The information addressed in this section will include the description of the data being studied and the process of approaches applied for exploring the move structure and the use of meta-discourse.

### REFERENCE

- About 3MT (online). <http://threeminutethesis.org/about-3mt>. Retrieved on October 2, 2015.
- Adel, A., 2010. "Just to give you kind of a map of where we are going: A taxonomy of metadiscourse in spoken and written academic English." *Nordic Journal of English Studies* 9 (2): 69-97.
- Cornbleet, S. and R. Carter., 2001. *The Language of Speech and Writing*. London: Routledge.
- Crews, S., 2011. *3MT: The Three Minute Thesis Competition* (Online). [www.simonclews.com/?page\\_id=30](http://www.simonclews.com/?page_id=30). Retrieved on October 19, 2014.
- Dubois, B. L., 1980. "Genre and structure of biomedical speeches." *Forum Linguisticum* V: 140-168.
- Hyland, K., 1998. "The Pragmatics of Academic Metadiscourse." *Journal of Pragmatics* 30: 437-455.

- Hyland, K., 2005. *Metadiscourse: Exploring Interaction in Writing*. New York: Continuum.
- Hyland, K., 2009. "Metadiscourse: mapping interactions in academic writing." *Nordic Journal of English Studies* 9 (2): 125-143.
- Kanoksilapatham, B., 2005. "Rhetorical structure of biochemistry research articles." *English for Specific Purposes* 24: 269-292.
- Kanoksilapatham, B., 2007. "Rhetorical moves in biochemistry research articles." In E. TogniniBonelli and W. Teubert. (eds.). *Discourse on the Move: Using Corpus Analysis to Describe Discourse Structure / Douglas Biber, Ulla Connor, Thomas A. Upton*. Amsterdam: John Benjamins Publishing Company, 73-119.
- Posteguillo, S., 1999. "The schematic structure of computer science research articles." *English for Specific Purposes* 18 (2): 139-158.
- Rowley-Jolivet, E. & S. Carter-Thomas., 2005. "The rhetoric of conference presentation introductions: context, argument and interaction." *International Journal of Applied Linguistics* 15 (1): 45-70.
- Skrbis, Z., 2010. "The Three Minute Thesis (3MT) ". *Paper presented at 9th Quality in Postgraduate Research Conference, Adelaide, South Australia, 13-15 April, 2010*. Australia: The Australian National University.
- Swales, J. 1990. *Genre Analysis: English for Academic and Research Settings*. Cambridge: CUP.
- Swales, J., 2004. *Research Genres: Explorations and Applications*. Cambridge: CUP.
- Thompson, S., 1994. "Frameworks and context: A genre-based approach to analyzing Lecture introductions". *English for Specific Purposes* 13 (2): 171-186.
- Williams, R., 1999. "Results section of medical research articles: An analysis of rhetorical categories for pedagogical purpose". *English for Specific Purposes* 18 (4): 347-366.
- Yu, S.H. and K. Cadman., 2009. "EFL learners' connection with audience in oral presentations: the significance of frame and person markers". *TESOL in Context Special Edition S2*



**STUDY ON THE CHARACTERISTICS OF DISTRIBUTION AND ECOLOGICAL OF  
CUNNINGHAMIA KONISHII HAYATA IN PU MAT NATIONAL PARK AND SOME SOLUTIONS  
FOR CONSERVATION**

Authors: Nguyen Cong Truong and Nguyen Van Sinh  
Nghe An University of Economics

*Address: 51 – Ly Tu Trong street, Vinh city, Nghe An province, Country: Vietnam*

*Corresponding author-E-mail address: congtruong777@gmail.com*

**ABSTRACT**

Cunninghamia konishii is distributed in 04 areas in Pu Mat National Park such as Khe Bu, Khe Tun, Khe Ngoa and Pu Nhung with an area of 7,167ha (0,008% total area of Pu Mat). Cunninghamia konishii is distributed at the elevations from 960m to 1500m, on the light yellow feralit or grey yellow feralit. The regeneration ability of Cunninghamia konishii is very weak.

**KEYWORDS:** Cunninghamia konishii Hayata, Taxodiaceae family, distribution, Pu Xai Leng, Pu Hoat, Pu Mat, Pu Den Den.

## INTRODUCTION

*Cunninghamia konishii* Hayata belongs to the Taxodiaceae family with very narrow distribution. Until now, scientists have only recorded the distribution of *Cunninghamia konishii* Hayata in no places in the territory of Vietnam but some mountainous areas of Nghe An such as Pu Hoat, Pu Mat, Pu Den Den, Pu Xai Leng. Vietnamese Red Book of 2007 ranked *Cunninghamia konishii* Hayata at the vulnerable level. This species is not only scientifically significant but also of high economic value. *Cunninghamia konishii* Hayata is tough, free from termite, with colourful flower grains which makes it very popular in making handicrafts, household items. It's these reasons that *Cunninghamia konishii* Hayata attracts much attention of being exploited. *Cunninghamia konishii* Hayata has higher export value than *Fokienia hodginsii* (about 15% - 20%). The survey which researched the plant diversity has confirmed that *Cunninghamia konishii* Hayata is distributed in some areas of Pu Mat National Park. However, the scientific data and in-depth researches on this rare species are not much. Therefore, it is necessary to conduct in-depth studies to provide a scientific basis for conservation solutions in Pu Mat National Park, especially, the studies of distribution, conservation and ecology of the species.

## RESEARCH MATERIALS AND METHODS.

### 1. Research objects:

*Cunninghamia konishii* Hayata which belongs to Taxodiaceae.

### 2. Research purposes:

- (+) To study the distribution of *Cunninghamia konishii* Hayata in Pu Mat National Park;
- (+) To study some ecological characteristics of *Cunninghamia konishii* Hayata in the natural distribution area of Pu Mat National Park;
- (+) To study reproductive characteristics of *Cunninghamia konishii* Hayata;
- (+) To propose solutions for preservation of *Cunninghamia konishii* Hayata in Pu Mat National Park.

### 3. Research methods and materials

Literature review:

- Reviewing domestic and foreign documents or researches which are related to the research topic.

Linear survey method:

- Basing on the collected data on land area and amount of forest resources status, establish preliminary survey lines to determine the distribution of species in Pu Mat National Park. According to the topographic conditions and inherit information from a number of previous studies, I have established four survey lines:

Route 1: From Khe Tun to Khe Ca;

Route 2: From Khe Bu area to Khe Ngo;

Route 3: Upstream area of Khe Thoi; Route 4: Pu Nhung area.

### 4. Data collection:

On the locations where *Cunninghamia konishii* Hayata are identified through the linear survey, three typical standard plots were established and the survey was conducted in forestry science. Standard plot sizes are 2000m<sup>2</sup> (40m x 50m).

## RESULTS

### 1. Distribution characteristics of *Cunninghamia konishii*.

*Cunninghamia konishii* in Pu Mat National Park has a narrow, disruptive distribution area that forms almost pure populations of *Cunninghamia konishii*, and appears at elevations between 900 and 1,500 meters above sea level. *Cunninghamia konishii* usually occurs in the closed-canopy evergreen mixed broadleaved and coniferous subtropical forest.

Table 01: The distribution of *Cunninghamia konishii* in Pumat Nation Park

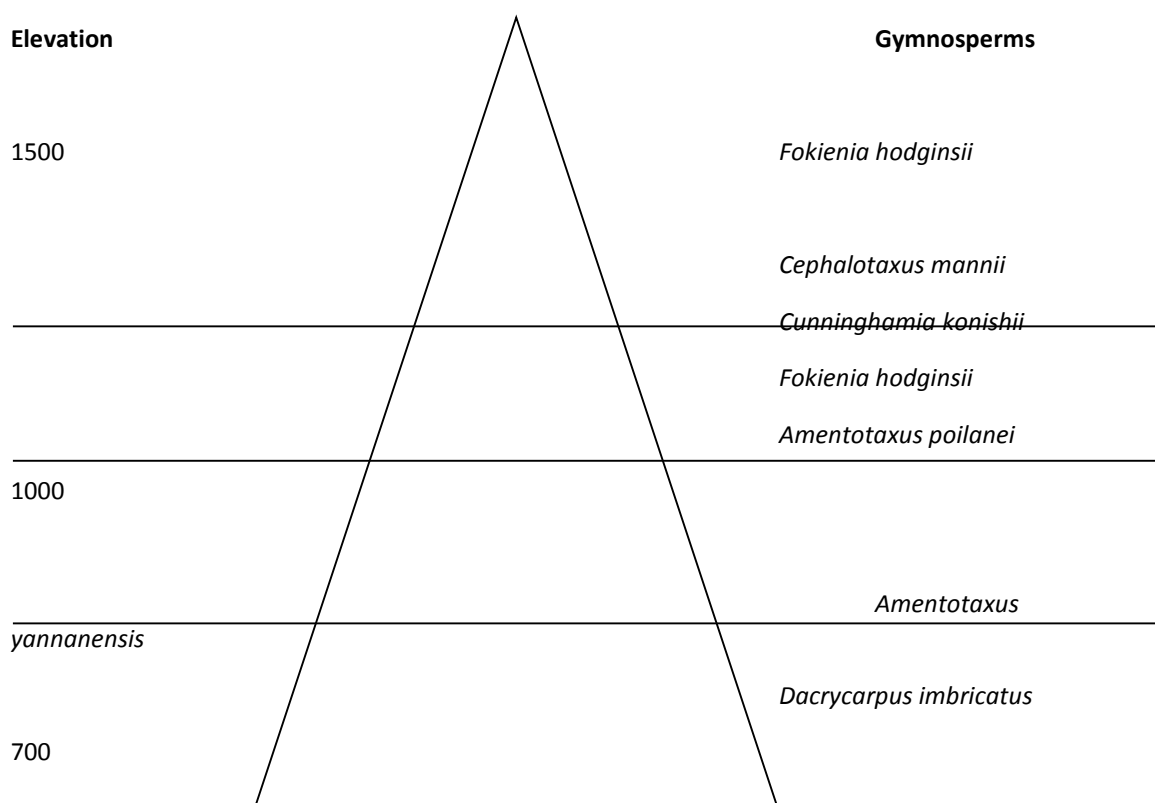
Area	Height	Steepness	Quantity	D1.3 (cm)	Hvn (m)
Upstream Khe Thoi	1.050 m	400 - 420	650	96,20	31,80
Khe Ca – Khe Tun	960 m	350 - 380	70	154,90	46,60
Upstream Khe Ngoã	1.350 m	400 - 450	23	82,19	30,63
Pù Nhông	1.200 m	400 - 430	25	90,00	34,25

*Cunninghamia konishii* is distributed in populations with very large individuals which gain the average diameter from 80 cm to 160 cm, the height from 30 - 50m. Particularly there are giant trees of diameter from 450 to 500 cm, height over 60m. Areas in which *Cunninghamia konishii* are identified, are often high - varies from 350 to 450 m and complex in the terrain. *Cunninghamia konishii* often grows along the waterways between the ravines and the mostly found in the upstream area of Khe Thoi with 650 individuals discovered more than other areas such as Khe Ca - Khe Tun, Upstream Khe Ngo, Pu Nhung.

**Table 02: Statistics on the distribution of in *Cunninghamia konishii***

TT	Area	Sub-area	Area (ha)	Notes
1	Upstream Khe Thoi	787; 794	5,513	
2	Khe Ca – Khe Tun	795; 798	1,039	
3	Upstream Khe Ngoã	835	0,325	
4	Pù Nhông	813	0,289	
Total			7,167	

Comparison of the distribution of *Cunninghamia konishii* with some bare-seeded species found in the Pu Mat National Park at high elevations. For a clear understanding of the distribution characteristics of *Cunninghamia konishii*, we compared that of the species with some other Gymnosperms in Pu Mat National Park by elevation. Basing on the results of the previous authors' studies and the available data on the distribution of the species in the field, together with the research data in this issue, we draw out a distribution map of Gymnospermous species as follows:



From the map, we can see that *Cunninghamia konishii* is distributed at elevations of 1,000 - 1,500m. This is the transition height between closed-canopy broad-leaved evergreen rainforest and evergreen subtropical forest. The above results show that the *Cunninghamia konishii* can be distributed along the same elevation with

*Cephalotaxus mannii* or *Amentotaxus poilanei* and possibly with *Fokienia hodginsii*. However, *Fokienia hodginsii* are often distributed at higher elevations.

## 2. Some ecological characteristics *Cunninghamia konishii*

### 2.1. Elevation and topography.

*Cunninghamia konishii* is distributed in closed-canopy evergreen mixed broadleaved and coniferous subtropical forest, with elevations between 960m and 1,500m. The slope of the distribution area is very large, varies from 380 to 450. The terrain is very complex and divided. *Cunninghamia konishii* is usually distributed from the base of the ravines to the middle of the trenches.

In these areas, there are usually rocky mountains with erect and steep slopes and primitive forests. These are the main reasons for difficulties in widening the distribution areas of the species and this may explain the limitation in the distribution of *Cunninghamia konishii*. On the other hand, the distribution in places with difficult terrain has a great impact on the regeneration ability of the species. It is very difficult for seedlings to cling to in steep places, and often swept away by water to areas with unfavorable conditions and inability to survive. In some places where the seedlings survive, they usually grow into clusters. This is the reason why *Cunninghamia konishii* are generally distributed by species.

### 2.2. Structural features of tree floor.

- The structure and density of the tree floor:

From the results of the survey at 03 OTC, we have calculated the formula of the tree floor in which there is the distribution of *Cunninghamia konishii* as follows:

Area	Formula
Khe Thoi.	$2,64Smd + 2,11Gie + 1,48Tra + 1,35Com + 1,20Mn + 0,97Re + 1,45LK$
Khe Tun – Khe Ca.	$1,82Gie + 1,81 Sa mu dau + 1,62Re + 1,21Tra + 1,06Mn + 0,99Com + 0,51Gi + 1,84 LK$
Khe Ngõa	$1,89Gi + 15,68Tra + 14,58Smd + 1,43Vu + 0,90Com + 0,59Chr + 2,40LK$

In Khe Thoi, *Cunninghamia konishii* has a remarkable advantage over other plant species in the plant community. Growth parameters and the density of *Cunninghamia konishii* in Khe Thoi are the highest. The dominant level and growth level of *Cunninghamia konishii* decreased from Khe Ca - Khe Tun to Khe Ngõa. This feature is quite similar to the distribution of the species in areas of Pu Mat National Park. Thus, Khe Thoi can be considered the most suitable ecological area for *Cunninghamia konishii*.

Through the formulas, we can see that there is the appearance of plants such as ramie, red tangerine, Mac Nieng with a relatively large participation in the formula. It is initially recognized that these species often grow along with *Cunninghamia konishii* and among them, there has been a certain relationship. However, to test this relationship we need to study their relative level.

**Table 04: Growth Quotient**

Area	N (c/ha)	$\bar{D}_{1.3}$ (cm)	$\bar{H}_{vn}$ (m)	N (%)	$\Sigma G$	G%
Khe Thoi.	25	96,20	31,80	4,95	18,16	39,19
Khe Tun – Khe Ca.	20	154,90	46,60	3,42	37,67	57,08
Khe Ngõa	20	82,19	30,63	4,17	10,61	27,40

- Growth:

The average growth quotient of *Cunninghamia konishii* is high. This suggests that the plants in these communities are mostly mature, but there doesn't exist the next generation which means there are no young plants. This is an unusual problem for the community and it is very important to be researched

- Sublevel structure:

Most of the areas where *Cunninghamia konishii* are distributed, the forest is also very pristine; the canopy can vary from 0.70 to 0.80. Here, the forest is divided into three distinct levels: the Emergent layer A1 is 27 m high, including *Cunninghamia konishii*, *Manglietia insignis*, accounting for 15%- 20% in communities. Tree are scattered and distributed relatively evenly, the main forest floor A2 consists of trees of 15-25m height, accounting for 55- 60% of the total number of individuals. *Cinamomum* spp, *Lithocarpus elegans*, *Machilus trijuga*, *Endiandra hainanensis*, *Syzygium* spp, and *Mischocarpus pentapetalus* make the canopy. The A3 floor

consists of trees of less than 15m in height, mainly pineapple, sarcophagus, forest tea, rattan shoots... The floor of shrubs and vegetation is very thin, often include *Tectaria brachiata*, *Pentaphragma*, *Begonia* sp, *Melastoma eberhardtii*, *Ludwigia octovalvis*.

### 2.3. Soil and climate characteristics.

- Soil: The areas where *Cunninghamia konishii* are distributed are mainly yellow or yellowish feralite, developed on sedimentary rocks and metamorphic with coarse-grained composition and light composition. The ground in these areas is often crushed or rocky.

- Temperature: The temperature in the areas appear to be lower than the normal temperature from 20°C to 30°C. The amplitude of the heat varies greatly in the year.

- Precipitation and humidity: The precipitation in the areas where *Cunninghamia konishii* are distributed are high, from 1700mm to 2000mm.

Rainfall is usually seasonal, with the rainy season coming sooner and ending earlier than in the lowlands. These areas are heavily influenced by Lao's wind and classified into two distinct seasons. The humidity here varies greatly, in the rainy season the humidity is very high but in the dry season, especially in a season with Lao's wind, the humidity is very low.

- Lighting intensity: These areas are often distributed at the edge of the ravines up to the middle of the mountain, where the slope is high, so the length of the lighting time is greatly reduced. There is often lack of light in the forest.

### 3. Reproductive characteristics.

Basing on the results of the survey, we have identified some of the important regeneration characteristics of the species. The seeds of ripening fruits are not separated after falling but remain on the hat. If the condition is favorable, the young tree will sprout on the fallen hat. This phenomenon is completely different from other gymnosperms. This is the reason why *Cunninghamia konishii* are often found in clusters. Another important feature is that the density of young *Cunninghamia konishii* is often found in vacant areas or places with lots of light or places of change such as landslides. This proves that *Cunninghamia konishii* has a high demand for light, which is also the reason why less regenerated *Cunninghamia konishii* are found in the forest canopy. Because there is lack of sunlight under the forest canopy. Through the results of the survey, we find that the reproductive condition of *Cunninghamia konishii* is very poor. Regeneration occurs mainly at the seedling stage. Young trees are rarely found and the tree survival is not good. This is a problem and a major challenge for the conservation of this rare tree species.

### 4. Solutions for the conservation of *Cunninghamia konishii* in Pu Mat National Park.

In order to preserve the *Cunninghamia konishii* species, we propose some solutions as follows:

#### + In-situ conservation:

Establish specific sub-zones where *Cunninghamia konishii* are found; ask the local forestry authorities to focus on the inspection and protection; call for the participation of local people, border soldiers and local authorities in inspection and protection; use postbox for revelation; prevent illegal deforestation; publish conventions; carry out regeneration by shedding the vegetation to enhance the light under the forest canopy for the seedlings to grow; collect the ripen fruits to sow in adjacent areas

#### + Ex-situ conservation:

This is a guiding solution. By using clonal propagation and sexual propagation, we can plant seedling in areas with suitable ecological conditions to conserve the *Cunninghamia konishii*. However, in order to preserve the successful transition, Pu Mat National Park needs to have more in-depth study on the ecological characteristics of Sa Mu mountain to ensure its success.

## CONCLUSIONS AND RECOMMENDATIONS

### 1. Conclusions

*Cunninghamia konishii* is distributed in the areas of Khe Thoi, Khe Tun, Khe Ngoa and Pu Nhong with the area of about 7,167 ha, accounting for 0.008% of the total area of Pu Mat National Park. *Cunninghamia konishii* is often found in the elevations of 960m - 1500m above thesea. The slope in these areas are high from 38° to 45°, the terrain is very complex and sharply divided.

*Cunninghamia konishii* often grows on light yellow feralite soil, develop well on sedimentary rocks and metamorphic raw grain. Temperature requirements from 23 to 24°C - either high nor low, the amplitude of the heat is large.

There are two distinct seasons in these areas with Lao's wind. Regeneration of *Cunninghamia konishii* is poor, regenerated young trees under forest canopy are few and mainly in the seedling stage. Young regenerated trees are almost unnoticed.

## 2. Recommendations

*Cunninghamia konishii* is rare, narrow distributed, and are in endangered status. They need to be listed as a protected species. In order to have a basis for proposing appropriate conservation practices, we need to have in-depth studies on the ecological and physiological characteristics of *Cunninghamia konishii* which can be ascientific basis to preserve the species.

## REFERENCES

- [1]. Vietnam National University, 2001: List of Vietnamese plant species. Volume 1: 1165-1166 (In Vietnamese)
- [2]. Ministry of Science and Technology, 2007: *Vietnam Red Book. Department of Plants*. 530-532. Publisher. Natural Science and Technology (In Vietnamese)
- [3] Tran Huy Thai, Phung Tuyet Hong, Nguyen Thi Minh, 2007: *Chemical composition of essential oil (Cunninghamia konishii Hayata) in Vietnam*. Research issues in life sciences. 375-377 (In Vietnamese).

**SCENARIO AND SOLUTIONS FOR PRESERVING KHMER FAIRY TALES  
(SITE: SOC TRANG AND AN GIANG PROVINCE)**

Professor Vu Anh Tuan

*Lecturer of Hanoi University of Education I,*

Email: tuan.v.a.sphn@gmail.com, Tel: 0912668358

Ph.D. student Nguyen Thi Nhung

*Ph.D. student specialized in Folk Literature at Hanoi University of Education, Lecturer of Ethnic Minority  
College of Can Tho University,*

*Corresponding Email: ntnhung@ctu.edu.vn Tel:0945637676*

**ABSTRACT**

The more the society develops, the more the spiritual life of people is improved and diversified. Many modern forms of entertainment have emerged and have replaced the traditional forms of culture and art. Therefore, many conventional cultural values are gradually lost. Conducting a survey and looking for solutions to preserve Folklore genres, especially fairy tales is one of the most necessary and urgent tasks in the Mekong Delta, especially Areas where Khmer people are living.

**KEYWORDS** :Reality, solution, conservation, Khmer fairy tales.



## INTRODUCTION

In the Mekong Delta, folk literature, including the legendary Khmer tales, is at risk of being forgotten [1],[4],[8]. The survey shows that less of Khmers know and care about folk tales especially their fairy tales. Therefore, researching the situation and finding solutions to preserve the Khmer fairy tales in the Mekong Delta is a contribution to the preservation and development of folk literature, which is fairy tales in Khmer folk literature.

## MATERIALS AND METHODS

To complete our research, we use the following research methods and approaches:

### \*Practical method

This method is used when we go to Khmer-inhabited areas in the Mekong Delta to participate in scenarios where miraculous fairytales are performed for recording, filming and documenting. In addition, we designed questionnaires and notes for the in-depth interview with native Khmer people to find suitable stories to propose conservation solutions.

### \*Methods of analysis, statistics, classification

Methods are used in this research to count available texts and practical texts, based on that method and categorize the stories, as the basis for identifying and classifying the fairy tales.

## RESULTS

### 1. Survey

Total number of survey questionnaires: 222

#### Age of respondents:

- Under 25 years old: 144 questionnaire forms, occupied 64,9%
- 25 to 50 years old: 52 questionnaire forms, occupied 23,4%
- Over 50 years old: 26 questionnaire forms, occupied 11,7%

#### Ethnic group of respondents:

- Khmer: 207 questionnaire forms, occupied 93,2%
- Kinh: 14 questionnaire forms, occupied 6,3%
- Hoa: 1 questionnaire forms, occupied 0,5%

#### Survey content: (Questionnaire, interview, survey)

- Form of existence and preservation
- Main content
- Time of the performance
- Object of interest
- Other values

#### Form of survey:

Order number	Questions	Responses
1	What kind of folk tales of the Khmer usually exist? (oral/ written records)	-oral records: 118 sheets (53,2%) -written records: 16 sheets (7,2%) -both oral and written records: 88 sheets (39,6%)
2	Where are the written-form folk tales of the Khmer preserved? Were they written in Vietnamese or Khmer language?	*place of preserve: -pagodas: 107 sheets (48,2 %) -other places: libraries in An Giang, Tra Vinh, Soc Trang province; museums in Soc Trang, Tra Vinh 115 sheets (51,8%) *They were mainly written in Khmer language (124 sheets, occupied 55,9%). Besides, they were also written in Vietnamese and Bali language 98 sheets (44,1%).
3	When are folk tales of the Khmer told? Where are they told?	-family gathering, festivals at the pagodas and when the monks evangelize Buddhist tenets. 180 sheets (81%)

Order number	Questions	Responses
4	Do many local people remember folk tales of the Khmer? Who can remember the most?	-at Khmer learning class by teachers 42 sheets (19%) -much: 96 sheets (43,2%) -a little: 126 sheets (56,8%) -people remembering the most are the monks, the management board of the pagodas, youngsters learning at pagodas and the elderly 180 sheets (81%) -teachers teaching Khmer language 42 sheets (19%)
5	Can the content of folk tales be changed into scripts for other forms of art? What are the forms of art? When are they performed?	-answer "No": 58 sheets (25,5%) -some form of arts being changed into scripts are Lam Thon, Du Ke, Ch'Bay, Ro bam and they are primarily performed in festivals of the Khmer 164 sheets (74,5 %)
6	-Currently, what is the age of Khmer people having understanding about fairy tales?	-before 15 years old: 67 sheets (30,2%) -from 15 to 59 years old: 118 sheets (53,1%) -after 60 years old: 37 sheets (16,7%)
7	Do Khmer children love the fairy tales of your ethnic group?	-answer "yes": 82 sheets (81,9%) -answer "no": 40 sheets (18,1%)
8	Do Khmer children ask other older people in the family tell the fairy tales of the Khmer?	-answer "yes": 161 sheets (72,5 %) -answer "no": 61 sheets (27,5%)
9	What are some difficulties affecting the existence and preserve of fairy tales of the Khmer?	-the traditional feature is not maintained because of the shortage of preserve in books 40 sheets (18%) -because of the busy life, the elderly couldn't remember much about the fairy tales and children do not care much about them 100 sheets (45%) -technological development and the advancement of mass media makes the need to expose to fairy tales decrease, because of the influence from other ethnics and wars 82 sheets (37%)
10	How does your community preserve these fairy tales?	-answer "do nothing": 62 sheets -oral stories, "dien tuong" are the main way of preverve 160 sheets (72%)
11	How do you and your family preserve fairy tales of the Khmer?	-answer "do nothing" : 47 sheets (21,2%) -tell fairy tales in festivals and in family meetings. -find fairy tales books to read 175 sheets (78,8%)
12	Can you tell me the names of some fairy tales of the Khmer you know?	-can not tell : 77 sheets (34,7 %) -can tell some fairy tales: 145 sheets (65,3%)
13	In your opinion, the study about the scenario of the existence of preserve of the Khmer's story including fairy tales is:	a. 134 sheets (60,4%) b. 78 sheets (35,1 %)

Order number	Questions	Responses
a.	Very necessary	c. 7 sheets (3,2%)
b.	Necessary	d. 2 sheets (0,9%)
c.	Not really necessary	
d.	Completely unnecessary	

Assess the situation:

**\* Older people are less interested in fairy tales**

- During the survey, the majority of Khmer people responded enthusiastically, with 207/222 questionnaire forms (occupied 93.2%). This proves that the Khmer are proud and conscious, responsible for preserving their folk tales, including fairy tales. However, the number of respondents is still young, under the age of 25, 144 questionnaire forms (64.9%). The age from 50 years old and over, 26 questionnaire forms (11.7%). This shows that older people have more accurate information that we need but they are less interested in fairy tales.

**\* Form of existence and preservation**

- From the survey, we found that the main form of existence and preservation of the Khmer folktales is in oral and written records. Specifically when asking: What kind of folk tales of the Khmer usually exist?, the result shows that there are 118 questionnaire forms indicating that it exists in oral records (53.2%), 16 questionnaire forms answered by the form of documents (occupied 7.2%) and 88 questionnaire forms answered in both forms (39.6%). The questionnaire forms answered that they exist by the Khmer documents which accounts for 55.9% and the total 107 questionnaire forms show they are preserved in temples are 107 (occupied 48.2%). The documents in Vietnamese are written and compiled by folklore collectors, such as *Khmer-bilingual story* (Son Phuoc Hoan-Son Ngoc Sang) [6], *Khmer narratives* (Son Wang and Lam Es), *Folk literature of the Mekong Delta* was collected and compiled by the teachers and students of Can Tho University, *Khmer folk tales* (Huynh Ngoc Trang) [12], *Folk literature of Soc Trang*, *Folk literature of Bac Lieu* and *Folk literature of Soc Trang* of Chu Xuan Dien, collected and compiled by teachers and students of the University of Social Sciences and Humanities of Ho Chi Minh City.

**\* The amount and content of fairy tales gradually narrowed**

The survey also shows that nowadays, most of the monks only know the folk tales of Shakyamuni Buddha. (When talking about the Buddha, the monks talk very confidently and proudly) but the folk tales of the Khmer are rarely remembered. This is also understandable because of the process of learning and the need to evangelize. The monks only focus on the Buddha, but gradually forget the folk story. Even if they remember, they cannot remember the whole story, so they often refused to tell the stories. According to the monk Lam Tu Linh (Hamatup Temple - Soc Trang City), there are some historical books preserved at the temple but due to the time and the lack of preservation, some are damaged, and some are lost. This is a big loss for the researchers interesting in this field. Besides the monks in the temple, the elders also know the Khmer folk tales but most of them do not clearly remember clearly the content of the stories and also get many difficulties when telling the stories. The main problem is old age and they do not tell the stories for a long time. If you want to hear the stories, you have to give the elders time to reflect. Although they have time to remember, they cannot remember all the stories. Sometimes they are confused and mix up one genre to another genre. Story telling is sometimes too difficult and that makes the life of the folk stories including the legendary Khmer miracles are decreasing and being on the verge of a gradual decline.

**\* The legendary fairy tales are often Vietnamized**

Naming stories is also varied more according to trend naming the stories by the Kinh and is often Vietnamized. As the story Chau Thong Chau Sanh is called Thach Sanh - Ly Thong, Nieng-mo-ro-nac-moda or Nieng-kon-tuoc Nieng - Chong-Ang-Kam is called Tam Cam... What we are concerned most is the number of people who know about this genre is becoming less and less. Many of older people who know greatly about this type of story of the Khmer people have died of age, and the young Khmers today approach the Vietnamese culture quite early (because most of them study at the schools using National language) then they have little interest in the folk tales of their people. And today's reality also shows that: On festival occasions, the Khmer people do not often tell folk tales to each other. They only tell the stories of the Buddha for the purpose of preaching and teaching Buddhists to direct their hearts toward the Buddha.

## 2. Some conservation solutions

Based on the survey situation, we propose some solutions to preserve and bring into play the Khmer folk tales as follows:

### **\*Enhance the role of Khmer students in preserving and promoting the Khmer folk tales**

According to the statistics we have, currently the proportion of Khmer students studying at Can Tho University and professional schools in the country is quite high (about 30%), they are young intellectuals of the Khmer future. More than anyone else, Khmer students need to be aware of the importance of the Khmer folk story system in traditional folk preservation. So, for preserving the Khmer folk tales, we chose to enhance the role and our awareness of Khmer students which is the most important solution. Through the organization of the "Khmer Folk Storytelling Contest," firstly it will be launched mainly in the School of Pre-University, to encourage Khmer students to participate and learn about folk tales of Khmer in general and the Khmer legendary in particular. Then, we will organize the contest at the school on the occasion of the new year celebration of the Khmer, Chol - Chnam - Thmay. In addition, we also organize the collecting and practicing programs so that Khmer students can join. We believe that the activities mentioned above are likely to be able to preserve and promote the Khmer ethnic culture.

### **\*Based on the temple, the administrators of the temple and the monks, teachers teach Khmer language to improve Khmer people's sense of story Khmer folk**

In the cultural life of Khmer people, pagodas and monks play a very important role. The Khmer people consider temples as their second home. In particular, the Khmer people worship Buddhism and fully trust in the monks as well as the temple administrators. The monks and the administrators of the Khmer temple are intellectuals who understand many aspects of their spiritual and cultural life. They are the most well-informed about the role and value that the Khmer story brings. In particular, temples are places storing many cultural values of the Khmer. Khmer temples are places occurring spiritual, religious activities as well as teaching words and convey the knowledge of traditional culture. Especially, according to traditional custom, the Khmer boys getting the adulthood usually have to go to the temple for 3-5 years before leaving the monkhood to get married. The ordination is an act of showing gratitude toward parents and to learn the wisdom to improve knowledge. When studying Khmer language at the temple, if these boys are told the folk tales, they will be the force to spread the Khmer stories after their marriage to the society.

The schools that teach Khmer language, ethnic boarding schools are the places to spread Khmer folk stories to the young Khmers. Moreover, during the stressful learning time, teachers can tell the Khmer folk tales to the students. First of all, it helps the students to be entertained. Then, it makes the class more interesting and the most important benefit is to raise the awareness of the student about the importance of Khmer folk tales when they are still sitting on the school bench.

### **\*Promote the role of mass media in preserving and bringing into play the Khmer folk tales**

The television stations, radio stations, and mass media have a quite important role in popularizing the Khmer stories. The television station, radio stations at the places where Khmer people live has a specific time frame for the Khmer. Therefore, we can encourage the television stations to promote the folk tales. The programs broadcasting at the places where the majority of Khmer people live need to take apart in introducing or telling the folk tales. And the television stations in Khmer should spend a few minutes to play short films with scenarios of folk stories of the Khmer. TV stations can also follow the format of the program Once Upon a Time to restore folk tales. This is also a viable option. In addition, there is a need to organize a contest about the Khmer folk tales on television to popularise, attract, as well as raise the awareness of people about the Khmer folk tales. The Khmer local newspapers should devote a part to introduce the Khmer folk stories more widely. A YouTube channel is one of the most popular videos sharing channels right now. Therefore, we can create a Khmer folk storytelling program on this site, which can help the Khmer stories not only be widely circulated in the country but also has the opportunity to expand worldwide.

### **\*The preservation and development of storytelling environment of Khmer folk tales**

We can clearly see that the storytelling environment of the Khmer folk tales has created a unique atmosphere for the reception of the work, only in that atmosphere, the novel tells the story of all its aesthetic value and its aesthetic effects are all-round and diverse. During a free time in evening, under the moon light and a nice breeze, grandparents or parents sit down to tell folk stories for the children. Imagine how attractive the story would be compared to reading the stories on pages of the Khmer folk tales exception. When a narrator tells the story, it means the narrator is performing the story through the style, the voices, the gestures, the actions, the emotions expressed during the process of telling the story which makes it more lively and charismatic. In addition, stories that have been changed into scripts, such as Du Ke, also give the audience more options to approach. The Du Ke stage has become a great storytelling environment of folk tales. The storytelling environments of Khmer folk tales

are on the downswing, needing the owners, who are actually possessing them, trying to restore them. Although knowing that raising awareness of the Khmer in this is relatively difficult, it is not impossible. During the topic, the writer asked people about the meaning of the survey of exist and handed situation of Khmer folk tales and receive a very positive answer. Specifically, there are up to 134/222 (occupied 60.4%) of very necessary evaluation forms, 78/222 (occupied 35.1%) necessary evaluation forms. The evaluation shows that the Khmer are still conscious of preserving their folk tales, the issue is that their condition is not allowed.

To keep the Khmer folk stories alive, it is very necessary to preserve and develop the types of scripts that are changed into scripts, because they are the life of the Southern Khmer folk tales, keeping them as keeping the breath of Khmer folk tales. As mentioned above, Du Ke is the most popular stage performance and should be preserved most. Besides Du Ke, Cham – rieng – cha – pay is also another type of art. The art of Cham - rieng - cha - pay is playing Cha - pay and singing (singing as the storytelling) without any orchestra and accompanies. It sounds very monotonous, but not simple. Learning how to play Cha-pay is difficult because it requires a meticulous training of every finger and need to apply a variety of cultural and social knowledge. Khmer people often use Cha-pay to accompany when telling stories. The stories can be folk stories or some sort of life stories. When we listen to a storyteller, we feel as if we are lost in a story full of different emotions, all emotions that depend on and improvise the emotions of the performer. Having the same fate with the Du Ke, Cham - Rieng- Cha - pay is also gradually, the number of artists who know how to play a piano is now very small. The restoration of the two types of arts requires people who are truly dedicated and a long-term, sustainable process. The Khmer culture is in need of cooperation from all, by preserving the culture of the Khmer is preserving the culture of the Vietnamese people.

### CONCLUSIONS AND DISCUSSION (10 pt)

According to the survey results, the author has proposed four major solutions to preserve and promote the folk tales of the Khmer which are: Enhance the role of Khmer students in the conservation and broadcast the stories of the Khmer folk stories; based on temples, the administration board and monks, teachers teach Khmer writing to improve the Khmer people's sense of Khmer folk stories; promote the role of mass media in preserving and promoting the Khmer folk tales; preserve and develop the storytelling environment of Khmer folk tales. These above four solutions are highly practical and the author is convinced that if these four solutions are implemented, we will achieve positive results in the preservation and transmission of the Khmer folk story system including fairy tales.

We have two questions to discuss with the researchers:

- In your country, what methods do people use to preserve Folklore genres including fairy tales?
- Are the solutions we have set out above feasible and usable for preserving folklore genres in your country?

### REFERENCES

- [1] Tran Ngoc Binh (2008), *the Ethnic culture of Vietnam*, Thanh Nien Publishing House, Hanoi.
- [2] Vu The Binh (2000), *Beautiful Scene of Vietnam*, Culture and Information Publishing House, Hanoi.
- [3] Nguyen Dong Chi (2000), *Museum of Vietnamese fairy tales*, Education Publishing House, Hanoi.
- [4] Chu Xuan Dien (2004), *the Folk literature of Soc Trang*, Culture and Information Publishing House, Hanoi.
- [5] Le Ba Han - Tran Dinh Su - Nguyen Khac Phi (2007), *Dictionary of Language Arts*, Education Publishing House, Hanoi.
- [6] Son Phuoc Hoan – Son Ngoc Sang (1999), *Story of Khmer (bilingualism)*, Education Publishing House, Hanoi.
- [7] Dinh Gia Khanh (2001), *Vietnamese Folk Literature*, Education Publishing House, Hanoi.
- [8] Pham Tiet Khanh (2007), *Survey of Khmer folk tales in South Vietnam (Myths, legends, fairytales)*, Hanoi University of Education, Hanoi.
- [9] Nguyen Khoi (2006), *Ethnic Groups in Vietnam - How to Use last name and Naming*, Ethnic Culture Publishing House, Hanoi.
- [10] Huynh Vu Lam (2008), *Practical cultural values in Khmer Southern folk comedy*, Ho Chi Minh City Pedagogical University, Ho Chi Minh City.
- [11] Huynh Vu Lam (2015), *Study of the Southern Khmer folk story from the perspective of the context*, Ho Chi Minh City Pedagogical University, Ho Chi Minh City.

- [12] Huynh Ngoc Trang (2002), *Folk tales of Khmer - Volume 1*, Dong Nai Publishing House., Dong Nai.
- [13] General Statistics Office (2010), *Population and Housing Census 2009*, Statistical Publishing House, Hanoi.
- [14] Ministry of Culture and Information (2004), *build the cultural life of Khmer ethnic group in the South*, Hanoi.
- [15] Antti Aarne, Stith Thompson (1973), *The Types of the Folklore-A classification and Bibliography*; Suomalainen Tiedeakatemia Academia Scientiarum Fennica, Helsinki.
- [16] Stith Thompson (1977), *The folktale*, University of California press, Berkeley, Los Angeles, London.



**USING FORMATIVE ASSESSMENT IN THE SECOND LANGUAGE CLASS**

Pham Thi Thang, M.A.

*Department of Foreign Languages & Informatics - Lao Cai Teacher Training College  
Chieng On Streer, Binh Minh Ward, Lao Cai city  
Corresponding E-mail address: phamthanglc@gmail.com*

**ABSTRACT**

Assessing the students' learning outcomes is an important step in teaching and learning process. Assessment is the process of gathering data. More specifically, assessment is the ways instructors/ lectures gather data about their teaching and their students' learning. Formative assessment is a deliberate process used by teachers and students during instruction that provides actionable feedback used to adjust ongoing teaching and learning strategies to improve students' attainment of curricular learning targets/goals. Assessment is a huge topic. In order to grapple with what seems to be an over use of testing, educators should frame their view of testing as assessment and that assessment is information. The more information we have about students, the clearer the picture we have about achievement or where gaps may occur. The objective of every good teacher is that students can have a successful and progressive performance throughout the course. However, there are times when what is taught in the classroom is not enough for the proper outcome of some students who may have some learning difficulties. "What should we do with these students?", "how can we find the source of their real difficulty?" and "how to deal with such problems?" are common questions among teachers and about which we intend to reflect in this work. The answer lies in the use of planned formative assessment procedures. Formative assessment guides teachers in many ways. It helps teachers to appropriately scaffold and provides feedback to them and to the students. Use formative assessment to check for understanding and adjust teachers' instruction based on what teachers 've found. Formative assessment is an ongoing process that involves far more than testing and measurement of student learning. The information from formative assessments provide data during the instructional process and the results from teachers and students are used to make decisions about what actions to take to promote further learning. In doing research, we decided to think our students as patients who are looking for medical care, and showing them the steps to overcome the difficulties they have by using formative assessment. This paper is written with the hope that others will benefit from conceptualizing formative assessment as a tool for signposting the patients of second-language learning.

**KEYWORDS** : Formative assessment, Second language class, Students' competency, learning process



## INTRODUCTION

Several researchers have shown that formative assessment is essential in ESL/EFL teaching and learning (Bachman, 1990; Gattullo, 2000; Rea-Dickins & Gardner, 2000). As Cheng, Rogers, and Hu (2004) stated: “every model of the teaching-learning process requires that teachers base their decisions—instructional, grading, and reporting—on some knowledge of students’ attainment of and progress towards desired learning outcomes”. Therefore, teachers should continuously assess their students in order to help teaching and learning progress (Fulcher & Davidson, 2007). Thus, formative assessment is mainly conducted in the context of classroom. However, what is done in the classroom (with the purpose of assessing the students) is not always in favor of forming students’ learning; in another word, assessment practices in the classroom are not formative all the time. For instance, as Brown (2004) categorized, classroom assessment can have diagnostic or achievement purposes, or even measure proficiency purposes.

Through the process of teaching and learning of a foreign language, it is expected that students reach different levels of understanding and use of the topics taught. It is also expected that this knowledge be sufficient to enable students, based on practices they have previously had in the classroom, to communicate in an authentic environment outside the controlled situations presented during classes. One of the problems encountered during these practices is what a teacher must do with those students, for several reasons, fail to achieve the expected results in the communicative environment and, therefore, require more attention from the teacher in the classroom, as well as working outside the classroom to continue moving forward in their learning without losing motivation and still keeping up with their classmates. The teaching profession, at least in this specific point, resembles the medical profession and also the ones of other professionals in the health sciences: the teacher is often asked, through a work of initial observation of the student, to give a diagnosis of what is not functioning properly, then, propose a treatment for them and predict the prognosis, and last, follow the evolution of such treatment, in order to change what has been prescribed or reassure the option chosen. In order for the teacher to help the student overcome his difficulties, similar to what doctors do to their patients, it is necessary that the teacher follow three important steps: observation to determine how students are progressing, diagnosis by analyzing the data collected during the observation phase to determine what action should be taken, and decide the treatment. It is important to emphasize that these steps are carried out in a cyclical and continuing way until the “patient” (the student) is “cured”.

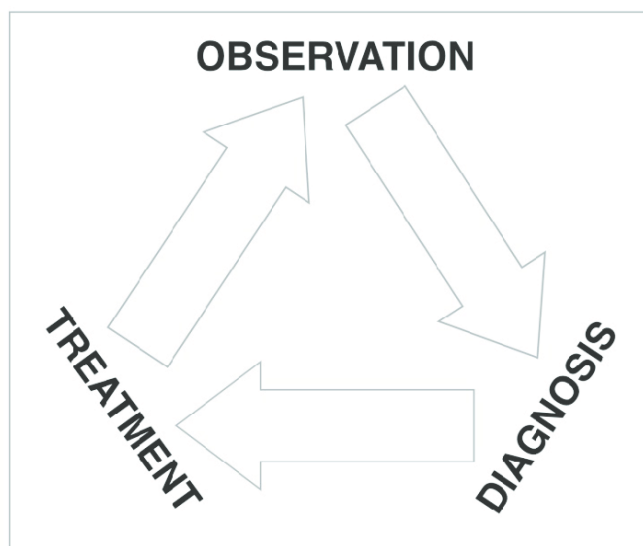


Figure 1: Diagram of the cyclical approach to assessing students' needs

### 1. Definition of Formative assessment

Formative assessment is the assessment that takes place during the course or program of study. It is a collection of practices that all leads to students learning improvement. Tools for the teachers to determine what they need to do to move the learners forward. A technique to help students optimize learning. As an integral part of the learning process, it is down to the teachers to design and implement it, incorporate into classroom practice, and it provides feedback to both teacher and learner about how the course is going. It also

helps answer the questions of “How can the learning be improved on during the course?”, and “Are the learners doing what they need to do?” Formative assessment helps teachers determine next steps during the learning process as the instruction approaches the summative assessment of student learning. Formative assessment is the way teachers assess students to understand what they have acquired from our instruction. The purpose of formative assessment is to adapt and accommodate our instruction based on student needs and readiness, to determine if teachers have achieved the goals and whether teachers can continue or should reteach the language.

In summary, the goal of formative assessment is to monitor student learning to provide ongoing feedback that can be used by teachers to improve teaching and by students to improve their learning. Formative assessments are generally low stakes, and can be a very quick assessment of whether the students have learned the content. Formative assessments help students to identify their strengths and weakness and target areas that need work. They also help teachers recognize where students are struggling and address problems immediately. Teachers engage in formative assessments give continual, explicit feedback to students and assist students in answering the following questions: (Figure 2.)

- (1) Where am I going?
- (2) Where am I now?
- (3) How can I close the gap between the two

In order to show students how to close the gap between where they are academically and where they want to be, teachers must help students evaluate their progress in the learning process and give them explicit, descriptive feedback specific to learning task.



Figure 2. The questions for students in formative assessment process

## 2. Expectation from students' learning.

Knowing what is the expectation of students at a given level and the language knowledge that students already have is one of the first things the teacher should consider to prepare extra tasks for the students. Furthermore, the students should be aware of what the teacher expects their outcome and which level they are expected to come to when students receive an instruction from the teacher and carries out activities. With goals are established, the task will be more palpable, and the goal will be more likely achieved. From all information, the teacher have to then proceed to the first step of the cycle: the observation.

## 3. The motivation of student.

One of the most difficult aspects of becoming a teacher is learning how to motivate students in learning. It is also one of the most important thing in teaching. Students who are not motivated will not learn effectively. They won't retain information, they won't participate and some of them may even become disruptive. A student may be unmotivated for a variety of reasons: They may feel that they have no interest in the subject, find the teacher's methods un-engaging or be distracted by external forces. It may even become known that a student who appeared unmotivated actually has difficulty learning and is need of special attention. If the student feels that he has a gap that needs to be filled in his learning, and the proposed activity to fill this gap is related to the reason why he is studying the language in the first place, he will be more prone to perform what the teacher proposes as extra work.

## 4. The cyclical approaches

#### 4.1. Observation

The observation of students' performance should be done from the beginning to the end of the course. When teachers start with new class students, they usually do not know who their students are, what their level their students is. In this situation, teacher should find out the ways to learn about students, their interests, their needs and motivations as well their background and language competency. The initial assessment will serve as an evidence for the construction and development of extra work that comes to be necessary while teachers are responsible for students' learning development.

According Zabala (1998), regarding the initial of assessment is the knowledge of what students know; know how it is, know how to do must be the starting point tell teachers know what objectives and intended learning content will be in the lessons, what kinds of activities and tasks will be established that have to favor the learning outcome of students.

There is no specific time to the observation of students' work. The importance is the teachers be attentive to all situations involving the use of the proposed language, such as interactions, reactions in the class, and products of skills performance

Another equally important issue is what to do with the data obtained from the observation. The information gathered during the observation to facilitate future reference is recommended in order to facilitate the assessment and the evaluation of the student, as well as to compare one's performance with oneself, to see how and how much the student has improved since the first observation.

Anderson Moço (2009) shares these early impressions when he poses that "Being attentive to students reactions while they produce is fundamental. Taking notes of what they say, especially when they do it spontaneously, may help teachers realize what their ideas are about what they are learning".

In teaching process, the more we know about students, the more we can help them. The primary motivation for using observation in teaching process focused on formative assessment is to improve teaching practice. Observations, sometimes called kid watching, can help teachers determine what students do and do not know to help find the diagnosis to the fill the gaps and promote the strengths of the students' learning.

#### 4.2. The Diagnosis.

Formative assessment if, how students are learning, and if the teaching methods are effectively relaying the intended messages. Formative assessment is about meeting the needs of all students by collecting data on what they know and do not know. Often, teachers do assessments that get this information, record the data, and move on to the next task or lesson. The result is not formative assessment, but summative. Summative assessments record student status for meeting key objectives, and then moving on to a new focus. A good diagnosis can only be given through thorough analysis on data collected during the observation phase. As teachers gather information and data about student learning, several categories may be included. In order to have better understand student learning, teachers need to consider information about the products students create and tests they take, observational notes, and reflections on the communication that occurs between teacher - student or students - students.

These data must be analyzed together to find what problems or difficulties are frequent to that specific student and what is the basic underlying cause of them, to direct which way the teachers and the students should follow. Moco (2010) stated that : « A good diagnosis does not have as its objective to account errors or classify students. This expresses that, it is not a test in the traditional sense. The purpose is to observe similar problems which will allow teachers to plan and direct the activities.»

When a comprehensive assessment program at the classroom level balances formative and summative student learning, a clear image emerges of where a student is relative to learning targets and standards. Students should be able to articulate this shared information about their own learning. When this happens, student- led conferences, a formative assessment strategy are valid. The more we know about individual students as they engage in the learning process, the better we can adjust instruction to ensure that all students continue to achieve by moving toward in their learning.

#### 4.3. The treatment

When defining what linguistic problems the students is facing, the teacher should first consider how much knowledge about the topic to be worked on the students already has suited their Zone of Proximal Development (ZPD), suggested by Vygotsky (1982), so that the work to be done is neither too easy, nor impossible to be performed, but challenging and motivating at the same time. The ZPD consists on the distance between the level of development of the learner in which he can complete tasks unaided and an upper lever of his potential development, in which he can complete tasks with the help of a peer, more qualified in this particular aspect, or a teacher.

This zone is based on a sociocultural perspective, where social interaction is a key concept for the development of students' learning. Knowing whether the contents taught are in the student's ZPD or not will help them look for an adequate treatment. The need of looking for treatment from students will help teachers propose suitable tasks that motivate students in learning.

During the treatment time, it is also important that the teacher, when thinking about the work to be developed by the students with the difficulty, be quite precise in addressing it, looking for the most urgent aspect to be "treated". That is, even if the student has several difficulties, the teacher should select the most urgent one, because the treatment will be performed during the school term and the student needs to meet the demands required during the learning time.

If the teacher does not focus on a specific goal to work and, instead, tries to address all the difficulties at the same time, the student may feel burdened and unmotivated to work on many difficulties, or may focus on such extra work and not meet the obligations necessary to advance in the course. To sum up, the treatment cannot be any kind of activity; it must be a specific action directed to a goal.

For the following three steps, we cannot think that the teacher's duty is over. More than "prescribing a medicine" for the student, the teachers has the obligation of following the development of the proposed solution. Without proper attention of those involved in this work, be the student, as the subject who takes active part in the execution of the work, or the teacher, as a counseling agent, the production will be not very good and possibly not as effective as it could be. In addition, it is also compulsory that a moment be reserved for the teacher to give feedback to the student in what concerns the work done. It is extremely important that students feel that their work is being given proper attention and that they receive in good time, the result of its production.

If students receive a feedback on their work many weeks after the evaluation was administered, they will probably be involved with other projects and will no longer focused on the work previously done. If using formative assessment for their student and work every day, it will help students recognize their limited and focus on their limited to try to get over it. It is equally important to verify the student's perception about what is being worked on.

With all these considerations, both the teacher and the student can assess the improvement acquired from the work in progress, and thus propose changes in the implementation thereof, so that the ultimate goal is reached. Finally, it is necessary to bear in mind that this process is not linear but cyclical. The follow-up serves as an integral part of the new observation, as well as to define a new diagnosis and help in using a new treatment, or changing the current one. Without this cyclical view, the work will remain stagnant and both the teacher and the student may mistakenly assume that, once executed, there will always be an effective improvement of what had been worked, which does not occur in all situations.

As the teacher looks over the data from the students' formative assessments, she or he can then modify instruction to address specific language functions that require reteaching or additional practice. During this reteaching, the teacher focuses on instructional strategies that will directly and immediately address specific functions. Students select which new strategy or strategies they want to use.

## CONCLUSIONS

When we talk about assessment of student performance and progress, there are simple, but important factors that teachers often do not pay attention and end up undermining the work done during teaching in the course. Therefore, teachers need to raise awareness and habits in using formative assessment during teaching time. We should do not let our students go adrift! Should give a precise and in time feedback to help student to be aware of their difficulties and can take actions to improve their performance. That means, the feedback of the teacher must have the necessary information so that students know how their performance is and what they can do to improve it. If this feedback is given late, it will probably be much more difficult to address and overcome such difficulties. In addition, the teacher needs spend the interested in how this work is being carried out. If the students do not perceive this, they will probably not give it due importance. Remind students when the work is due and observe the steps they are taking to get an improvement out of the activities they have to perform are ways to show that the teachers are interested and, thus, determine whether the student needs new "treatment". The second reason that can cause inefficiency in the whole process is a poor or inadequate choice of the work the student has to do with this student's interests. If the student fails to see one possible positive outcome for them in the tasks proposed by the teacher, this student will not carry out this work properly. Therefore, the importance of adapting the work to be done to what the student expects to have at the end of the course, what he aims to do with the language he is learning and whether this extra work really helps him achieve his linguistic goals. Finally, but not least, wrong attitude of many teachers is to put all their attention on the problems of those

students with difficulties and forget the students who do not necessarily require extra work to develop previously taught topics, because these students also need to feel challenged, they also need to feel they are developing, because if they get a feeling that they are not developing as much as they could. They will have no motivation. Hence, teachers should have different to different level students to bring them motivation with new challenges.

The problems encountered by some students during the school term, which prevent them to keep up with the pace of their fellow classmates is a challenge to teaching practice and, often, teachers do not know how to deal with many of them. By comparing the assessment, teachers need carry out while teaching students; we intend to provide a simpler approach to help especially, but not only, teachers who are beginning in this career and feel the burden of so many new responsibilities and preoccupations that come when we are relatively new to the job. Throughout this work, we found that through the understanding that the assessment is not a closed, but cyclical, and that each turn in this cyclical process leads the student to a new stage in their learning, these difficulties can be better examined by the teacher and consequently better treated and overcome. By paying attention to each step in this cyclical approach, teachers can understand what is expected from them when assessing their students, and, most importantly, they can understand more clearly what they need to do during each step and why it is needed follow such steps.

Observing the student, identifying their difficulties and testing (through the comparison of the data gathered through observation) if they really exist, leads the teacher to a precise diagnosis and the possibility of more effective treatment. Such treatment should be carried out in enough time and always taking account and respecting the students' ZPD. With good assessment, in which the student also can evaluate himself or herself, the probability of overcoming these difficulties will be much higher.

In conclusion, formative assessment has long been recognized as one of the most influential methods to improve learning and teaching. Many tools of formative assessment have been introduced since then; such as journals, portfolios, surveys, oral interviews, and presentations. Classroom assessment, on the other hand, has potentials to be formative and for-learning. However, Black and William (1998) showed that practical problems in classrooms could hinder effective formative assessment to be conducted. Therefore, by considering the importance of formative assessment in ESL/EFL teaching and learning, the difficulties and complexities teachers face in applying formative assessment in their classes, and lack of studies on this area, scholars should also focus their attention to the problems of making classroom assessment as formative as possible and suggesting ways to improve classroom assessment.

### ACKNOWLEDGEMENT

First and foremost, I would like to express my deep and appreciation to Rajabhat Maha Sarakham University, Thailand for conference invitation & warm welcome. I would like to express my deep and sincere gratitude to Prof. Thanwaporn Wimonchailerk for spending time to read my paper, correct mistakes, give effective comments and advice to make my paper productive and completed. I would like to express my gratefulness to Prof. Nguyen Huynh Phan for connecting me to the conference and the kindly help, guidance and reminders to researchers in preparing for paper and presentation in the conference. My thankfulness would also send to my colleagues for their support and help to complete research work directly or indirectly.

### REFERENCES

- [1] McManus, S. (2006). *Attributes of Effective Formative Assessment*. Accessed March 20, 2009 from The Council of Chief State School Officers.
- [2] Glenn Fulcher & Fred Davidson. *Language Testing and Assessment*.
- [3] Judy Dodge. *Using Formative Assessment to Differentiate Instruction & Meet the Needs of Second Language Learners*. (Scholastic, 2005)
- [4] Kozulin, A., Gindis, B., Ageyev, V., Miller, S. (2003). *Vygotsky's educational theory and practice in cultural context*. Cambridge: Cambridge University Press.
- [5] Liying Cheng, Todd Rogers, Huiqin Hu. *ESL/EFL instructors' classroom assessment practices: purposes, methods, and procedures*, 2004.
- [6] Lorna M. Earl, *Assessment as Learning: Using Classroom Assessment to Maximize Student Learning*, Corwin Press, Inc., 2003
- [7] Natalie Regier, M. Ed. (2012) *Formative assessment strategies*. Educational resource.

- [8] Vygotsky, L (1978). *Interaction between learning and development*.
- [9] Thu H. Tran. *Second Language Assessment for Classroom Teachers*. Missouri University of Science and Technology Rolla, Missouri, USA.
- [10] Source: Adapted with permission from J. Chappuis. 2007. *Learning Team Facilitator Handbook: A Resource for Collaborative Study of Classroom Assessment for Student Learning*. Portland
- [11] <https://mullinshe.wordpress.com/2011/11/22/assessment-for-learning-the-struble-technique>



# POTENTIAL DEVELOPMENT OF KNOWLEDGE MANAGEMENT PROCESS OF COMMUNITY ENTERPRISES CHIANG MAI PROVINCE

Napatra Wisawakul

*Department of Human Relations, Faculty of Humanities, Chiang Mai University*

*Corresponding author. Tel : (+66) 818822251, fax : (+66) 53942330*

*Corresponding E- mail address : nwisawakul@gmail.com*

## ABSTRACT

The purpose of this research were to 1) study the current state of knowledge management and 2) study potential development of knowledge management process of community enterprises in the Agriproducts processing sector Chiang Mai Province applied the Mixed Methods research. A total of 279 random selected by using purposive sampling method, consisted of leader, committee and member of Community Enterprises in the Agriproducts processing sector. The instrument used in the research were questionnaire, in depth interview and focus group discussion. The data was analyzed through descriptive statistics (frequency, percentage) and content analysis. It was found that Knowledge management process consists of seven steps, which are 1. Identifying knowledge about the product through a collective thinking and decision-making process, 2. Acquiring knowledge it from local philosopher inside group, 3. Creation knowledge about creating a specific and localized knowledge base, 4. Collection knowledge was not consistency, 5. Knowledge Sharing, especially the exchange of knowledge within the group 6. Knowledge Store was mainly carried out in the form of memorizing. Some were recorded in personal notebook and 7. Knowledge was transfers within shared among group member. The potential development of knowledge management process which are 1. Identifying knowledge from group participation with local philosopher and officer of agricultural extension 2. Learn the knowledge management process from prototype community enterprise 3. Use research process to create knowledge within the group. 4. Use technology for processing of knowledge for systematics data collection 5. Encourage youth in the community to participate in the community enterprises activities.

**KEYWORDS:** potential development, knowledge management, community enterprises



## INTRODUCTION

The eleventh Education development plan of the ministry of education (A.D.2012 -2016) and The eleventh national economic and social development plan (A.D.2012 -2016) focus on sustainable development. The fifth chapter strategy to strengthen food and energy security and agricultural sector of national economic and social development plan emphasize develop agricultural institutes, community enterprises as mechanism to enhance self-reliance and sustainability. Develop knowledge management of marketing, operation process, the best farming practices, and local knowledge / culture should be integrated in to community enterprise. It can be stated that, the key of knowledge management formation and development of community-based organizations lies at the resource co-management which is mainly based on their knowledge and experience. Such management needs an individual or organization working together and supporting each other in order to develop learning network of community-based organization. This process emphasizes on sharing of resources, management and homogeneous knowledge. It is not likely to emphasize on staging or arranging a meeting once or twice a year according to the demand of the capital' source or outside individual or organization. So, in creating the learning network in community, people must gather together in proceeding any activity no matter what form it is, for example occupational promotion group, agricultural housewife group, female Agricultural group, youth agricultural group and other groups protected by law like agricultural cooperatives, agriculturist's group and small and micro community enterprise. Consistent with community enterprise acts (A.D.2005) that emphasizes on self – reliance of community, families, and between communities by used the existing social capital is knowledge, wisdom, local way of life, culture, traditions, local resource to combine with modern management / knowledge management to bring sustainable development in community, which does not destroy the environment. So knowledge management is a process that community enterprise can use to develop their work in the community, competitive advantage and can face new challenges.

Chiang Mai is a province with a unique tradition, culture, and local wisdom. The provincial development strategy for community enterprise are continues such as strategies for creating sustainable security according to sufficiency economy according to Royal speech of King Rama IX by promoting and developing local community products for distribute income fairly, promote and develop Chiang Mai as a leader in diversity of agriculture and agro-industry, Agricultural processing and handicrafts. However, most of the community enterprises in Chiang Mai are lack of knowledge about management but their also have a system of thinking that always need support from another organization. The pilot community enterprise to study current situation of knowledge management process and potential development of knowledge management of Community Enterprises Chiang Mai Province is Community Enterprises in the Agriproducts processing sector that get evaluate operational potential in 2016 from office of agricultural extension in moderate level 121 group because it is the main target group in the development of Chiang Mai Province agricultural extension office. The study is beneficial for the development of knowledge management process of community enterprise in Chiang Mai in other groups more systematically and get the way to increase operation efficiency of Chiang Mai community enterprise.

### Research Questions

1. What are current situation of knowledge management process of Community Enterprises in the Agriproducts processing sector Chiang Mai Province?
2. What are potential development of knowledge management of Community Enterprises in the Agriproducts processing sector Chiang Mai Province?

### Objectives

1. To study current situation of knowledge management process of Community Enterprises in the Agriproducts processing sector Chiang Mai Province
2. To study potential development of knowledge management of Community Enterprises in the Agriproducts processing sector Chiang Mai Province

## MATERIALS AND METHODS

### 1. The instrument used for data collection

In this research was a quantitative and qualitative study. For quantitative study the instrument used to collect data content by questionnaire for qualitative study the researcher was a tool to collect data by in-depth interview, Focus group, the data collection devices such as VDO recorder and cameras.

### 2. Research Methodology was the Mix Method Research

### 3. Scope of Research

3.1 Research Areas were the Community Enterprises in the Agriproducts processing sector (The group includes only food processing from agricultural products such as Dried Longan, Pickled Garlic, Chilli Paste etc.) in Chiang Mai Province.

### 3.2 Population and sample

The population was the community enterprise in the Agriproducts processing sector that get evaluate operational potential in 2016 from office of agricultural extension in moderate level 121 group. The samples of this research is calculated by using Taro Yamane formula with 95% confidence level, the numbers of sample is 93 group and the contributor consist 1. Leader 93 persons 2. Committee 93 persons and 3. Member 93 persons their were in the community enterprise in the Agriproducts processing sector Chiang Mai Province. The criteria for selected purposive sample were 1. Be ready and willing to provide information 2. At least 3 years of working experience in group 3. Can communicate clearly, so total of the number of sample is 279 person

### 3.3 The time frame of the study is on February – May 2017 B.E.

### 4. Research Procedure

The research was study focused on potential development of knowledge management process of community enterprises in the Agriproducts processing sector in Chiang Mai Province The data was collected from March – April 2017 B.E. Knowledge management process consist of 7 steps 1. Identifying 2. Acquiring 3. Creation 4. Collection 5. Sharing 6. Store and 7. Transfers (Marquardt (1996), Turbun (2004), Dalkir (2005))

4.1 Coordinating with leader, committee and member of Community Enterprises in the Agriproducts processing sector of primary data collection

4.2 Interviewing the key informants of current situation of knowledge management process in their Community Enterprises in the Agriproducts processing sector.

4.3 Organizing focus group discussion representative of leader, committee and member of Community Enterprises in the Agriproducts processing sector 8 persons

4.4 SWOT analysis of the strengths, weakness, opportunities and threats

4.5 Analyzed and conclusion potential development of knowledge management of Community Enterprises in the Agriproducts processing sector Chiang Mai Province

### 5. Data collection

This is Mix Method research that compound a quantitative and qualitative study. Thus, the method used to collect data content by Questionnaire. SPSS program was used for data analysis, and the interviews in order to interpret the phenomenon as issues need further study

### 6. Data analysis

To study the context of this study and data analysis is a quantitative and qualitative study. For quantitative study SPSS program was used for data analysis. The statistics used in this study include frequency and percentage. For qualitative study researchers analyzed using content analysis by bringing content from the interviews and focus group to interpret of content and explain the issue to the attention of researchers in the current issues of potential development of knowledge management of Community Enterprises in the Agriproducts processing sector Chiang Mai Province. The researchers then analyzed the data to identify strengths, weakness, opportunities and threats (SWOT), then take all the information to determine potential development of knowledge management of Community Enterprises in the Agriproducts processing sector Chiang Mai Province

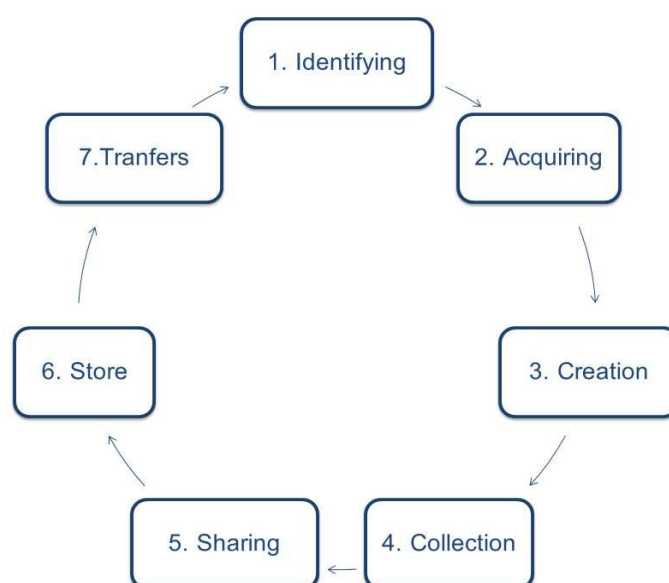
## RESULTS

### 1. Primary data of Community Enterprises in the Agriproducts processing sector

Sample are leader, committee, and member of the community enterprise between the age of 41 -50, 50 – 60 for 30.51%. For 50.80% of them have their primary education, and their think that knowledge management has affected work process for 51.70% and used Facebook and Line for communicate in their group for 30.50 %.

### 2. The result of the study on current of knowledge management

1. Identifying knowledge about the product through a collective thinking and decision-making process, between member, local philosopher and officer of Agricultural Extension that consideration on utilizing local resources 2. Acquiring knowledge it from local philosopher inside group, 3. Creation knowledge about creating a specific and localized knowledge base, create learning and innovative social networks using information technology as a tool 4. Collection knowledge was not clearly implemented and not consistency, should develop knowledge and innovation dissemination and storage system 5. Knowledge Sharing, especially the exchange of knowledge within the group and the learning source network was not established 6. Knowledge Store was mainly carried out in the form of memorizing and work experience. Some were recorded in personal notebook. The community knowledge management process was non-systematic therefore the effective operating was rather difficultly. 7. Knowledge was transfers within small group and shared among group member, should create knowledge management network associates (Figure 1)



**Figure 1 :** Knowledge Management process (Marquardt (1996), Turbun (2004), Dalkir (2005))

3. Regarding SWOT analysis, the research results are as follows :

3.1 The strengths of the community enterprise were unity, have their own cultivated area and good network with other community enterprise that have similar operations.

3.2 The weakness was lack of technology knowledge for add value products and don't have young generation in their group,

3.3 The opportunities were various and unique local wisdom knowledge, get knowledge transfer from local philosophers, get a good support from officer of agricultural extension.

3.4 The threats referred some raw materials used in production were not available in the community, operating budget was not enough and development policy was lack of continuity

4. The potential development of knowledge management process of community enterprises in the Agriproducts processing sector Chiang Mai Province which are 1. Identifying knowledge from group participation with local philosopher and officer of agricultural extension 2. Learn the knowledge management process from prototype community enterprise 3. Use research process to create knowledge within the group. 4. Use technology for processing of knowledge for systematics data collection 5. Encourage youth in the community to participate in the community enterprises activities, moreover which were developing a team of knowledge management network, community learning sources for lifelong, and creation a learning society

## CONCLUSIONS AND DISCUSSION

1. According to studies, it has been found that the community enterprises in the agriproducts processing sector used 7 process of knowledge management but their was non-systematic therefore the effective operating.

Their think that knowledge management has affected work process and should have training them to increase knowledge about knowledge management that consistent with the Kanokporn Chimplee (2012) study found that

1. Group members have knowledge of knowledge management
2. Strong Organization Culture
3. Leadership and
4. Basic structure were affected work effectiveness process

2. The potential development of knowledge management process of community enterprises in the Agriproducts processing sector Chiang Mai Province found that group leader should encourage members, local philosophers, leader of young generations group in community and officer of agricultural extension to participate in the target direction and implementation plan to develop community enterprise, and to from collaborative network to build up strength for sustainable development that consistent with the study of Sukanya Duanguppama (2015) found that participate from organization's member for plan policy there should also be the community leadership development and the participation of people in community for the sustainable development.

### RECOMMENDATIONS

Recommendations for further research include : Researcher should study collaborative and effectiveness of knowledge work an empirical study of community enterprise. In-depth study on the community enterprise should be arranged to suit with community' lifestyle

### ACKNOWLEDGEMENTS

This article is part of the study Potential Development of the Community Enterprises, Chiang Mai Province, funded by Faculty of Humanities Chiang Mai University. The researcher would like express his sincere attitude to the institute as well as the Chiang Mai Provincial Agricultural Extension office, leader, committee and member of Community Enterprises in the Agriproducts processing sector who kindly contributed to this study.

### REFERENCES

- [1] Chiang Mai provincial agricultural extension office. (2016). *Operations information of Chiang Mai Community enterprise*. Department of Agricultural extension.
- [2] Dalkir, K. (2005). *Knowledge Management in Theory and Practice*. Burlington, MA: Elsevier Butterworth-Heinemann.
- [3] Kanokporn Chimplee (2012). *Knowledge management models for local wisdom in wickerwork handicrafts: A case study of local community enterprise in Nakhon Ratchasima Province*. Doctor of Philosophy (Social Development and Environmental Management). National Institute of Development Administration, pp.318-321.
- [4] Marquardt, M. (1996). *Building the Learning Organization*. New York: McGraw-Hill.
- [5] Prayard Manopasao. (2012). *Learning Network Development Process to Increase the Potential of Dried Longan Community Enterprise Groups, Lamphun Province*. Doctor of Philosophy (Agricultural Extension and Rural Development). Chiang Mai University, pp.142-144.
- [6] Sukanya Duanguppama. (2015). *The development of good management practices of the community enterprise in Kalasin Province*. Department of science and mathematics, general education office, faculty of hospitality industry. Dusit Thani Collage, pp.137-138.
- [7] Turban, E, Rainer, K. and Potter, R. (2001). *Introduction to Information Technology*. Toronto: John Wiley & Sons.

# AN ENGLISH LEARNING AND TEACHING MODEL RESPONDING TO CURRENT JOBS MARKET NEEDS IN THE ASEAN COMMUNITY: A CASE STUDY OF RAJABHAT UNIVERSITIES IN THE NORTH EAST OF THAILAND

<sup>1</sup>Suwitchan Un-udom, <sup>1</sup>Chutipa Kongsombut, <sup>1</sup>Thanatchapohn Silaked

<sup>1</sup>Chaoprapa Jantuma, Sittichai Bussaman, and <sup>2</sup>Nuchsara Choksuansup

*1 English curriculum, the Faculty of Humanities and Social Sciences, Rajabhat Maha Sarakham University*

*2 Department of Western Language and Linguistics, Mahasarakham University*

## ABSTRACT

This study was conducted by the purposes to 1) study current jobs market needs in English in Asean context, 2) investigate the current situation of English instruction in the tourism related courses in Rajabhat Universities in the North East of Thailand, 3) investigate differences between the needs of current market in English and current situation of English instruction in the tourism related courses, and 4) present English learning and teaching model responding to current jobs market needs in the ASEAN community. 3 groups of the participants including 275 entrepreneurs, 530 performers, and university instructors in 6 institutions involved in the data collection. The research instruments were 2 sets of questionnaires aiming to investigate the expectations of entrepreneurs and needs of English among performers and a material checklist. The result of the study showed that 1) skills that were required in real working situation were related to communicative skills in online communication such as taking orders, telephoning, and conversation in working situations while the document management skills such as document preparation and translation were less important. 2) The materials used English instruction of courses related to tourism industry by instructors in Rajabhat Universities in the North East of Thailand still had limitations in several aspect including content, vocabulary and grammar, exercises and activities, attractiveness of media, and context, 3) there were differences between the needs of current market in English and current situation of English instruction in the tourism related courses in terms of content, vocabulary and grammar, exercises and activities, attractiveness of media, and context, and 4) the presented model emphasizes on instructing students to have skills needed in working in tourism industry in ASEAN context.

**KEYWORDS:** ASEAN, Need analysis, Teaching Model

## INTRODUCTION

The existence of ASEAN community triggers Thai government to aware the advantages and disadvantages of the situations to the country. There have been preparations to ASEAN economy communication (AEC) which would affect the country in several aspects in the late 2015. One of the important issues is to improve English competency of Thai citizens to be ready to the co-operation. According to Declaration of ASEAN Concord II (2012), ASEAN citizens have more right to travel in other fellow nations. One of the industries affected directly by the AEC is tourism as the nation would welcome more travelers from the ASEAN nations. This rises the importance of English to the region as employees who have good command of English seem to take advantages in job opportunities.

However, English teaching in Thailand seems to be one of the crucial problems of the education system. According to the English proficiency index (2013), the country was left in the bottom of English proficiency ranking among other ASEAN nations. More crucially, even though Thai students are planned to start learning in English since the early age of education (Ministry of Education, 2008), they still have problems with all 4 skills in English (Foley, 2005; Khamkhien, 2010; Noom-ura, 2013; Kuar, Young, & Kirkpatrick, 2016). From this perspective, there could be possibility that Thai workers would lose their jobs because of their disadvantage in English proficiency comparing to migrant workers from other ASEAN countries.

In detail, the problems in Thai EFL context could be described by the geographical, social, and instructional issues. Thailand has its own language used as the official language. The Thai language is both used and instructed in the early ages of Thai citizens' lives. Unfortunately, the differences between mother tongue and the English seem to cause troubles for Thai EFL learners (e.g. Tenses, punctuation, verb order etc.). According to James (1980), it would be a difficulty for language learners when they transfer mother tongue structure in the use of target language. Moreover, Thailand is a country that considers English as a foreign language. Therefore, Thai citizens rarely expose to English apart from classroom setting. According to Krashen (1981), language could be acquired and learned though natural order that happen when learners have interactive communication. Therefore, lack of real word uses of English could be an issue that takes responsibility for Thai EFL problems. In addition, teaching approach of Thai instructors seems to be an account of the problems. Thai English instruction has been criticized by scholars (Foley, 2005; Khamkhien, 2010; Noom-ura, 2013; Kuar, Young, & Kirkpatrick, 2016). The teaching methods that support teacher centered environment, lack authentic practices, and focus mainly on grammar translation are also the defendants to the situation.

Considering English proficiency as one of important factors leading to success in ASEAN community and problems to the current situation in Thailand, it would be beneficial if there is an alternative English teaching method that responds to jobs market in the ASEAN community. The current study aimed to investigate the need of English language used in the tourism industry, one of the industry affected directly by the existence of AEC, as a comparison to current method used in English teaching in Thai EFL context. English teaching model responding to current jobs market needs in the ASEAN community would be suggested based on the result of the comparison.

## LITERATURE REVIEW

### English teaching Approach

Teaching approach could be considered as the helm of the curriculum. It could control design of curriculum, activity, and assessment. The development of English teaching approaches could be reviewed in the following sections.

#### *Audio-lingual*

The method was widespread during World War II while foreign soldiers invaded countries. There was the need to train officers to communicate with the locals as rapid as possible. The method emphasizes on listening and speaking training with repeat practice. Specific types of language uses are instructed repeatedly in order to formulate mastery (Richard & Rogers, 1987). The audio-lingual was accepted to be effective in developing language learners in the short period. However, it has also been criticized to depend too much on memorizing instead of forming language.

#### *Grammar-translation*

Grammar translation is a method that normally practice in EFL countries. The classes focus on teaching of grammar combined with list of words. Reading text of mixed levels are applied without difficult order. The classes are normally instructed in L1 with less practice of authentic L2 exercise (Prator & Celce-Murcia, 1979). The approach is beneficial in developing grammatical knowledge and vocabulary which are very important in



language production. Nevertheless, learners in this teaching approach usually struggle in real world uses of language.

#### *Direct method*

Direct method was invented with the purpose to fill disadvantages of grammar translation which leads learners to difficulties in real world uses of English. According to Richards & Rodgers (2001), direct method focuses on pronunciation, interactive exercises, feedback giving, and brainstorming. The method has been criticized in the way it focus too much on forms while the uses of language are left behind.

#### *Communicative language teaching (CLT)*

Communicative language teaching comes with the idea to promote language learning at the functional level. According to Rhalmi (2009), CLT focuses on instructing language in the real world uses. The uses of authentic exercises are promoted to encourage learners to be familiar with language production in real situations. Moreover, communicative competence, one of the main goal of the approach, considered mistakes as part of inter language communication. Therefore, as long as meaning is expressed, the communication could be considered successful. The approach is widely accepted in language teaching in the 21<sup>st</sup> century, and other approaches focusing on the similar issues (e.g., Task based language teaching) are also promoted.

### **Thai EFL Teaching approach**

Thai EFL teaching method has been criticized as one of the reasons leading to failure in English instruction. According to Ministry of Education (2008), Thai students have to learn English since the kindergarten level. Moreover, most universities in Thailand require English proficiency as one of the qualifications of their bachelors. It seems that this attempt pays an undesirable results considering English proficiency ranking which indicates that the country is in the position below other ASEAN countries. Particularly, even though the government has tried to fix the problematic teaching method, the situation does not improve. For example, in the late 90s, The Ministry of Education tried to convince teachers to adapt their classes to children centered environment; however, the teacher dominant environment in Thai EFL context is still reported. The following section is a review of critiques to Thai EFL teaching situation.

#### *Teacher centered environment*

One of the common critiques to Thai educational situation is the teacher centered environment. According to Noom-ura (2013), most classes in Thailand are manage mainly by teachers. This could lead to passive learning styles of the students who only do what they are asked to without participation nor negotiation. This situation could not lead to learning skills, critical thinking, and self-regulation which are important factors in language learning.

#### *Grammar translation teaching approach*

Moreover, the teaching method commonly practiced in Thailand has also been criticized to have characteristics of grammar translation method (Wiriyaichitra, 2002). Particularly, Thai EFL classes are normally instructed in Thai language focusing mainly on grammar structure. Vocabulary is also instructed in the list and reading texts are normally come in non-logical order. Moreover, assessment of language proficiency is normally done in multiple choices form. Even though the teaching method has been proved to be beneficial in grammar instruction, the benefit in contributing real world uses which is the actual purpose of English instruction is still in doubt.

These issues lead to the purpose of the study to suggest alternative English teaching model which could improve language proficiency and response to the job market in ASEAN community. The study was investigated by the following research questions:

- 1) What were current jobs market needs in English in ASEAN context?
- 2) What was current situation of English instruction in the tourism related courses in Rajabhat Universities in the North East of Thailand?
- 3) What were differences between the needs of current market in English and current situation of English instruction in the tourism related courses?
- 4) What could be English learning and teaching model responding to current jobs market needs in the ASEAN community?



## METHODOGY

### Participants

3 groups of participants namely entrepreneurs, performers, and university instructors were included in the study. 275 participants were selected from 2565 entrepreneurs by stratified sampling method. 530 participants were purposively selected from the population. Lastly 6 university were selected from 19 Rajabhat University in Northwestern Thailand.

### Research Instruments

The Research instruments were 2 sets of questionnaires aiming to investigate the expectations of entrepreneurs and needs of English among performers and a material checklist. The two sets of questionnaire were adapted from Sothan (2015) who studied the need of English uses in ASEAN community in the similar business. The questionnaire was found with the Cronbach's alpha consistency analysis at 0.886. The material checklist was adapted from Miekley (2005).

### Data Collection and Data Analysis

The data were collected in four phrases below.

Phase	Data collection	Instrument	Data analysis
1	Collecting data related to English needs in job market in ASEAN community	Questionnaire (Sothan, 2015)	Mean score, Standard deviation
2	Analyzing text books related to job market in ASEAN community	Material checklist Miekley (2005)	Mean score, standard deviation
3	Comparing the data from need analysis and practice in current situation	-	Qualitative analysis
4	Presenting model of English learning and teaching model responding to current jobs market needs in the ASEAN community	-	-

## RESULTS OF THE STUDY

### The results of the study would be discussed by the issues below.

The needs in English in the real uses of jobs in ASEAN community

The data were collected from entrepreneurs and performers in tourism industry using the questionnaire adapted from Sothan (2015). The questionnaire consisted of 3 parts including background information, perception toward employees' English skills (for entrepreneurs) and English uses in real situation (for performers), and open ended questions. The result of the study could be seen below.

For the background information, it was found that most entrepreneurs were from central of Thailand; they had between 16-20 years experiences in the business; and they report the uses of English in their organization as very often. In terms of performers, most of the participants were from central Thailand and they had less than 5 year experience. The perception of English proficiency and English uses in real situation could be seen in the table 1.

Table 1 : The needs in English in the real uses of jobs in ASEAN community

Employer perception	$\bar{x}$	S.D.	Employee uses of English	$\bar{x}$	S.D.
Giving or receiving instruction	4.61	0.50	Giving or receiving instruction	3.61	1.26
Interacting with colleagues, clients, and customers	4.56	0.51	Negotiating with customers/suppliers	3.61	1.17
Negotiating with customers/suppliers	4.56	0.51	Interacting with colleagues, clients, and customers	3.57	1.20
Writing business letters, memos, e-mail	4.50	0.79	Conducting interviews	3.46	1.43
Making oral presentations and communications	4.44	0.78	Producing network with customers, suppliers, or stakeholders	3.46	1.29

It could be noticed from the table that the demanded skills that were important for jobs market in ASEAN community were related to communicative competence such as interviewing, speaking, negotiating, and giving instruction and replies. Moreover, the writing skills needed here also related to such specific content as business letters.

Current situation of English instruction in the tourism related courses in Rajabhat Universities in the North East of Thailand

The data were analyzed from materials used in teaching English courses related to job market in ASEAN community. The checklist adapted from Miekley (2005) were used to check whether the teaching method was related to the need of English in specific purposes or not. The result of the study could be seen below.

Table 2. Current situation of English instruction in the tourism related courses in Rajabhat Universities in the North East of Thailand

Issues	$\bar{x}$	S.D
Content	3.28	0.30
Vocabulary and Grammar	3.09	0.06
Exercises and Activities	2.76	0.17
Attractiveness of the Text and Physical Make-up	3.39	0.14
Context	3.04	0.03
Overall	3.112	0.14

It indicated that teaching material in Thai context only rated at the average level ( $\bar{x}=3.112$ ). This could evidence problems in Thai EFL teaching method that could not match the satisfaction level of standardized checklist. The data were compared to the result in the previous section in order to answer the issue in the third research question.

- Differences between the needs of current market in English and current situation of English instruction in the tourism related courses.

In this section, the results from need analysis and current situation related to English needs in ASEAN job market were compared. The result of the study could be concluded in the issues below.

#### *Content*

In terms of content, it was found that the lack of logical order of content was found. The content related to real uses of English skills in ASEAN community was missing.

#### *Vocabulary and Grammar*

The vocabulary and grammar were not ordered based on difficulty and complexity. The instruction was found to have characteristics of audiolingual and grammar translation methods. There were list of vocabulary and communicative language patterns to memorize and practice. Lack of structure instruction was found. The grammar teaching focused mainly on sentence level while the authentic practice such as business letter were missing.

#### *Exercises and Activities*

The issue seemed to be most crucial in Thai EFL context. Authentic exercises were missing. Most exercise and activities focuses on grammar and sentence structure. This was difficult for learners to connect these structure to the uses in real situation. This was contrast of the result in need analysis which point out that face to face communicative was the most encountered situation in working.

#### *Attractiveness of the Text and Physical Make-up*

Most of material used figures which were not related to the content in tourism industry. Even though some commercial texts had good visual quality, the figures were still not related to ASEAN community.

#### *Context*

The lessons were planned well. However, some of course objectives were not fulfilled by the content of textbooks. This could affect the quality of the classes directly as the learner missed opportunity to learn in such contents.

- English learning and teaching model responding to current jobs market needs in the ASEAN community

It could be concluded that the current teaching method was different from the real needs of English used in job market in ASEAN community. The study analyzed the differences and suggest a model that could response to current jobs market needs in the ASEAN community as follow.

The teaching model should have the content that follows logical order. The content should be authentic situation which allow learners to learn like they perform activities in real world context. The content should focus

on synchronous communication such as telephoning, face to face interaction, client negotiation etc. In writing session, specific task related to the real world uses of English should be the main focus on curriculum design. Vocabulary and grammar should come with the clear examples of how they are used. The examples of exercises and activity should be real texts such as business letter, memorandum, and email.

### ACKNOWLEDGEMENT

The study was financially supported by the National Research Council of Thailand with well cooperation of Research and Development institution, Rajabhat Maha Sakham University.

### REFERENCE

- Association of South East Asian Countries. (2012). *Declaration of ASEAN concord II*. Retrieved 17 August 2016 from [http://asean.org/?static\\_post=declaration-of-asean-concord-ii-bali-concord-ii](http://asean.org/?static_post=declaration-of-asean-concord-ii-bali-concord-ii).
- English First. (2013). *English proficiency index*. Retrieved 17 August 2016 from <https://www.ef.com/~/media/centraleftcom/epi/downloads/full-reports/v3/ef-epi-2013-report-en.pdf>.
- Foley, J. (2005). English in Thailand. *RELC*, 36 (2), 223-234.
- James, C. (1980). *Contrastive Analysis*. London: Longman.
- Kaur, A., Young, D. and Kirkpatrick, R. (2016) 'English Education Policy in Thailand: Why the Poor Results?', in R. Kirkpatrick (ed.), *English Language Education Policy in Asia*. Charm: Springer International Publishing, 345-61
- Khamkhien, A. (2010). Teaching English speaking and English speaking tests in the Thai context: A reflection from Thai perspective. *English Language Teaching*, 3 (1), 184-190.
- Krashen, S. (1981). *Second language acquisition and second language learning*. Oxford: Pergamon.
- Miekley, J. (2005). ESL textbook evaluation checklist. *The Reading Matrix*, 5 (2). Retrieved 20 March 2017 from [http://readingmatrix.com/archives/archives\\_vol5\\_no2.html](http://readingmatrix.com/archives/archives_vol5_no2.html).
- Ministry of Education. (2008). *Basic education core curriculum*. Retrieved 1 March 2017 from <http://www.act.ac.th/document/1741.pdf>.
- Noom-ura, S. (2013). English-teaching problems in Thailand and Thai teachers' professional development needs. *English Language Teaching*, 6 (11), 139-147.
- Prator, C.H. and Celce-Murcia, M. (1979). An outline of language teaching approaches. In Celce-Murcia, M. and McIntosh, L. (Ed.), *Teaching English as a Second or Foreign Language*. New York: Newbury House.
- Rhalmi, M. (2009). *Communication Language Teaching (The Communicative Approach)*. Retrieved 10 January 2017 from [www.myenglishpages.com/blog/communicative-language-teaching-communicative-approach/](http://www.myenglishpages.com/blog/communicative-language-teaching-communicative-approach/).
- Richards, J.C. & Rodgers, T. (1987). The Audio-lingual Method. In *Approaches and Methods in language teaching* (pp. 44-63). Reino Unido: Cambridge University Press.
- Richards, J., C. & Rodgers, T. (2001) *Approaches and methods in language teaching*. Cambridge: Cambridge University Press.
- Sothan, S. (2015). Exploring English language needs according to undergraduate students and employers in Cambodia. *International Journal of Linguistics and Communication*. 3 (1), 87-96.
- Wiriyachitra, A. (2002). English-language teaching and learning in Thailand in this decade. *Thai TESOL Focus*, 15 (1), 4-9.

**SIMILARITIES IN THE STORY TYPE OF HEROES THAT KILL MONSTERS OF VIETNAMESE  
AND SOUTHERN KHMER PEOPLE IN VIETNAM**

Nguyen Thi Nhung

*Lecturer in Can Tho University, Vietnam.**Corresponding Email: nhung1976@gmail.com. Tel: 0945637676***ABSTRACT**

Research on fairy tales in general and miracle fairy tales of the people in particular in the point of view of type and motif has been effectively applied by worldwide Folklore researchers. In Vietnam, in recent years, the trend of the research is becoming popular and achieves high practical values. During the research on comparison between miracle fairy tales of Vietnamese and Southern Khmer people, we found that this trend of approach contributes an important part to find similarities and differences between miracle fairy tales systems of the people living in the same territory in the view of both literature and culture. In this article, on the basis of statistics, analysis and synthesis, we choose some typical types of story belonging to "Heroes that kill Monsters" of miracle fairy tales of Vietnamese and fairy tales of Southern Khmer people in Vietnam and then they are compared with each other to figure out the similarities between them.

**KEYWORDS :** Miracle fairy tale, Vietnam, Southern Khmer, type, motif.

## INTRODUCTION

Comparative research method is a very effective method in term of approaching the trend of culture – science research. The author Tran Thi An of the essay “Research on folk literature from the view of type and motif – possibility and impossibility” has a systematical point of view and indicates readers a possible trend of research in terms of type and motif. We choose to compare a type of Heroes that kill Monsters in the system of miracle fairy tale between Vietnamese and Southern Khmer people living on the same territory, Mekong Delta, to find similarity and first base on characters of history, religion, geographic culture, custom, habit, ... to explain this similarity as a possible and practical trend of research, in our opinion, in Vietnam at present. Finding this similarity will help us to have an overall scientific view of intimate relation between type of Heroes that kill Monsters of Vietnamese and that of Khmer people living in the South of Vietnam.

## MATERIALS AND METHODS

To complete our research, we use the following methodology and trend of approach:

### \* Field research method

This method was used when we went to areas of Mekong Delta where Khmer people are living to get to understand the context where the fairy tales occurred to record, film and document. Besides, we create questionnaires and diaries to carefully interview native Khmer people so as to find out stories suitable to the trend of research topic.

### \* Method of analysis, statistics and classification

This method is used to count the texts that were available and gained by field research method, then classify motives of stories; and analyze factors and details relating to stories, ... to consolidate basis of assessments and evaluations.

### \* Type comparison method

This method is used to examine stories; analyze and compare types of miracle fairy tales of Vietnamese and Khmer people in terms of culture and history that they were composed; in the relation between type and other cultural and social issues; compare texts to the others; compare type of a story to that of another story; ... Therefore, we found correlation between them.

### \* Interdisciplinary approach

The study to apply this approach to consider, approach from different view like: culture, history, literature, credit, festivals, ... to show the characteristics of this type of story from the perspective of literature, culture and history. Of course, in this approach, the method of studying folklore is essential.

## RESULTS

### 1. Theoretical basis

In the world, the term Type was first known in the works of Verzeichnis de Marchen typen (List of fairy tales) of Antti Aarne in 1910. This work was later succeeded by S. Thompson in The Type of the Folktale - A Classification and Bibliography, Antti Aarne's Verzeichnis der Marchentypen (FF communications No.3). Translated and Enlarged by Stith Thompson.

In The Folktale established in 1977, Thompson defined the type of story as follows: “Type is a plot which can exist independently in the oral story treasures. It can be considered as a complete story, its meaning is not the same as any other story. Of course, it can also be combined with other stories at random, but appearing separately can also prove its independence. It can consist of one or more motifs ...” [19].

In this definition, Stith Thompson has initially distinguished two very basic concepts as **type** and **motif**. Accordingly, there may be one type of story that may have one or more stories; There can be many motifs or only one motif. Type is a relatively fixed set of motifs” [19] Thus, on the level, type is bigger than motif, in other words, the motif is a base unit to create the type.

In Vietnam, the first person to introduce and apply A-T theory into folk tales research is Nguyen Tan Duc. In the works About the table of type and motif of folk story contents search Nguyen Tan Duc has raised his understanding of type as follows: “Type is just a collection of stories with the same core of the same story or unit story; Motif indicates an element of the story, can be separable, can be assembled, more or less strange, unusual, especially the characteristic feature of folk tales.” [5]

The author Nguyen Bich Ha in Thach Sanh works and The story of the brave in ancient Vietnam and Southeast Asia, have given the definition of story style as follows: “story style is a collection of stories with motifs of the same type.

In a story with many motifs but not necessarily every story in that style must have all the general motifs. There may be stories have some motif with other stories but there are also many stories with so many the same motif" [6].

The author Nguyen Thi Hue, beside her research work "Ugly character but talented in Vietnamese fairy tales", second year..., has collaborated with some colleagues to compile a dictionary of Vietnamese folk tales type. This dictionary is also a basis for us in the process of identifying and naming types and motifs [7].

In this study, we used the type concept of Nguyen Tan Duc and Thompson as the basis for establishing Fairy tales of Khmer and fairy tales of Kinh type.

## 2. Survey results

To compare the type of The Valiant man of the two peoples, we studied nearly 70 tales of the South Khmer and more than 100 tales of Vietnamese miracle (Kinh). After statistics and classification, we have identified 19 stories has the type of Valiant man killing monsters, as follows:

With the type of the story Valiant man of the Vietnamese (Kinh), We choose 3 narratives: *Thach Sanh*, *Three skilled boys* or *Kill the python* to survey. Based on the naming of motifs as in Table 1, we define the structure of this type with the following basic type [2],[3]:

NO.	Story	Beginning	Content	Ending
1	Thach Sanh	I.1	II.8 – II.9 – II.10 – II.11 – II.12 – II.13 – II.14 – II.15	III.35 – III.36
2	Killing the Python	I.2	II.8 – II.15 – II.9 – II.17	III.36 – III.37
3	Three skillful men	I.3	II.18 – II.19 – II.10 – II.21 – II.28	III.36

For fairy tales of Khmer people, we also conducted to examine 16 following stories: *Chau Sanh Chau Thong*; *Say V'oan*; *Rich Thi Sel and Kon Ray lady*; *The last child of 17 girls and the Ogress*; (*Xangxa Rachi*, *Sangsen Lochay*, *San sal La chi*); *Seventeen children*; *Chao T'bat T'bu*; *Hero Maha Tho te*; *Areca flower*; *Three-color flower*; *Chau Pram Thngay*; *Nieng Soc Ko-ro-op*, *Fragrant hair lady*, *Fragrant hair princess*; *Bo-Piel kills giant crocodile*.

Base on the above analysis, we can systemize structure of type of stories Heroes that kill Monsters of Khmer people into the below categories [12]:

NO.	Story	Beginning	Content	Ending
1	Chau Sanh Chau Thong	I.4 – I.5 – I.6	II.11 – II.31 – II.8 – II.9 – II.10 – II.9 – II.14	III.38 – III.37
2	Say V'oan	No motif	II.16 – II.23 – III.37 – II.24 – II.8	III.39
3	Rich Thi Sel and Kon Ray lady; The last child of 17 girls and the Ogress	Type	II.26 – II.25 – II.27 – III.37 – II.30	III.38 – III.39
4	Xangxa Rachi; Sangsen Lochay; San sal La chi	Type	II.20 – II.27 – II.28 – II.16 – II.31 – II.9 – II.16 – II.13	III.38 – III.39 – III.37
5	Seventeen children	Type	II.16 – II.8	III.36
6	Chao T'bat T'bu	None	II.31 – II.14 – II.15 – I.3	III.37
7	Areca flower	I.22	II.25 – II.10 – II.29	III.37
8	Hero Maha Tho te	I.4 – I.5 – I.6	II.26 – I.8	III.36
9	Three-color flower	I.7	I.8 – II.30 – II.23 – II.16	III.36
10	Chau Pram Thngay	I.1	II.20 – II.21 – I.31 – II.8	III.36 – III.37 – III.39
11	Nieng Soc Ko-ro-op, Fragrant hair lady, Fragrant hair princess	None	I.2 – II.16 – II.8 – II.9 – II.13 – III.37 – II.10	III.37 – II.20 – II.34

**Note:** *Miracle birth (I.1); offering sacrifice (I.2); Son-in-law selecting (I.3); Eating so much (I.4); Leaving child in the forest (I.5); Strong man (I.6); Reward (I.7); Killing a python (II.8); Victory depriving (II.9); Killing Magpie*



(I.10); Killing a crocodile (II.11); Going to underwater palace (II.12); Being mute (II.13); Miracle sounds (sound of musical instrument); Fighting against the invasion war (II.14); Fighting against the invasion war (II.15); Magical things (rice pots, sword, hammer, shoes, drug, flower, bottle of water, talisman) (III.16); Considering ogress as disciple (III.17); The left thing (III.18); Competing (III.19); Competing (II.20); Agreement to snake (II.21); Calumniation (II.22); Learning cabala and talisman (II.23); Jostling victory (II.24); Fighting over each other to have the father (II.25); Prediction of deviner (II.26); Work (wage earner) to support relatives (II.27); Fraudulent exchange (II.28); Passing the ocean (II.29); Adjudging (II.30); Transforming (II.31); Vying in wits and a challenge with a snake (II.32); Violating the taboos (II.33); Traitorous maiden (II.34); Invasion (III.35); Jostling and adjudging victory (III.36); Victory rewarding (III.37); Marrying and throne demise (III.38); Punishing the guilty (III.39); Reunion (III.40).

### 3. The similarities between Viet people's hero and monster story type and the Southern Khmer's one

When studying the comparison between the story type involving heroes and monsters of Vietnamese and Khmer people, we found that besides the distinctive features of the two peoples, there are many similarities between them. The basic points are specified as follows:

#### \* Similarity in content

Giving a general view based on the statistics table above, we can realize that: The story content of Viet people's hero and monster story type and the Southern Khmer's one is basically similar, including 3 parts: the beginning, the content, and the ending.

#### + The beginning

The introduction of the story type involving heroes and monsters of Vietnamese and Khmer people often includes some motifs telling about the background and birth of the heroes. In the stories of Viet people, the motif of these stories is usually *the motif of miraculous births*. The expression of this motif can be shown clearly as in *Thach Sanh*, or it can be included in the contents of *Ba chang thien nghe (Three Skillful Men)*, or *Tieu diet mang xa (Killing the python)*. The heroes of these stories may have clear miraculous backgrounds, such as *Thach Sanh (motif of miraculous births)*. He was a son of the Jade Emperor, and then he was reincarnated as a son of a farmer. After his parents had passed away, he became an orphan. In addition, a hero might be an orphan and be adopted by a Buddhist priest, like a young man who had magical powers in *Killing the Python*. Also, some heroes might not have a clear background, like the three men who had natural endowments in *Three Skillful Men*.

In the story of the Khmer people, in the beginning of the story of *Chau Sanh – Chau Long* is also a motif about the background of his birth. In the country of *Pa-ria-na-xay*, the capital city of the king *Po-rum Mo-tot*. There was a couple. They were old but they had no children. One day the old man entered the forest and saw a boy in a lotus flower in the middle of a swamp. Then, he took the child home.

In the story of the Prince *Sang-Sen-Lo-Chay*, the beginning was also the appearance of the prince *Sang-Sen-Lo-Chay*. When he was born, he had a preternatural strength. Right after he was born, he rode a sacred snail with a sword in his right hand, showing the ascendancy of the heroic descent, and a crossbow made of a precious wood as white as elephant's tusk in the left hand, with a tube of arrows on his shoulder. He looked so stately. The prince *Rec-cho-say* had a shape as a lion with an invincible strength. He could fly above the clouds like the wind. Therefore, we can see that although the men in the stories mentioned above had different backgrounds, when they appeared and grew up, they were burly and had miraculous talents.

#### + The content

The middle part of the Vietnamese stories involving heroes and monsters often has basic motifs such as: killing malicious snakes, being cheated, choosing a son-in-law, killing malicious bird, going down to the palace under the sea, becoming mute, miraculous mellow tones, miraculous sword, things that were left behind, fighting against the aggressive wars, miraculous rice pot, marriage and becoming Kings. This is the part centering around the challenges that these heroes need to overcome. Every challenge often comes along with one or some certain motif(s). Thanks to the magical force, magical things, or their own power, these heroes could overcome the challenges and complete their missions.

In the story of *Thach Sanh*, the brave and good-hearted woodcutter experienced the following basic challenges. *The first challenge is killing the monster (Motif of killing malicious snakes)* thanks to the magic taught by the josses and a magical hammer. After that, *Ly Thong* deceived him for the first time and deprived his achievement (being deceived); the second challenge was killing an eagle (Motif of killing malicious birds) to save the princess and then he was deceived for the second time by *Ly Thong*. Thanks to the musical instrument given



by the son of the King of water, Thach Sanh could cure the princess from being mute (*motif of magic mellow tones*) and get married to the princess (*motif of getting married*). *His last challenge was defeating the invaders from 18 countries (motif of fighting against the aggressive wars, miraculous musical instrument and earthenware pot)* to bring peaceful life to everyone.

Although the orphan man in Killing the Python did not experience as many challenges as Thach Sanh, he overcame a very dangerous challenge *which was directly fighting the python, killing it and saving a princess and people (motif of killing malicious snakes, motif of miraculous swords)*. After that, his achievement was deprived by a duke. However, *thanks to a remaining piece of a sword (motif of the things that were left behind)*, he could retake his achievement.

The three men in Three Skillful Men overcame a common challenge which was killing the eagle to save the beautiful princess of the Le dynasty based on their abilities. *The first man had the ability in shooting arrows with a bow in spite of difficulty and long distance. [9]. The second man could swim underwater for many weeks and dive for small things under the ocean. [9]. The third man was a skilled doctor. He could cure people of any diseases, including reviving people who just passed away [9].* The story's situation challenged all of them; however, they could overcome their own challenges by using their abilities.

Like Vietnamese stories involving heroes and monsters, in the Southern Khmer's stories, the heroes have to directly fight against the monster.

In the story of Chau long – Chau Sanh, the old man was too poor to raise Chau Sanh. Then, he took his son to the forest to kill him because he did not want his son to be rotten away. He cut a big Apitong tree laying on his son's body. He thought that his son had died. He brushed away his tears and went home. After a few moments, his son shouldered the apitong tree and went home. He was very surprised and happy. Since then, people called him hero shouldering apitong tree (Bo-ros com – benh ma – ha cho – tiel). After that he killed a crocodile, a monster, Ko-ruot bird, to save the princess and Dragon King's son.

In the story of *The prince Sang – sen – lo – chay*, being deceived by the King's wife, he expelled the two princes to the forest. When the princes' aunt was caught by the monster, he killed the monster and saved her. Besides, he also went down to the palace under the sea to save the princess.

#### + The ending

When studying the three stories: *Thach Sanh, Killing the Python, Three Skillful Men*, we found that the endings were the victory of the heroes before the formidable battle between them and monster. The prize for this victory was that they can marry a beautiful girl. Getting married to a princess, they could be crowned king. Perhaps for Viet people, a happy ending and a dream of a happy family are always their dreams. Therefore, the fairy stories involving heroes killing monsters always go along with beautiful and smart princesses.

Chau Sanh was crowned king after having got married to the princess.

The prince Sang – sen – lo – chay saved his aunt from the monster and also saved her daughter. He was clear of accusation. Then, he and his mother went back the palace and he was crowned king.

As Viet people, the Khmer people also dream of a life of comfort and happiness and having a complete family. The worthiest prize is that the beautiful girl shall become the hero's wife after his famous victory.

#### \* Similar in motif

After statistically analyzing the motif in Viet people's type of heroes and monster tales and that of Khmer people, we found that both of them have common motifs such as: Motif of extraordinary birth and growth; Motif of killing malicious snakes; Motif of killing malicious birds; Motif of being deceived; Motif of becoming mute; Motif of miraculous sounds; Motif of getting married and becoming Kings. These motifs are almost comprehensively similar in terms of implications and connotation and denotation. The details are as follows:

Motif	Viet people	Khmer people
Motif of extraordinary birth and growth	Knowing that there was a couple who were poor but very kind, the Jade Emperor sent the Crown Prince to reincarnate as their son. All of these young men were outstandingly gifted: swimming, archery, saving people, etc.	The child was born after praying to heaven and Buddha (found on a lotus flower). The child learned to walk and talk only 5 days after birth.
Motif of killing malicious snakes	He used a hammer to fight against the monster. It was cut it into halves and had to reveal the real figure which was a huge python.	Chau Sanh used a hammer to cut the monster's head when he was cutting wood in the forest; three sons joined their father in killing the monster; Sayvoan kills the

Motif	Viet people	Khmer people
Motif of killing malicious birds	Seeing the eagle carrying a girl as it was flying by, Thach Sanh used the bow and arrow to shoot it. The eagle was injured but it still carried the princess back to its cave. Then, Thach Sanh led Ly Thong and the troops down to the cave to save the princess. He waited until the eagle fell asleep and used the rope to tie around the princess and signaled Ly Thong to pull her. When the eagle woke up, he used magic to fight against it and was able to save the son of the King of Water.	monster by an arrow; 17 siblings squeezed the monster's neck, break its teeth and killed it; thanks to 2 treasures of the monster, the younger brother was able to kill the malicious monster and save the princess. Chau Sanh shot the Maha kraut then followed the blood trace to the cave of the malicious bird to save the princess; the younger brother was attacked by a covey of malicious birds -> he used the sword to kill it and was unintentionally able to save the princess with fragrant hair who was left behind by the soldiers on the way running away from the covey of malicious birds.
Motif of being deceived	When knowing that Thach Sanh had killed the monster, Ly Thong devised a plan to deceive Thach Sanh that the python was raised by the King and he advised Thach Sanh to run away, otherwise the King will cut his head. Thach Sanh believed Ly Thong so he ran and hid.	Chau Thong deceived Chau Sanh that the monster was a precious creature raised by the King and told Chau Sanh that unless he hid, the King would cut his head. Chau Thong took the head of the monster from Chau Sanh and brought to the yard of the King's palace -> reaping the fruit of Chau Sanh's labor for the first time. When he knew that Chau Sanh had come back, Chau Thong stole the King's gold and jewelries of the King and took them to the tree where Chau Sanh was living to slander him
Motif of becoming mute	After being taken back to the palace by Ly Thong, the princess became mute.	The princess became mute after being saved from the monster.
Motif of miraculous sounds	Hearing Thach Sanh's mellow tone, the princess suddenly stood up and spoke and smiled.	In the prison, because Chau Sanh was bored, he took out his musical instrument and played it. When the princess heard the mellow tone, she immediately asked her father to bring the person who played the musical instrument to her. Thanks to that, Chau Sanh was exculpated.
Motif of getting married and becoming Kings	The King allowed Thach Sanh to married the princess. The wedding was held very ceremonially. Later then, the King did not have any son so Thach Sanh was crowned as the King.	Chau Sanh married the princess and was crowned as the new King; the courageous warrior married the princess and was crowned as the new King; the younger brother married the princess and was crowned when the King became old.

**\* Some explanations:**

Firstly, these similarities are originated from the characteristics of the category. The characteristic of folk literature, in general, and the fairy tale type, in particular, is the acceptance of variants. Fairy tales were created from the time of primitive communism and developed flourishingly in hierarchical society in which the stratification between the upper and the lower classes, the rich and the poor, the lavish and the meager was clearly visible. In this society where the people who were not powerful enough to make themselves heard were always looked down and trampled, it is evident to have the desire to rise up, to dream of and struggle for a better and

fairer life. The type of hero tales, in particular, and folk literature, in general, is the place where ancient people put their thoughts and desires in. The dream of the kindness defeating cruelty, and the concept of courageous warriors with extraordinary strength and outstanding talents and the support from miraculous forces always ready to protect and help people in trouble have become a characteristic of the fairy tale category in general and courageous warrior in particular. This aspect governs the structure and the connotation of the tales' content of both ethnic groups.

Secondly, Southern Vietnam - Mekong Delta is the land on which 4 brother ethnic groups Viet, Khmer, Hoa (Chinese), Cham have been co-residing together. They have lived together, worked together and shared their culture, which is one of the characteristics contributing to the similarities between the story type, including the heroes and monster type. In ancient time, Mekong Delta was a land of sacred forest and poisonous water, "crocodile swimming under the river, tiger growling in the forest" or "mosquitoes buzz like playing the flute, leeches floating like thick noodle soup". Therefore, the residents of this land have to struggle against not only two-legged enemies but also four-legged enemies, malicious snakes, fierce crocodiles and cruel birds to survive. As a result, in the subconscious of the ancient people in the Southern Vietnam, the animals listed above are, at the same time, the dangers and the josses as well as their friends. From the reality, they became the characters in the folk tales of the ethnic groups. The courageous warriors are the robust and brave Viet and Khmer young men who were always the leaders in the struggles against the harsh conditions of the nature of the land they were living in. Ancient people always worshiped and respected these warriors and considered them as the heroes of the world. The common characteristics of living conditions and the effect and interfere of both ethnic groups' culture are amongst the important factors that make up the similarities between the heroes and monster story types of the two ethnic groups.

## CONCLUSION AND DISCUSSION

Comparing of the tale systems in general and the heroes and monster story type, in particular, to figure out the similarities and differences between the story types of the two ethnic groups living in the same region and initially explaining these similarities and differences is a meaningful act. It is to satisfy the demand of teaching and studying folk literature in the universities in Vietnam, in particular, and the conservation of the basic values of folk tale of the ethnic groups in Vietnam in general. Within the scope of this writing, we have only mentioned a part of the similarities and provided the initial explanations for the similarities between the heroes and monster story types of the two ethnic groups Viet and Khmer, but we also hope that our study will also be a scientifically valuable study.

Within the scope of this writing, we are looking forward to receiving your attention and discussion of the following issues:

1. In your opinion, is the research method we are using conformable to the international trend of research? Has this research orientation been used in your country?
2. My postgraduate thesis that I am studying in in Vietnam is specialized in the field of fairy tale type and motif. Therefore, we hope to receive your sharing experience.

## REFERENCES

- [1] Tran Thi An (2007), "Studying folk literature from the type and motif aspect - the possibility and insufficiency", Journal of Literature no.2
- [2] Nguyen Dong Chi (1974-1982), Collection of Vietnamese fairy tales, 5 volumes, Social Sciences Publisher, Ha Noi.
- [3] Chu Xuan Dien, "Regarding the comparison method in studying folk culture", <http://khoavanhocngonngu.edu.vn>.
- [4] Nguyen Tan Dac (Cb) (1983), Regarding the reference list of the type and motif of folk tales", Folk Literature, methods of study, Social Sciences Publisher.
- [5] Nguyen Tan Dac (1999), "Studying Southeast Asian folk tales through the type and motif", printed in the Folk Literature – the research works, Education Publishing House, Ha Noi.
- [6] Nguyen Bich Ha (1998), Thach Sanh and the heroes story type in Vietnamese and Southeast Asian fairy tales Education Publishing House, Ha Noi.
- [7] Nguyen Thi Hue (1999), Characters that are ugly but talented in Vietnamese fairy tales, Social Sciences Publisher, Ha Noi.

- [8] Pham Tiet Khanh (2007), “Appearance of Southern folk Khmer literature”, Journal of Folk Culture, (1), tr.71
- [9] Chief editor: Nguyen Xuan Kinh (2004), “Collection of Vietnamese Folk Literature”, Volume 6, Fairy Tale, Social Sciences Publisher, Ha Noi.
- [10] Meletinsky. M. E (2004), Poetics of the legends, translated by Tran Nho Thin – Song Moc, Education Publishing House, Ha Noi.
- [11] Tang Kim Ngân (1994), Vietnamese Fairy Tales - Structural characteristics of the story plot, Social Sciences Publisher, Ha Noi.
- [13] Huynh Ngoc Trang (1987), Khmer folk tales, (2 volumes), Cuu Long Culture and Art Publishing House
- [14] Do Binh Tri (2006), Vietnamese Fairy Tales – read using morphology if V.Ja.Propp Fairy Tales, National University Ho Chi Minh City Publishing House.
- [15] Multiple translators, (2003), “Collection of V.Ia.Propp” volume 1, National Culture Publishing House.
- [16] Multiple translators, (2004), “Collection of V.Ia.Propp” volume 2, National Culture Publishing House.
- [17] Alan Dundes (2007), “From etic to emic units in the structural study of folktales”, *The meaning of folklore*, p.88-101, Edited and Introduced by Simon J.Bronner.
- [18] Antti Aarne, Stith Thompson (1973), *The Types of the Folklore-A classification and Bibliography*; Suomalainen Tiedeakatemia Academia Scientiarum Fennica, Helsinki.
- [19] Stith Thompson (1977), *The folktale*, University of California press, Berkeley, Los Angeles, London.
- [20] Stith Thompson (1958), *Motif – index of folk – literature*, Indiana University press; Blomington and Indianapolis.

# **APPLYING AND EVALUATING INFRASTRUCTURE SOLUTIONS IN EDUCATION PROGRAMS FOR PHYSICAL DEGREE STUDENTS OF PHAM DA NANG**

NGUYEN THANH GIANG

Organization: Faculty of Physical Education, University of Danang.  
Contact address: 62 Ngo Si Lien - Lien Chieu District - Da Nang City

## **ABSTRACT**

The solution to prevent traumatic injury in the training for students of Da Nang University of Education is very important in teaching today. The research results have selected 6 solutions put into practice in teaching practice has brought high efficiency.

**KEYWORDS :** Education

## INTRODUCTION

Danang Pedagogical University is a school that is responsible for training physical education teachers for the general education schools. At present, the scale and quality of training is increasingly improved, the product training is socially recognized. Therefore, the school continuously improves the quality of its faculty members, applies new training processes, improves the content and teaching process. At the same time, step by step approach to modern teaching methods to improve the quality of training. The school's specialty is the high school tuition in the training program. However, the reality of the trauma usually occurs during teaching hours, especially in the classroom. Therefore, research on the causes and methods of preventing traumatic injury in the subject of student-physical education is necessary and very practical.

In this regard, in many scientific studies, the authors studied the development of motor qualities through the use of various types of exercise development such as Pham Quoc Toan (2010) with injury prevention and more research.

However, so far at Danang Pedagogy University, there is no study on the solutions of injury prevention in the practice of physical education. There is a need for scientific experiments to demonstrate the rationality of using exercise and exercise equipment to ensure injury prevention for students in physical education is essential. Based on the above facts and in order to serve the teaching, as well as effective solutions to injury prevention, we conducted research on the subject: "Research on solutions to injury prevention in training physical education subjects for students of Danang Teachers College "

### Research purposes:

By studying the theoretical basis and the situation of traumatic injury in fitness training, from that, find out the causes of injury and propose solutions to injury prevention in exercise training. Physical education for students of Danang Pedagogy University

## RESULTS AND DISCUSSION:

### 1. Applying and evaluating the effectiveness of measures to prevent trauma in physical training of students of Da Nang Pedagogic University:

#### 2.1. Application solutions:

From the basis of theoretical and practical science, research topics proposed solutions to prevent injuries in training physical education for students of Da Nang Pedagogy University. Specific solutions include:

1. Organize class time.
2. Insurance and assistance.
3. Use insurance equipment yards and equipment
4. Thoroughly warm up and dress appropriately.
5. Strengthening professional strength.
6. Educate the psychological qualities.

After interviewing experts, managers and lecturers are highly consensus, the topic of application for research subjects, specifically:

#### **Solution 1: Organize class time**

During each lesson, the teacher must always play a dominant role in the classroom, organize a tight classroom, aware of trauma, have specific instructions, instruct the learner to master the equipment. be in training Discipline education for learners, improving the capacity and dedication of the teacher.

Equip students with self-organized, self-learning. In particular, encourage the spirit of hard work, the spirit of unity help each other and always create exciting hours of exciting and serious.

#### **Solution 2: Insurance and assistance.**

Insurance and help during class time is very important: helping the technician to correct the problem, when doing all the work (can be done slowly), with the help of coaches in The process of mobilizing and assisting the practitioner at the critical stage of the movement, helping when needed, helping indirectly the practitioner to perform his / her own actions, insurance in the process of performing the action, helping and applying This is in accordance with the specific conditions, based on the level of completion of the practitioner's movements and must know the standing position to help, as well as appropriate help skills, using auxiliary means to help the person. learn in the process of learning and technical improvement.

#### **Solution 3: Use of insurance equipment, yards and equipment.**



Gymnastics in general and physical education in particular are sports that require specialized equipment for training and competition. It is a home gym, the use of exercise and fitness competitions for learning the technique to develop physical strength.

Equipment must be synchronous and safe for learners, ensuring proper professional requirements. Being aware of the meaning and importance of it, we propose and report in writing to the Party Committee - Administration and functional departments of the school equipment, upgrading equipment, equipment fully in accordance with the content requirements of the subject.

**Solution 4: Thoroughly warm up and dress appropriately.**

Provide a variety of warm-up exercises that are tailored to each subject, combined with stimulating music and a ready-to-exercise state.

Instructing students to start and self-start, educating the practitioner to see the importance of warm-up, giving the practitioner a warm-up routine and positive start to avoid possible injuries. happening. On the other hand, the launch is interwoven with movement games to arouse passion, love movement, strengthen the will to be willing to mobilize the practice. In addition, neat outfits also reduce Significant cases of injury.

**Solution 5: Strengthen your fitness**

Strengthening the professional body is a very important measure in the activity and prevention of injury in physical training. Each lesson should have a reasonable volume of work to ensure the system, the strength... should not put overload exercises, and always educate the self-training self-training.

Every hour, there is always a certain amount of time to improve physical strength through a variety of exercises, developing muscle groups, improving circulation, breathing and adaptability. coursework requirements

**Solution 6: Educate mental qualities.**

Psychological training will focus on the control and conditioning processes of activity in the process of emotions, will and awareness, with the aim of delivering the right tasks that satisfy the practitioner, motivating them. active.

Psychological education is organized and practiced throughout the training process, as well as during preparation for a specific competition.

Put on the training elements of the competition, with the goal of creating and strengthening good personal qualities for learners, developing and reinforcing conscious control of all professional psychological symptoms. Learners in training conditions, raising the need to mobilize all personal factors to overcome difficulties in learning to overcome themselves.

Psychosocial correlation involves enhancing the basic premise of psychosocial well-being as well as possible and even energy storage through resting.

**2.2. Evaluate the effectiveness:**

To carry out research objectives of the project. To ensure objectivity, science in the research process, the topic of applying solutions for students of the University of Pedagogy Danang. Evaluation results were compared by self-comparison method (sequence comparison).

After conducting experiments on the prevention of traumatic injury in the training course for students of the 11th grade of the Pedagogic University of Danang, we compared the pre and post traumatic injury level.

Table 2.1. Comparison results of traumatic injury level of 11th grade students of Danang Pedagogy University after the experiment

	Gender	Before the experiment		After the experiment		t	P
		Number of injured people	%	Number of injured people	%		
1	Male (n=177)	58	32,8	44	24,7	2,617	0,05
2	Female (n=73)	21	28,5	14	19,5	2,715	0,05



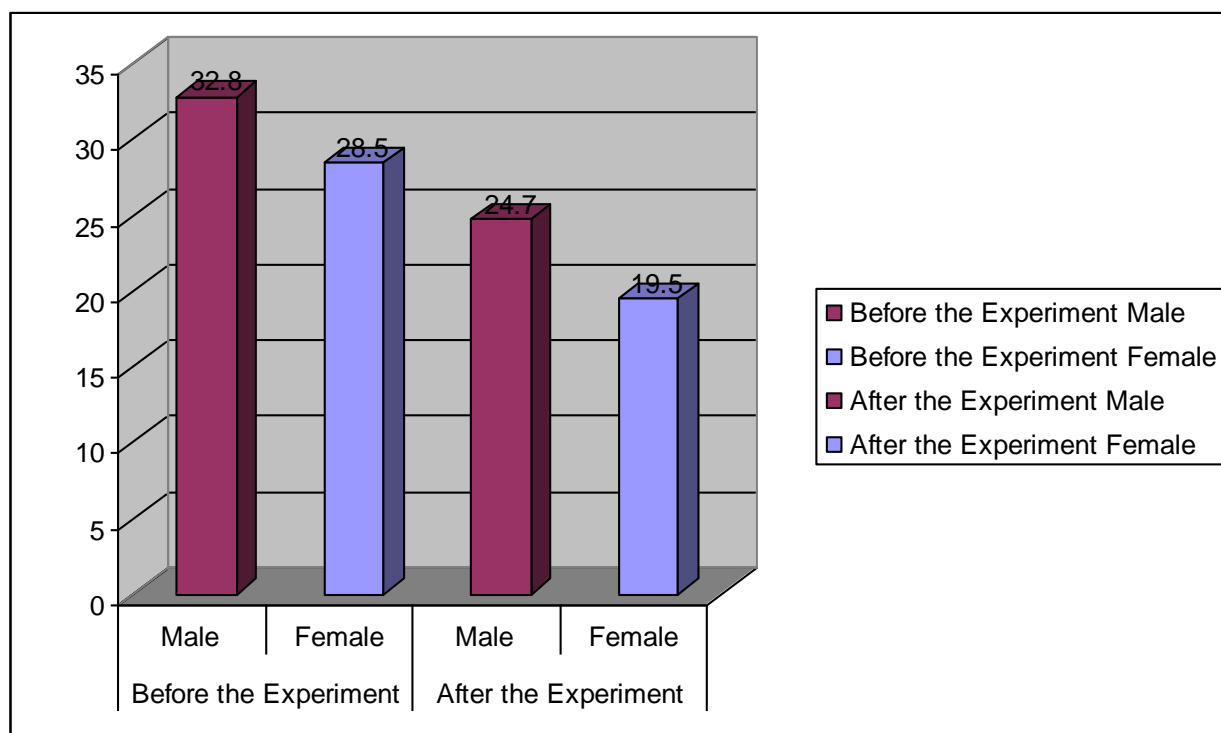


Figure 2.1. Post-experimental results

The results of Table 2.1 and Figure 2.1 show that, in the practice of applying some injury prevention measures, the number of traumatic injuries was significantly reduced. Men from 32.8% to 24.7%, women 28.5% to 19.5%. The results were statistically significant at the probability threshold  $p < 0.05$ , or in other words, the solutions applied by the subjects reduced the traumatic states of exercise in the 11th grade students. Da Nang teacher. Thus, the solution to injury is applied in the experimental time is effective.

### CONCLUSIONS

From the results of the study, some conclusions can be drawn:

In the exercise of diverse, complex and high-difficulty exercises, the practitioner performs the movement technique on the instrument. Therefore, there are more injuries than other sports. Therefore, in teaching, training and competing, injury prevention is an extremely important measure to be taken care of to ensure the safety of the practitioner.

### REFERENCES

- [1]. Pham Dinh Bam (2005), *Some basic issues in sport management, monographs for athletes*, Sports Publisher, Hanoi.
- [2]. Ministry of Education and Training (1998), *distribution of physical education programs in universities* (Decision 203 / QĐ-GDTC dated 23/01/1998).
- [3]. Ministry of Education and Training (2002), *Education Development Strategy 2001-2010*, Education Publishing House, Hanoi.
- [4]. Le Buu (1995), *Uncle Ho with Vietnamese sports*, Sports Publisher, Hanoi.
- [5]. Nguyen Dang Chieu (2005), *Lecture on Sports Medicine*, Internal Documents.
- [6]. Luong Kim Chung (1987), *fatigue training*, sports publisher, Hanoi.
- [7]. Duong Nghiep (1991), *Sports Measurement*, Sport Publisher.
- [8]. Vu Cao Dam (1995), *Research Methodology*, Materials for Higher Education, Managers and Teachers of Universities and Colleges.

## INNOVATING STATE MANAGEMENT OF LAND IN NGHE AN PROVINCE IN THE URBANIZATION PROCESS

Tran Thi Hoang Mai, Nguyen Thi Hai Yen

*Address: Faculty of Economics, Vinh University, 182 Le Duan,  
Vinh City, Nghean Province, Vietnam, Country: Viet Nam  
Corresponding E-mail : hoangmaikt@gmail.com; haiyenkt@gmail.com*

### ABSTRACT

The paper focuses on clarifying the situation of land movements and state management of land in the process of urbanization in Nghe An province from 2005 to present, using the secondary data collected from General Statistics Office of Vietnam, World Bank and state management agencies of Nghe An province. In addition to the results obtained, the article also points out the limitations in state management of land in Nghe An: (i) Land use planning have not yet meet the target of socio-economic development of the province as well as ensuring the harmony of interests of the state, investors and people; (ii) Corruption in the land sector is still occurring; (iii) There is no clear and transparent settlement mechanism for compensation, site clearance and resettlement, and there is no harmonious interest among parties. (iv) financial management of land unregulated by market principles; (v) The benefits of land acquisition have not been paid enough attention, causing difficulties in stabilizing their lives after land reclamation.

In order to deal with these constraints, the authors proposed four solutions: (1) improving the legal system and raising awareness on land law; (2) Ensure publicity and transparency in state management of land; (3) strengthening the rights and interests of land users; (4) Improve the organizational structure and enhance the efficiency of the state management apparatus for land. The proposed solutions are practical and secure to address the issues of state management of land in the process of urbanization, with the requirement of improving the market oriented market economy. The land is really an important input for economic development, contributing to fulfill the goal of urbanization and industrialization of Nghe An province to 2020.

**KEYWORDS:** state management, urbanization, state management of land

## INTRODUCTION

Along with the urbanization process in the whole country, the urbanization pace in Nghe An province in general and Vinh City in particular has been happening more and more rapidly (take place faster), especially since 2008 when Vinh City officially became urban type I. Land in Nghe An fluctuates dramatically both in terms of use purposes and use objects. After 7 years of implementing the 2003 Land Law (from 2004 to 2011), Nghe An province has recovered 33,357 hectares of land (accounting for 4.58% of the total withdrawal land in the country, ranking fourth in 63 provinces) to implement 458 projects which includes 102 new urban area projects and housing projects. The area of urban land has increased rapidly while the area of rural- agricultural land (particularly forest land) has narrowed down.

In the process of urbanization, the management and use of land in Nghe An has arisen many limitations and problems. Conflict of interests between the government and the people, between enterprises and citizens in the process of land acquisition, land allocation, land lease, compensation for site ground clearance is increasingly intense, threatening social stability and eroding the trust of the people in the Party and government. First, planning and land-use plan have not yet done well the role of orientating, forecasting the land conversion process, which regularly adjusting the planning according to the economic benefits in order to meet to the needs of investors. In the process of conversion of land use patterns, many projects is extremely valuable, causing the closed program without publicity and transparency in term of land allocation, land lease, conversion of land use purposes, land acquisition; which leads to many land corruption cases in the province. Besides, land valuation does not follow market principles. The land price set by People's Committee of province still amounts to approximately 30% to 70% of the actual land transfer price, damaging to people whose land is recovered. In addition, the development of the land market is sometimes spontaneous and dominated by speculative factors, posing negative fluctuations. Particularly in urban areas and places where the shift in land use structure is occurring strongly. For example, the urban land price in Vinh City rises considerably, surpassing the affordability of the majority of the population. The conversion of land use purposes from agricultural and rural land to urban land has fundamentally altered the form of land assets. The rapid increase in the value of land assets results in the complexity of land economic relations between land users and the state, requiring state management of land to be renewed and improved in terms of contents, methods and management tools. Therefore, the state management of land must be studied and considered comprehensively and fully in economic, political and social aspects. Accordingly, the analysis and assessment of the state management of land and the search for solutions to renovate this activity in Nghe An is necessary to ensure harmony between the interests of the State and the investors and land users, which maintains social stability in the process of development.

## MATERIALS AND METHODS (10 pt)

The subject of this article is state management of land in the process of urbanization (including land for industrialization) in NgheAn, coupled with the change of land asset morphology and requirements to promote the improvement of economic institutions market oriented socialist. The article uses the following research methodology:

### - *Comparative analysis method:*

Research contents of the project are reviewed on the basis of assessment of land use, comparison of land use results and land changes over the years in order to analyze the impact of these indicators on the role of state management over land. The comparison results are taken as the basis for the implementation of solutions to enhance the role of state management over land in the process of urbanization.

### - *Statistical method:*

The subject used statistical data and documents for comprehensive analysis and evaluation of content of tasks and results of state management of land in each period, each specific year in NgheAn. The results of the analysis will equip the author with a scientific basis for solutions, focusing on the most influential factors to improve the effectiveness of state management of land in the process of urbanization in Nghe An.

### - *Interpretive and inductive methods:*

Based on the analysis of the basic contents of state management of land and the actual management of land use in the process of urbanization in Nghe An, the subject uses inductive methods to give an overview about them, in the context of the whole country and under the impact of industrialization and market economy mechanism.

### - *The method of data collection:*

The dissertation uses data, documents from the General Statistics Office of Vietnam; specialized reports and studies have been published such as scientific reports, monographs, scientific papers, journals, articles... which have been created by domestic and foreign experts; documents provided by agencies in NgheAn Province (People's Committee, Department of Natural Resources and Environment, Department of Construction, Statistical Office of NgheAn...). The results of this collection will provide a theoretical basis for analyzing and proposing solutions to strengthen state management of land in NgheAn in the near future. In addition, the authors also refer to World Bank reports on land and urbanization in Vietnam.

## RESULTS

### 1. Changes in land in NgheAn during the urbanization process

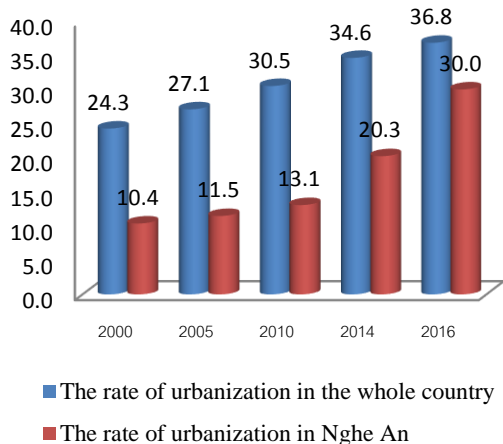
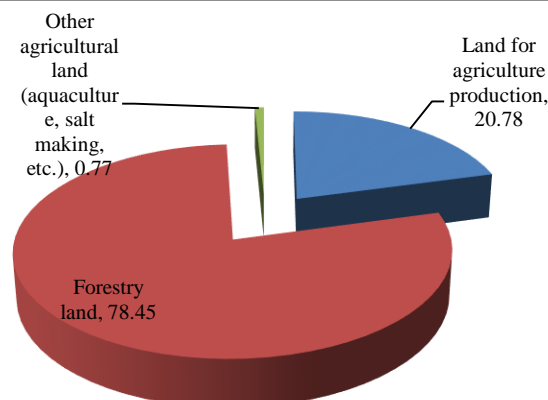
Since 2000, Nghe An has taken a new step in the process of industrialization and modernization along with the urbanization process with the formation of economic zones and industrial zones, for example: Dong Nam, Bac Vinh, Hoang Mai, Quy Hop, Nghia Dan... which promote the urbanization in the local region rapidly, firmly orienting the process of urbanization in association with industrialization and modernization.

Up to now, the province has 67 urban centers, including: 01 grade- I urban center (Vinh city), 01 grade -II urban center (Cua Lo town), 02 grade-IV urban centers (Thai Hoa town and Hoang Mai town), 17 grade-V urban centers are towns and district centers. The urbanization process in Nghe An has been relatively slow and the urbanization rate is low compared to the national average (Figure 1). However, the pace of urbanization has tended to increase rapidly in recent years. The process urbanization has significantly altered the land of Nghe An province, specifically as follows:

#### 1.1. Changes in agricultural land group

Nghe An is the largest province in the North Central region and the fourth largest in the country (accounting for 32% of the North Central area and 4.98% of the country). Nghe An has a high population density, with 184 people / km<sup>2</sup>, especially in wet rice production centers and densely populated areas. Total natural area of the province in 2014 is 1,648,067.06 ha, divided into 03 main groups: agricultural land (68%), non-agricultural land (29%) and unused land (3%). Agricultural land is a valuable asset, a resource for deciding farmers to survive and grow. Agricultural land in NgheAn is unevenly distributed among regions. The majority of the area is mountainous in the west, consisting of 10 districts and 1 town, mainly forest land. Agricultural land, aquaculture and salt-making land concentrated in the east are delta and coastal, including 7 districts, Cua Lo town, Hoang Mai town and Vinh city.

Although the land is distributed differently, the total amount of agricultural land is significantly huge, with 1,464,697.41 hectares, accounting for 88.87% of the natural area. Agricultural land in Nghe An is very suitable for rice, sugarcane, oranges, rubber... which in general ensures the food consumption for the people. The area of agricultural land in 2014 increased by 226,381.95 hectares compared to 2010 [8]. In particular, the area of forestry land increased from 972910.52 to 1149022.36 hectares while agricultural land grew from 256843.89 to 304407.17 hectares in the period from 2010 to 2014.

**Chart 1. Fluctuations in the rate of urbanization in Nghe An comparing to the whole country****Chart 2. Agricultural land structure in Nghe An in 2014**

Source: Author synthesis based on GSO data

### 1.2 Changes in non-agricultural land group

The total area of non-agricultural land in Nghe An is 129,500.51 ha, of which the types of land occupying a high proportion of total non-agricultural land include: specialized land occupies 57, 96%; residential land is 17.24%; rivers, streams and specialized water surfaces account for 19.58% [8].

In the period of 2005 - 2014, the non-agricultural land area in Nghe An province indicates the upward trend from 113,443.61 hectares in 2005 to 124,653.13 hectares in 2010 (an increase of 11,209.52 hectares), before reached at 129,500 hectares in 2014 (an increase of 4,847.38 hectares compared to 2010). On average during this period, non-agricultural land area increased 1,784 hectares each year.

**Table 1. Changes in non-agricultural land use in Nghe An 2005 - 2014**

Indicators	Area (ha)			Change (ha)		
	2005	2010	2014	2005-2010	2010-2014	2005-2014
Total area	113.443,61	124.653,13	129.500,51	11.209,52	4.847,38	15.992,4
Residential land	16.401,68	19.818,98	22.325,65	3.417,3	2.506,67	5.923,97
Specialized land	51.466,64	63.871,46	75.058,6	12.404,82	11.187,14	23.591,96
Land used for religion, belief	422	354,75	480,76	67,25	126,01	58,76
Cemetery land	6.750,97	6.636,42	6.264,49	-114,55	-371,93	-486,48
Land of rivers and streams	38.483,88	33.818,36	25.354,98	-4.665,52	-8.463,38	-13.128,9
Other non-agricultural land	52,94	153,16	16,03	100,22	-137,13	-36,91

Source: People's Committee of NgheAn province

In particular, specialized land group increased the most during this period (23,591.96 hectares); followed by the residential land area with an increase of 5,923.97 hectares and especially, the area of rivers, streams decreased by 13,128.9 hectares (Table 1). Along with the growth of non-agricultural land, the area of urban land is constantly increasing with the urbanization and expansion of urban space, thousands of hectares of agricultural land has been converted to urban land, economic zones, industrial parks and land for large projects in the province. The area of land used for conversion of land use purposes from agricultural land to land used for non-agricultural purposes such as construction of roads, Construction of urban areas, industrial parks, economic zones... bringing in high economic value namely Southeast Economic Zone, new urban areas of Vinh Tan, Cua Tien new urban

area, urban areas in the Soviet Nghe Tinh Avenue... Particularly, the area of urban land raise 380.94 hectares from 2005 to 2010 before reaching at 2709.81 hectares in 2014 (increase of 989.31 ha) compared to 2010 [8].

In the total land structure of the province, the structure of rural land tends to decrease while urban land tends to increase, which is in line with the general development trend of the economy, the tendency to increase the proportion of land in urban areas and gradually decrease the proportion of land in rural areas over time. The structure of urban land in total land structure in the province went up from 8.17% in 2005 to 12.41% in 2014. After a decade, the area of urban land increased relative to that of rural land, partly reflecting the rate of urbanization in the process of economic development in rural Nghe An.

### 1.3 Changes in unused land group

Currently, NgheAn has 53,869 hectares of unused land, accounting for 3.27% of the total natural area including: unused land with 9,509.03 hectares accounting for 0.58% of the total natural area; unused hill land with 39,351.85 hectares, accounting for 2.39% of the total area; rocky land without forest with 5,007.76 ha, accounting for 0.3% of total natural area [4].

Unused land increased sharply from 2005 to 2010 due to mainly the increase of the unused hill land area (up 234,853.67 ha) and the transfer of land from other land types to the protected forest land (178,271.16 ha of protected forest land has been converted) while this land tends to decrease sharply by 2014 (down 232,344.37 hectares) as compared to 2010, mainly for forestry purposes for zoning off forest restoration and afforestation and for re-measuring the cadastral map. Moreover, a large area of unused land has been allocated for non-agricultural purposes and the area of river and stream land transferred from unused land to non-agricultural land by changing the classification criteria in the new legal system on land. In the unused land category, the unused plain land experiences a substantial decline through the years when from 13.152,99 hectares in 2005 it dropped to 10,752.06 in 2010 and to 9,509.03 in 2014. Because this is a clean land fund, there is no dispute so it is very convenient for the conversion purpose in the process of urbanization in Nghe An.

## 2. State management of land in Nghe An in the process of urbanization

After the promulgation of the Land Law in 2003 and coming into force, the People's Committee of Nghe An province issued documents to implement the Land Law in the province. Thank to conscientious direction of the local government, the specialized agency - directly the Department of Natural Resources and Environment of Nghe An province organized the implementation of the Land Law 2003, 2013 for life, helping all organizations and individuals understand and seriously obey.

### 2.1. Technical and cadastral work

The determination of administrative boundaries, the preparation and management of records and the administrative mapping of the province have been carried out strictly according to the Government's Directive 364/CT. The measurement and identification has been assisted by consultancy units, completing the determination of administrative boundaries between communes in the province, between Nghe An province and other areas completed before 1995. Prior to 2010, Nghe An Province mainly used land maps to provide land use right certificates and land management. From 2010 onwards, the mapping of land use status has been implemented in accordance with the Land Law. By June 2016, the whole province has completed the cadastral mapping in 21/21 districts and put into use with 460/480 communes surveyed to make cadastral maps, cadastral measurements. In detail, 110/460 communes, wards and townships are entitled to carry out land surveying and mapping (prior to 2008) but not associated with the declaration and registration of certificates and the assignment of the certificate is handed over to the District People's Committee for implementation. Besides, 350/460 communes are organized by the Department of Natural Resources and Environment in association with certification while 20 cadastral maps have not yet been surveyed. The completion of land administration plays an important role in the management of land, especially in the formulation of land use planning and plans, implementation of land procedures such as land acquisition, transfer, inheritance and mortgage.

### 2.2. Management of planning and land use planning

In the period of 2005 - 2010, the whole province has 17/20 units at district level, adjusting the planning to 2010. Particularly, there are 10 district units completed before 01/01/2009 including Quy Hop, Dien Chau, Con Cuong, Tuong Duong, Ky Son, Que Phong and Hung Nguyen. The remaining districts of Nam Dan, Thai Hoa and Vinh City have not been planned until 2010, so that they were newly planned and approved in 2009 and 2010. From 2011 up to now, the province has urban system developing rapidly with 67 urban areas, 05 industrial zones, and 12 industrial clusters. The continued increase of land use criteria for urban development, for the development of industrial zones and industrial clusters, has severely reduced agricultural land but has not been properly considered. The use of rice land for other purposes is arbitrary, in many cases reflecting personal opinions without usefulness, and sometimes as an instrument of one or several interest groups. This is responsible for a series of



"hanging" projects such as the Red River Resort project in Cua Lo Petroleum Resort, the project of BMC Cua Lo Plaza, Smart City urban area project...when people have no land to produce.

### 2.3. Managing the allocation, lease, recovery and conversion of land use

The land allocation, land lease, land acquisition and land conversion purposes have been implemented in the province based on the approved land use planning which proposed by the organizations, individuals with land use demands in accordance with the Law. In the period 2010-2014, the whole province has 1,107 projects allocated land, leased land, converted land use purpose with a total area of 14,809.97 hectares [9], most of them have been implemented in accordance with the decision allocated, leased or transferred land use purpose. In particular, there is a large portion of paddy land for other purposes to build many projects such as: switching to land transport (building the road to the west of Vinh city, D4 roads, N1, N2, N5 in Southeast Economic Zone of Nghe An, paving the way for new rural construction...); switching to energy land (building the grid system of Xieng My commune, Tuong Duong district, Hua Na hydropower project...); switching to historical land (constructing the central square of Hoang Mai town, constructing historical relics of Truong Bon, Da Son commune, Do Luong district...).

In this period, about 559.11 hectares of land were allocated, leased or transferred but not implemented, including agricultural land: 0.94 hectares, non-agricultural land: 558.17 hectares (Residential land: 191.77 ha, special purpose land: 364.82 ha). The area of residential land has already been auctioned but not yet built (mainly in construction projects for sale in Vinh city, Quynh Luu district, Yen Thanh district, Do Luong district). Some projects have been leased land for production and business but over 12 months have not been put into use in accordance with regulations due to obstacles in the process of compensation for site clearance (mainly Hung Yen district, Quynh Luu district, Vinh city, Vinh city...).

### 2.4. Managing land use right registration, granting land use right certificates

The province determined that the granting of land use right certificates is an important factor contributing to creating favorable conditions for land management, minimizing the situation of land disputes and complaints which are currently hot issues across the country. Therefore, the province has implemented in a uniform manner, to declare and issue certificates to organizations and individuals.

**Table 2.** Results of granting land use right certificates (As of June 2016)

Ordinal	Category of land	Total land area to be allocated (ha)	Certificated (ha)	Rate (%)
I	Agricultural land category	984.633,51	898.276,62	91,23
1	Land for agriculture production	251.399,77	230.276,20	91,60
2	Forestry land	723.130,65	661.770,39	91,51
3	Fishery land	5.075,96	389,15	34,24
4	Land for making salt	814,68	86,50	57,61
5	Other agricultural land	4.212,45	3.987,18	99,43
II	Non-agricultural land category	46.031,71	41.828,47	90,87
1	Rural land	20.696,51	18.851,46	91,09
2	Urban land	3.382,13	3.187,61	94,25
3	Specialized land	21.445,88	19.389,80	90,41
	Total	1.030.665,22	940.105,09	91,21

*Source: Nghe An Natural Resources and Environment Department*

According to Table 2, the area for granting land use right certificates of Nghe An province is 1,030,665.22 ha, as of June 2016, the province has granted 940,105.09 ha, reaching 91.21% of the area to be granted. In the coming time, the province shall have to further declare 90560.13 ha, mainly for agricultural and forestry production. As for the land allocation, the certificate for the current investor has 105/138 projects have been allocated land by Nghe An People's Committee, land use conversion.

For the land allocation and issuance of certificates to investors, 105/138 projects have been allocated land by the provincial People's Committee with the total land area of 446.37 ha while 8198 certificates of land use rights have been issued to investors for the implementation of the project (8110 certificates for implementation of adjacent houses, villas and 88 certificates of condominium) [10].

### 2.5. Financial management of land

The financial management of land shall be implemented in accordance with the current law. All proceeds from the land shall be remitted to the State Treasury. The revenue from land finance mainly comes from the land use right acquisition, which was then re-adjusted to build, consolidate, renovate and upgrade the province's



infrastructure. Income from land in the years has increased but not significantly, except in 2013 compared with the years due to economic recession, therefore the province has reduced the land rent for 68 enterprises with the amount of 12.3 billion. Real estate market in recent years experiences a slow recovery, slight progress of land auction, large inventory...which leads to negative impacts on most enterprises in all fields, especially those operating in the fields of manufacturing and trading of construction materials and real estate. Consequently, the budget revenue from the land use is still low.

**Table 3.** The budget revenue from land of Nghe An in the period 2012 - 2016

	<i>Unit: VND billion</i>				
	2012	2013	2014	2015	2016
Revenues					
Land rent	136,72	87,5	228,9	265,5	279,7
Land use fees	658,54	540	829	1.019	2.271
Total	795,26	627,5	1057,9	1284,5	2550,7

*Source: Nghe An Tax Department*

After the equitisation of State-owned enterprises, many “gold” land projects in Nghe An were converted land use purpose without public auction. When determining land prices and land rents based primarily on the results of the consulting business, not close to market prices causing losses to the state budget. After the change of land use purpose, many “gold” land areas have brought great benefits to investors but some investors still owe land tax such as Lung Lo building project with nearly 18 billion of debt, the commercial center project and high-rise apartment in Ben Thuy Ward debt over 28 billion...[6].

## **2.6. Supervision, inspection and supervision of land administration**

The inspection and examination of the land use management of land use organizations in the province in the period of 2009 - 2014 has detected many acts of violation. Government revoked 750,506.8 m<sup>2</sup> of land from 50 organizations that used land inefficient and violates land law [8]. In particular, 48,111.7 m<sup>2</sup> of land was recovered for organizations using the land more than 12 months from the date of land allocation in the field, but land has not been used or the land use rate is less than 24 months. Government retrospectively collected 5.770 billion for organizations using land without payment of land rent. Chief Inspector of the Department of Natural Resources and Environment issued 36 decisions on sanctioning administrative violations, with a total fine of 433.95 million [8].

So far, basic economic organizations have paid fines and overcome the consequences of violations. Particularly in 2015, the provincial inspectorate has conducted 10 cases in 10 units found violations in 8 units with a total violation of 2,405 hectares; suggested to recover 1,6182 hectares of land into the state budget and proposed to handle other 0.787 hectares of land [8].

The settlement of complaints and denunciations in the past year has reached satisfactory results and the dossiers are settled according to the order, procedures and competence. In the period 2005 - 2010, the province has received and processed 5,284 complaints about land. In the period 2005 - 2010, the province has received and processed 5,284 complaints about land. The Department of Natural Resources and Environment has received 944 applications for land disputes, complaints and denouncements, including advising the provincial People's Committee on 216 cases [7].

However, there were a wide range of petitions and complaints related to the compensation and support activities when the State recovers land, especially around the land price and compensation property. For example, agricultural land compensation policy in residential areas and compensation policy for garden and pond land have not been recognized as residential land under the Land Law 2013. In the process of urbanization, Nghe An province has a great deal of investment projects contributing to the socio-economic development of the province. The majority of the recovered land fund for projects was concentrated in large urban areas of Vinh City, Cua Lo, Quynh Luu, Dien Chau...which was conducive to the emergence of complex, complex complaints putting pressure on the government. Major complaints focused on compensation for land clearance (50%), granting of land use right certificates, reclaiming land and land disputes between adjacent land users.

## CONCLUSIONS AND DISCUSSION

### 1. General assessment of the state management of land in the process of urbanization in Nghe An

#### 1.1. Achievements

The development of the market economy and the open in the Land Law 2003 and 2013 have created favorable conditions for the state management of land in the province to achieve many results. The use of land (especially agricultural land) is increasingly effective in the direction of commodity production and real estate market development. Specifically:

- The preparation and management of land use planning have been carried out at all levels of the province, district and grassroots levels, which have been initially reformed to improve the quality and feasibility of the proposed plan, clarified the planning contents of each level, create initiative and flexibility for each level in socio-economic development and construction, thus contribute an important part to the achievement of the industrialization and modernization objectives. Thanks to the province's land use planning, many unused land has been gradually put into operation. Approving the land use planning, initially the land has been used for proper purposes, thrift and efficiency, protect the ecological environment, promote the land resources, meet the requirements of country development, economic restructuring, socio-economic development, national defense and security, and new rural development.

- Land allocation, land lease, land recovery and land use change have basically met the needs of land users, creating a supply of relatively large and diverse real estate market. The projects contribute to speed up the urbanization, improve the face in urban modern and civilized direction, for Nghe An province in general and Vinh City in particular. The restructuring of land use under the impact of urbanization in the past time basically suited to the process of restructuring production, investment, labor, contributing to the development of infrastructure, industry, rural agriculture, urban and services, creating a reasonable step for economic restructuring. The agricultural and rural infrastructure has been significantly improved, improving people's living standards, narrowing the gap between regions and localities in the province. Through the land allocation and land acquisition, land resources have been exploited and used to actively contribute to socio-economic development in the province and improve the lives of the people. Many investment projects after the land allocation and lease by the provincial People's Committee have been carried out to build the works and put into use in accordance with the planning, promote the effectiveness of land use, meet the needs of land area business premises; creating more jobs for hundreds of local workers; help them stabilize their lives and increase their incomes, especially those who have lost their agricultural land, and increase their revenues to the state budget.

- The inspection and examination of the observance of the provisions of the land law and the handling of violations of the land legislation in the province have been conducted regularly in various forms such as inspection and examination, the implementation of land use planning, the fulfillment of land obligations, the issuance of certificates, conversion of land use purpose, especially financial-related land activities. The inspection and control activities have prevented and promptly dealt with acts of using land for improper purposes, preventing mistakes in the management of land.

- The reform of administrative procedures in the field of land has had positive changes, which are highly appreciated by the public, especially the land allocation, land acquisition, compensation, assistance and resettlement. Time to implement administrative procedures is minimized through the integration of investment, construction, land and environment procedures from the stage of approval of investment projects to compensation, site clearance, project implementation is done through the "one-stop shop" mechanism.

#### 1.2. Limitations

Land management in Nghe An has achieved remarkable results in recent years. However, because land is special and contained within many complex factors, management has encountered many difficulties and conflicts of interests always arise. Therefore, the state management of land in the process of urbanization in the direction of building a socialist-oriented market economy in Nghe An was inevitably limited.

- The planning and land use plans have not met the objectives of socio-economic development of the province as well as ensuring harmony among the interests of the state, investors and people.

The quality of planning and land use planning in the locality has improved, but has not met the requirements. The progress of planning and land use planning at all levels, especially at district and commune levels, is still slow. The contents of the land use planning and plan remain inadequate: the level and content of land use planning and land use planning between different levels; combining land use planning with socio-economic development planning and construction planning; It is linked to the goal of sustainable development, ensuring food security. In elaboration and implementation of land use planning and plans lack of strict supervision, the land use planning

and land use norms must strictly comply with the ordinance norms. The application of advanced technologies is still limited. The land use plans are not really for the benefit of the community and the people, but are also influenced by local interests, which increases the demand for land for cultivation. Many places are not suitable with the actual demand to increase the price of land, causing the phenomenon of many abandoned land, causing waste of resources. The province has emphasized the need to create capital from the land fund for investment in industrialization and urbanization without paying due attention to the legitimate interests of land users and land users.

- Land corruption is still occurring due to the limited availability of information in the land sector and the low participation of people.

The transparency issue is mainly aimed at contributing to the control of corruption in land management and use. However, Nghe An's information disclosure has not been highly appreciated. According to the World Bank's 2014 Land Information Disclosure Study, both public disclosure of land-related information online and on-the-spot (known as two public disclosure channels). In the open access ranking of 63 provinces in the country, Nghe An was ranked 22nd / 63th for provincial level public disclosure; However, for information disclosure online, Nghe An is ranked 56/63 provinces [12].

- The compensation for ground clearance, support and resettlement has not had a clear and transparent settlement mechanism and has not paid much attention to harmony between the State, investors and landlords. The work of land acquisition and compensation has not paid due attention to the interests of the parties and has not dealt well with the relationship between the State's rights as a representative of land users and the accredited rights of land users. In many cases, it is necessary to recover and compensate the authorities for the overstaying of the rights of the State (the right owner) without paying due attention to the legitimate interests of the land users who have created, for the land. The policy to support career change and stabilize the lives of people affected by land acquisition is still inadequate. The information on vocational guidance has not been satisfactory to the people, especially the collected agricultural land cases. There are a number of regulations on compensation and livelihoods for people losing land, but in practice these regulations are not fully implemented and the regulations themselves do not guarantee the right benefits and long term for those who lose land.

- Financial management of land not in accordance with market principles

As a state representative of land owner, Nghe An intervened in land relations along many lines, causing serious land market distortions. In particular, the province stipulates the land use purpose as planned, but the quality of the planning is low or changing, causing the user to be very passive with their property, many lands in the plan is not sold, use as desired also not done. In addition, the valuation of land has not met the price requirements regulated market price. The big difference between "state-set land price" and "market price" (usually 10 times higher than the specified price) is the cause of the distortion and major obstacles on the land market [14]. The current land price set by the provincial People's Committee is still only from 30% to 70% of the real price of land transfer. The system of land price monitoring has not been organized on the market as a basis for determining land prices.

- The benefits of land acquisition have not been paid due attention, causing difficulties in stabilizing the life after land reclamation.

According to survey data of Vietnam Union of Science and Technology Associations, after losing land, only a very few people in Nghe An province (8.7%) said that they did not have any problems. The majority of people are seriously affected by employment (46.5%) and lack of productive land due to land acquisition (46.2%). In terms of income, only 7.2% of the interviewed households said that their income was higher than before the land acquisition, while 68.5% had a lower income. The resettlement assistance policy in the province, especially the issue of creating jobs for people after land recovery under Decree 47/2014 / ND-CP has not met the requirements, The relationship between the state, the investor and the people. Many people without land for production, without stable jobs seriously affected the long-term livelihood of people losing land. It is clear that structural change has had a negative impact on large numbers of farmers losing land. The benefits of land acquisition in the process of urbanization, industrialization in the context of market economy development have not been shared worthy of the people.

The above-mentioned shortcomings in the state management of land in Nghe An are due to the following main reasons: The land law system is not completely complete, although it has been amended many times. Land ownership, use and transaction in many cases have not yet been sanctioned; Legal awareness and sense of compliance with land law are not high; The management capacity of local administrations at all levels and weak state management apparatus is not meeting the practical requirements; The land management system in Nghe An was formed and completed, but there were many legal, enforcement and monitoring gaps.

**2. Some solutions to improve the efficiency and effectiveness of state management of land in Nghe An**

For the state management of land early to overcome the limitations, meeting the development requirements of the market in the coming time, attention should be paid to implementing the following solutions:

*First, improve the system of legal documents and raise awareness of land legislation.*

The system of land policies and laws has been adjusted and supplemented regularly, but has not met the requirements of solving some problems in reality. A number of land-related legal documents issued by local authorities have been delayed, the content of guidance is unclear, causing difficulties for the implementation of state management of land. Therefore, the Department of Natural Resources and Environment should strengthen the review of legal documents and proposals to adjust and supplement the legal documents under the jurisdiction of the provincial People's Committee, consult the Ministry of Finance resources and environment on the problems in the implementation of the Land Law 2013. Publicizing the administrative procedures by public posting procedures and procedures in the land domain Referring to organizations and individuals on the means of newspapers, radio, on the Web and posting at their offices, people can easily access information on land related administrative procedures. Set up a citizen reception calendar to receive and handle questions related to the land domain of organizations and individuals. Regularly deploy and disseminate information to local officials and people about the Land Law 2013 and relevant guiding documents to raise awareness and sense of law observance of land. Therefore, the Government, the Fatherland Front and mass organizations should strengthen coordination in propaganda, advocacy, clarification of benefits in many aspects of the project, especially the key projects, through To persuade the people to strictly abide by the State's regulations on compensation, ground clearance and land recovery.

*Second, ensure transparency and transparency in state management of land*

Planning and land use plans related to the rights, obligations and interests of subjects using lawful land. Therefore, the development of land use planning and plans must be open, transparent and democratic with the participation of local communities and mass organizations. Ensure proper rights and interests of stakeholders in the implementation process. Granting the right to participate in monitoring the management and use of land for people in accordance with Article 199, Land Law 2013. Transparency in management and accountability of managers is not only regulated in the legal document that needs to be thoroughly implemented in practice from the provincial to grassroots level. Publicity and transparency are always an effective way to reach consensus among people, thereby limiting harassment and corruption in the land sector. The province should specify the regime of publicizing the plan so that people know and implement it, creating favorable conditions for investors to easily access information on the planning; Specifying the rights of people living in the planning area but not planning to the people peace of mind. It is necessary to define clearly, publicly and transparently the purpose of land acquisition and allocation, clearly define the authority, responsibilities and obligations of the person issuing the land recovery decision and land allocation. To decentralize and clearly define the order and procedures for land administration and associate them with the responsibility of settling localities in conformity with the undertakings and requirements of administrative procedure reform and specific conditions in each stage. The specific price for each recovered land lot should be assigned to the independent land valuation agents based on the transaction price at the recovered land with the consent of the involved parties and must be disclosed before withdrawal

*Third, strengthening the rights and interests of land users*

Compensation and resettlement assistance for land acquisition is to ensure that the land subject to land recovery has a stable working life and better production without land acquisition. The main targets in the transition to occupation after land acquisition are mainly middle-aged women, so the most feasible solution is the local government in combination with the investors, arranging for them to work. This is a simple service. On the other hand, it is necessary to propagate to the people a new way of looking at jobs, eliminating the rural-style thinking of farming new jobs. In addition, it is necessary to promote the non-agricultural economic development in urban areas, industrial parks and in the Southeast economic zone to create jobs for laborers whose production land is recovered.

In addition, in order to improve the effectiveness of land compensation and compensation for local people, local authorities must coordinate with organizations such as the Farmers' Association, the Women's Union and the Elderly Association help the local people to find jobs and make money. Determining land prices for compensation is important, but it is more important to have consistent views and policy systems to ensure better life and a stable job for the people. land acquisition, this is not only a matter of compensation and resettlement support for people recovering land, it is an economic problem, but a socio-political issue.

Continue to improve the procedures and procedures related to the issuance of land use right certificates and related assets in the province in the direction of: (i) protecting the legal rights of the certificate holder; (ii) rationalization and simplification of administrative procedures in certification; (iv) enhancing transparency, participation of local people and responsibilities of local authorities in the issuance of certificates of land use rights, the right to property and registration of land transactions. Strengthening community and local supervision of land acquisition projects in the area. Decisions on local land and land management need the participation of the people, in many cases the decision-making power of the local community is required to be consistent with the principle of universal land tenure. The consensus and participation of the people in land management are factors contributing to the reduction of corruption and wrongdoing, helping to solve the complex conflicts which are very difficult to solve in the land field.

*Fourth, to improve the organizational structure and enhance the efficiency of the state management apparatus for land*

Continuing to consolidate and consolidate the organization of land management from provincial to grassroots levels to meet the requirements of strengthening land management in accordance with the Land Law of 2013. Provincial People's Committee The establishment of a single-level land registration office and one-tier land fund development center (to date, 19/63 provinces and cities have set up and strengthened one-tier land fund development center) to implement Compensation, site clearance in the area. Adjust functions and tasks; Strengthening and perfecting the organizational apparatus and staff of the natural resources and environment sector from province, district and city to commune and ward level in sufficient quantity and quality to meet the management requirements. State management of land. The number of land managers is not concurrent with other tasks to ensure that land management is tight and consistent, avoiding unnecessary disturbance. Organizing the review and issuance of forms of administrative procedures for uniform application throughout the province. Implement the Regulation on inter-branch coordination, especially attaching importance to the "inter-branch and inter-agency" mechanism: dossiers shall be submitted and results returned at the one-stop shop (OSS) in order to shorten the settling time of lakes. transfer land, lease land and change land use purpose, creating confidence for organizations and individuals.

In addition, it is necessary to equip and supplement modern management equipment to ensure the provision of land information for management from provincial to grassroots level, thus reducing the Pressure from the workload on the land management, creating smooth operation and effective work. Improve the professional ethics and responsibilities of civil servants and advisory bodies in the field of land, avoiding overlapping and shifting of responsibilities. To promulgate specific professional ethics standards for state officials, especially cadres working in land management, which are considered as criteria for evaluating and classifying emulation for public employees annually. It is necessary to boldly and resolutely evaluate officials in a concrete and objective manner; Resolutely resolutely process and purge officers who show signs of shading, profiteering, violating professional ethics... In addition, they should actively use, evaluate, promote and appoint talented persons. They have the capacity to improve the efficiency of state management of land.

### ACKNOWLEDGEMENTS

This research was supported by grants funded by Vinh University. The authors thank to the Faculty of Economics, Vinh University for providing instruments. We also thank to Rajabhat Maha Sarakham University for inviting us to attend and supporting us in the meeting. Specially, we thank to the reviewers for reading, commenting on and treating our article.

### REFERENCES

- [1] Tran Tu Cuong (2008), Strengthening the role of State management over land in the urbanization process in Hanoi, PhD thesis.
- [2] People's Committee of Nghe An province (2012), Report on compensation, support and resettlement when the state recovers land in the province.
- [3] Committee of Nghe An province (2014), Report on the results of inspection, complaints, denunciations, anti-corruption in 2014 and orientations for 2015.
- [4] People's Committee of Nghe An province (2015), Report on results of inspection, complaints and denunciations, anti-corruption in 2015 and orientations for 2016.
- [5] People's Committee of Nghe An province (2010), Project "Socio-economic development plan for the period of 2011 - 2015 in Nghe An province".



- [6] Nghe An Tax Department (2015), Report on reviewing the implementation of tax task in 2015, tasks and solutions for taxation in 2016.
- [7] People's Committee of Nghe An province (2011), *Report on land inventory, land use mapping in 2010*.
- [8] People's Committee of Nghe An province (2015), *Land inventory report, land use mapping in 2014*.
- [9] People's Committee of Nghe An province (2015), Decision on approval of inspection results of the interdisciplinary inspection team to check the projects are behind schedule, the project does not deploy in the province.
- [10] People's Committee of Nghe An province (2015), Process of urbanization in Nghe An: practical issues and development solutions, Proceedings of the workshop.
- [11] UNDP, Ministry of Planning and Investment of Vietnam (2010), Promoting Agricultural Productivity and Rural Income in Viet Nam: Lessons from Regional Experiences (Project of supporting the strategy of socio-economic development in Vietnam for the period of 2011-2020), Hanoi.
- [12] World Bank (2014), Synthesis Report: Publication of Land Management Information in Vietnam, Hong Duc Publishing House.
- [13] World Bank, Center for Policy and Development Studies (DePoCen) (2010), *Survey report on information disclosure in land management*.
- [14] World Bank (2011), Urbanization Review in Vietnam.
- [15] World Bank (2011), Voluntary Land Acquisition and Land Transfer in Viet Nam - Approach, land pricing and settlement of complaints.

**NON-VERBAL COMMUNICATION OF ANGER EXPRESSION BETWEEN VIETNAMESE  
AND ENGLISH**

Nguyen Thi Ngan

*Institute for Research and Development of New Technologies  
17 Pham Kinh Vy street, Ben Thuy ward, Vinh, Nghean, Vietnam  
Corresponding E-mail : quocngan37@gmail.com*

**ABSTRACT**

A large number of studies relating to non-verbal communication and emotional expression have been conducted over the past years. However, little investigation has been conducted to focus on non-verbal communication of anger expression. Therefore, this study is undertaken in order to somehow fill in the gap. The objectives of the study were to find the similarities and differences in non-verbal anger expression and to address factors influencing anger expression in Vietnamese and English languages. In order to fulfill its objectives, 50 Vietnamese and 50 Anglicists were asked to fill in questionnaires. Results indicated that despite bearing some similarities in anger expression via facial expression, hand gestures and postures between Vietnamese and Anglophone culture had differences which are noticeable.

**KEY WORDS:** non-verbal communication, anger expression, Vietnamese culture, Anglophone culture, cultural issue



## INTRODUCTION

### I. Reasons for choosing the topic

Non-verbal communication seems to be the most powerful form of communication. More than voice or even words, non-verbal communication assists to create speakers' images in others' minds. Also, people can express emotions and feelings in front of others, which are hardly conveyed by words. Furthermore, multicultural communities have been increasingly established, in which English-speaking citizens occupy 963 million in 2010, the second rank after Chinese. It raises a need to study the similarities and differences in communication within people speaking English, especially non-verbal communication. It is believed the awareness of the non-verbal communicative culture may simplify the information exchange process and avert misunderstandings.

Therefore, the research "**Non-verbal Communication of Anger Expression between Vietnamese and English**" is conducted in order to somehow assist learners clarify the comparison and contrast between the two non-verbal communicative cultures.

### II. Objectives of the Study

This Study aims at finding out the similarities and differences of expressing anger through non-verbal cues in Vietnamese and Anglophone cultures and addressing factors influencing anger expression.

### III. Scope of the Study

Non-verbal aspects in communication in these two cultures require numerous amounts of time and effort to conduct research; as a result, it is challenging for the author to address all aspects of the issues. Due to time constraints, resources and the author's knowledge and experience, the primary focus will inevitably be on facial expression, eyes, and hand gestures.

As English-speaking people come from different countries and cultures, it is difficult to cover all perspectives. Therefore, the participants come from the UK, the US, Australia, Canada, and New Zealand.

## MATERIALS AND METHODS

### I. Materials and methods

- Descriptive method: describing and interpreting the collected data with the help using a powerful source from books, magazines and websites related to this subject.
- Analytical method: analyzing the collected data to find out the similarities and differences of Vietnamese and Anglophone cultures and the impact of these issues between the non-verbal aspects in communication between the two cultures.
- Contrastive method: setting up cultural similarities and differences within the non-verbal aspects in communication between various cultures.

### II. Data analysis (I moved this part from RESULT to MATERIAL AND METHODS)

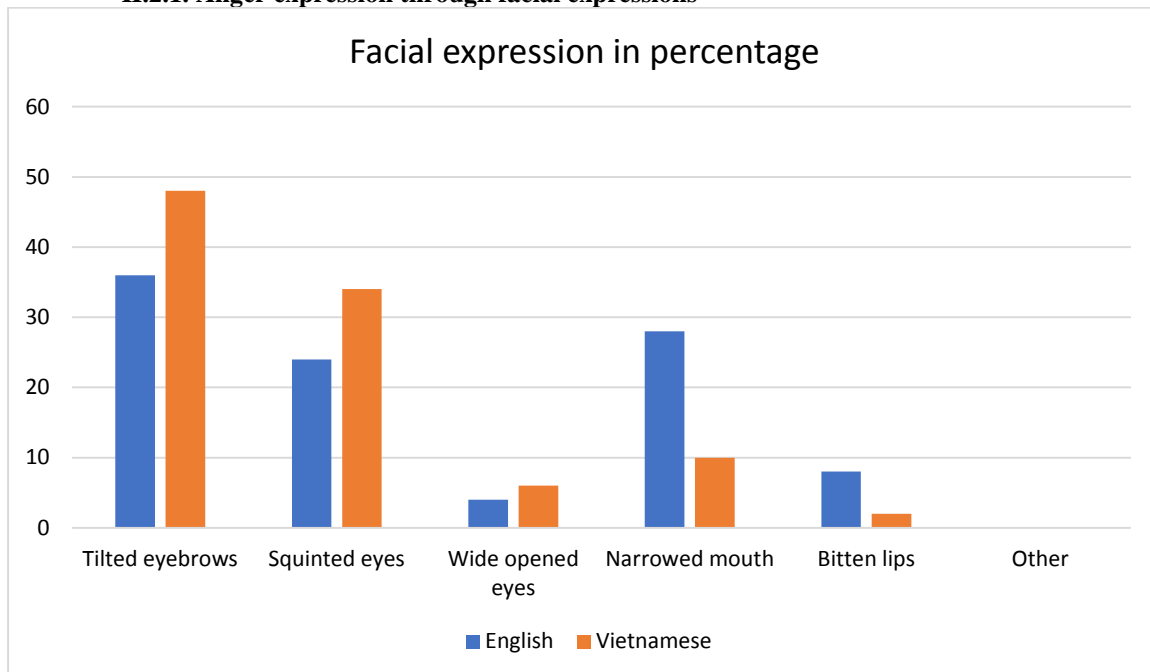
#### II.1. Selection of subjects and and research instrument

Probability samples are used as they allow the author to make inferences about the whole population. 100 participants are divided into 2 groups: 50 Vietnamese and 50 Anglicists who are from the UK, the US, Australia, Canada, and New Zealand. Each group has an equal number of males and females. In order to ensure the study's reliability and validity, except the variable above, all the participants were randomly chosen from different ages. Because the questionnaires will be delivered in Vinh city, the author visited English centers and English clubs held by foreign teachers to collect data. Most of the participants are enthusiastic and supportive enough to fulfill the questionnaires.

Survey questionnaire is employed to address the research questions. As regard to the design of the survey questionnaire, closed-ended questions are chosen because responses are easier to collect and analyze.

## II.2. Data analysis

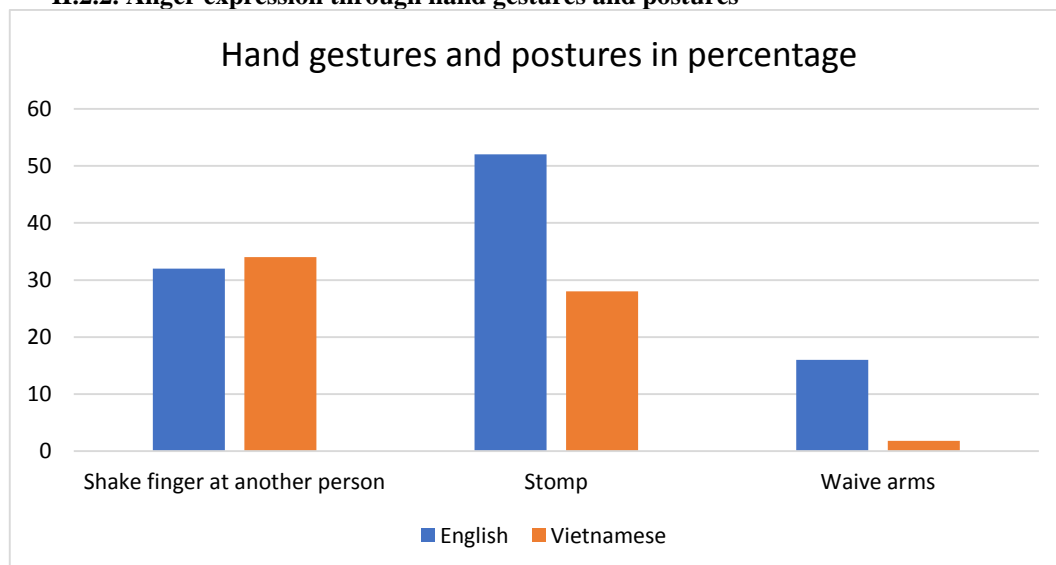
### II.2.1. Anger expression through facial expressions



As illustrated by the table, tilting the eyebrows to show the anger is chosen by the largest number of participants coming from both Anglicist and Vietnamese cultures. Nearly half of the Vietnamese participants (48%) tilt their eyebrows when they are angry. Although the number of the Anglicist participants who express their anger in the same way is smaller than that of the Vietnamese ones, this figure is still the greatest (18 out of 50 accounts for 36%). Ranking the second position is squinted eyes which makes up 34% of Vietnamese respondents. Meanwhile, regarding Anglicist respondents, narrowed mouth with 28% ranks second, and it is followed by squinted eyes at 24%.

While some similarities between Anglicist and Vietnamese cultures in anger expression through the eyes are noticeable, they still bear some minor differences. The number of the Anglicist participants who choose “wide opened eyes” is the smallest with just only 4% of the total respondents.

### II.2.2. Anger expression through hand gestures and postures



It is clear from the chart that by far the greatest proportion is shaking finger at another person, which accounts for 52% of the total Anglicist participants. This number is nearly double the proportion collected from Vietnamese respondents (28%). In Vietnamese culture, it is most likely that there are no arms waive at all when people show their anger as 38% Vietnamese respondents pick up this choice. In comparison, just only 16% of Anglicist ones, which is the smallest percentage, choose this. Shaking finger at another person also receives high responses from participants in Anglicist and Vietnamese culture (32% and 34% respectively).

## RELATED LITERATURE

### I. Culture

As Harrison and Huntington (2000 : xv) noted, “the term ‘culture’, of course, has had different meanings in different disciplines and different contexts”. By stating “culture is the human-made part of the environment,” W. J. Lonner and R. S. Malpass (1994:7) contrasts culture and nature. In their opinion, things in environment will never become cultural without the “touch” of humans.

According to H. Triandis (1994:23), “culture is a set of human-made objective and subjective elements that in the past have increased the probability of survival and resulted in satisfaction for the participants in an ecological niche, and this became shared among those who could communicate with each other because they had a common language and they lived in a similar time and place.” The subjective elements of culture here are elements such as values, attitudes, beliefs, orientations and underlying assumptions prevalent among people in a society. All of these elements act as a framework that influences one’s interpretation of the world and interactions in it.

### II. Communication

#### II.1. Definition

Larry A., Richard E. Porter and Edwin R. McDaniel (2006:12) select the all-encompassing definition of “human communication is the process through which symbols are transmitted for the purpose of eliciting a response”. Lustig (1996: 29) defines communication as “a symbolic process in which people create shared meanings”. In the both definitions, the center is “symbol”. A symbol may be “a word, action or object”, containing thoughts, perception or feelings which one wants to communicate with others.

#### II.2. Forms of communication

In order to create shared meaning, people have to use code or symbol. In reality, the two kinds of codes or symbols are verbal (spoken and written) and non-verbal (unspoken). These are referred to as forms of communication.

#### II.3. Components of communication

The followings are components of communication according to Hymes (1972):

- Situation: setting and sense
- Participants: speaker, presenter, hearer, receiver, narrator
- End: purpose, result or goal
- Act sequences: model or language content
- Key: clues that establish the “tone, manner, or spirit” of the speech act
- Instrumentalities: channel, form or style
- Norms: norms of interpretation, norms of interaction
- Genres: kind of speech act or event

Among these, the participants (speaker and hearer) and situation are prominent to the choice of message coder (language or non-verbal cue used). The participants’ background impacts much on the choice of the coder used. The background includes age, sex, living place, occupation, etc. when discussing different participants and situations, the underlying effect of power (P), social distance (D) and rank of imposition (R) have to be considered. With combination of the three factors, the choice of message coder can have diversity.

#### II.4. Cross-cultural communication

The relationship between culture and communication is often compared with the bond between the voice and the echo. From culture and communication, there are three branches of communication as follows:

- Intra-cultural communication: the communication between people who live in the same country and come from the same cultural background.
- Inter-cultural communication: the communication between people who live in the same country but come from different cultural background.

- Cross-cultural communication: the communication between people who live in different countries and come from different cultural background.

### III. Non-verbal communication

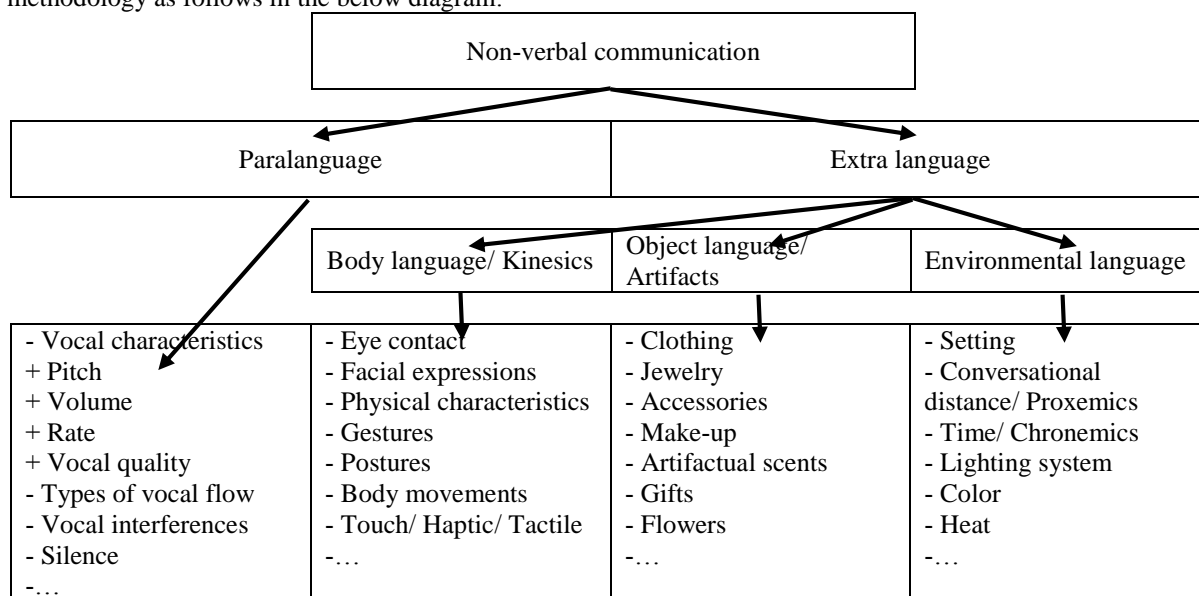
#### III.1. Definition

Non-verbal communication is understood as a way of communicating without the use of written or spoken language. According to Lustig (1996: 187 – 188), non-verbal communication is a multi-channeled process that is usually performed simultaneously; it typically involves a subtle set of nonlinguistic behaviors that are often enacted subconsciously. Non-verbal behaviors can become part of the communication process when someone intentionally tries to convey a message or when someone attributes meaning to the non-verbal behavior of another, whether or not the person intends to communicate a particular meaning. As Lustig pointed out, when some meaning is attached to a nonlinguistic behavior, whether by message transmitter or perceiver, that behavior becomes part of a communication process.

The detailed description of non-verbal communication is presented by Nguyen Quang: “all the components of the message that, when taken together, constitute a communication which is not verbally coded but both vocally and non-vocally channeled. Non-verbal communication is composed of paralinguistic factors (non-verbal – vocal channel), such as rate, volume, etc., and extra-linguistic factors (non-verbal – non-vocal channel), such as body language (gestures, postures, facial expressions, etc.) object language (including clothing, jewelry. Etc.) and environmental language (proxemics, settings, etc.)”

#### III.2. Classification of non-verbal communication

Of the various classifications, Nguyen Quang (2001: 9) presents a detailed and easy-to-follow methodology as follows in the below diagram:



## RESULT

### Anger expression in Vietnamese and English

Anger can be defined as a strong feeling that people have when something has happened that they think is negative and unfair. From the author’s observation and analysis of videos and photos available on the Internet, the most popular expressions form of anger are as follows:

#### Eyebrows

When angry, the eyebrows will tilt to the forward center of the face and will be straight and lower. There will be times when non-verbal communication of anger will be felt from others just from looking at the eyebrows.

### Eyes

When reading the non-verbal language of anger the eyes will have a glare to them. In some instances, people will squint their eyes even with the eyebrows lowered or straight.

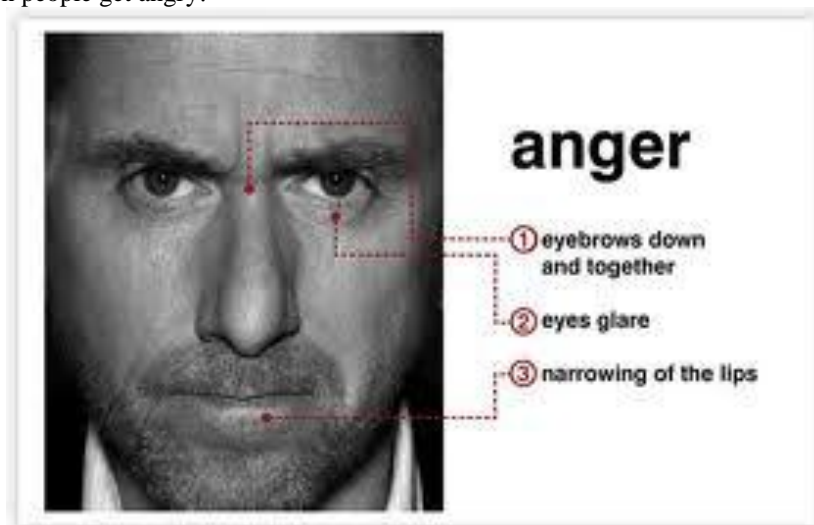
### Mouth

The non-verbal language of anger will also show through with people's mouth. When the micro expressions of anger are shown at the mouth it will be done so through the narrowing of the lips. It may seem as if people are biting their lips or holding them so tight that they cannot speak.

### Other non-verbal cues from the body

When people are angry their body language or actions will be more animated. People may shake their finger at another person and at times their hands will be as far away from the body as possible. A person may stomp, waive their arms, punch at non-animated objects or people.

The following picture is an illustration of facial expressions (including eyes, eyebrows, and mouth) and hand gesture when people get angry:



## CONCLUSIONS AND DISCUSSIONS

### I. Discussion

On the whole, the author has carried out a comparative study of nonverbal communication in anger expression in Vietnamese and English – speaking countries. Research questions have been addressed through the process of in-depth data analysis. In this part, the author will briefly sum up the outcomes of the study. Above all, main findings reveal that the Anglicist people tend to express their anger via nonverbal communication more frequently than the Vietnamese people. The biggest difference lies in hand gestures and posture expressions. In Anglicist culture, anger is often expressed through “shaking finger at another person” or “stomping feet”. On the other hand, many Vietnamese people show their anger through “waiving arms”. Therefore, ways of anger expression through hand gestures and postures are different between various cultures. Another striking finding of the research is the difference in eye expression. Many scholars claim narrowed eyes are a universal expression true to all cultures. However, it has been proved from the study that tilting the eyebrows and squinting eyes seem to be more universal.

### II. Conclusion

Cross-cultural study of emotional expression needs updating as the world has been changing day by day and it is central to our understanding of people all around the world. Therefore, it offers other researchers opportunities to carry out further studies. What has been found in the present study is still on the surface of the matter. It is suggested that the study could be improved by expanding the research sampling and conducting three research methods simultaneously if possible in order to avoid such limitations. Another alternative is to narrow the scope of study. For instance, a comparison study between Vietnamese and American or British culture should be considered.

Hopefully, this paper can be a useful reference document for teachers and students who are interested in the cross-cultural communication. Moreover, the researcher would like to raise the awareness and understanding of possible similarities and differences in non-verbal communication in two cultures. We are living in the world in which cross-cultural communication is indispensable. Therefore, communication between different cultures should be improved. Then the study could be seen as an attempt to provide more knowledge about Vietnamese and Anglicist culture and to boost mutual understanding between two cultures.

### ACKNOWLEDGEMENTS

For the completion of this work, I would like to express my deepest gratitude to my supervisor, Ph. D. Tran Ba Tien, who has helped me with enthusiastic guidance and adequate help. I would like to convey my gratefulness to Rajabhat Maha Sarakham University, Kingdom of Thailand for the upcoming 7<sup>th</sup> International Conference on Sciences and Social Sciences (ICSSS 2017) which I have a precious opportunity to attend. I believe this is an occasion that I can enhance my knowledge in educational field as well as broaden my mind in other areas. I would especially like to thank experts from Rajabhat Maha Sarakham University, Kingdom of Thailand for their reading and editing my paper. I have learned a lot from them.

### REFERENCES

- [1] Harrison, L. E., Huntington, S. P. (2000) *Culture Matters : How Values Shape Human Process*. New York : Basic Books.
- [2] Hymes, D. (1974). *Foundations of Sociolinguistics : An Ethnographic Approach*. Philadelphia : University of Pennsylvania Press.
- [3] Larry, A., Richard, E. P., & Edwin, R. M. (2006) *Communications between Cultures*. Belmont, CA: Thompson Publishers.
- [4] Lonner, W. J., Malpass, R. (1994) *Psychology and Culture*. Pearson.
- [5] Lustig, M. W., et. al. (1996). *Intercultural Competence*. Harper Collins College Publishers.
- [6] Nguyen Quang. (1994). *Intercultural Communication*. CFL – Vietnam National University – Hanoi.
- [7] Triandis, H. C. (1994). *Culture and Social Behavior*. New York: McGraw-Hill.
- [8] Triandis, H. C. (1972). *The Analysis of Subjective Culture*. New York: Wiley.

## THE VOCABULARY SIZE OF RAJABHAT MAHA SARAKHAM UNIVERSITY STUDENTS

Chawin Srisawat

*Rajabhat Maha Sarakham University, Maha Sarakham, Thailand*

*Corresponding Email : srisawatchawin@gmail.com*

### ABSTRACT

The aim of this study is to investigate the vocabulary size of Rajabhat University Students. The subjects were 94 first year students majoring in English, Rajabhat Maha Sarakham University. The research design is mixed method: qualitative and quantitative. The instrument used in the study was Vocabulary Level Translation Test (developed by Srisawat & Poonpon, 2014). The results of the test were analyzed using SPSS 17.0 to find out the reliability of the test (Cronbach's alpha), percentage (%), mean ( $\bar{x}$ ), and standard deviation (S.D.). The results of the study revealed the result of reliability at 0.95, similar to the result from the previous study that was done with Thai public university students (Srisawat & Poonpon, 2014). The results of the test showed that Rajabhat Maha Sarakham University Students get really small size of vocabulary. The results of the vocabulary size compared with General Service List in the first two thousand words revealed that students got 42.59% or about 852 words out of 2,000 word size. Moreover, students' result of the vocabulary size comparing with the Academic Word List was only 9.03% or about 52 words out of 570 word size. However, separately considered, the results of students in the first thousand words level was 56.38% or about 564 words (out of 1,000 words) which is only one level that is higher than 50%. However, the results of the second thousand words level, the 1-5 AWL sub-list level, and the 6-10 AWL sub-list level were 28.79%, 10.8%, and 7.01% that can be counted as 288 words (out of 1,000 words), 33 words (out of 300 words), and 19 words (out of 270 words) respectively. Nation (2001) determined that students who get score higher than 80% can be inferred that they already reached the level. Therefore, the results showed the insufficient vocabulary of Rajabhat University Students as they did not pass any levels from the study. Vocabulary is the main component in language learning, therefore, the size of vocabulary of the students should be enhanced. This study has the implication as the guideline for vocabulary teaching and learning, materials and course designing, and vocabulary size testing especially for Rajabhat University group.

**KEYWORDS:** Vocabulary size, Rajabhat University, Vocabulary Testing, Revised Vocabulary Level Translation Test



## INTRODUCTION

Nation and Waring (1997) mentioned that when you know more vocabulary, you will get greater capacity of using language; with the greater language, your vocabulary knowing becomes extended; when the vocabulary knowledge is increased, you get greater capacity of using language; and so on continuously. This means vocabulary is really important and you may not produce a language if you do not know its vocabulary. Vocabulary is the important factor for EFL learners in order to understand a language and it is really important component in a language that cannot be ignored (Nation, 1990; Nation & Waring, 1997). Vocabulary is defined as a word or a group words that provides grammatical and lexical functions in spoken and written context. In order to know vocabulary, learners have to know three main features that are form, meaning, and use (Nation, 2001; Nation, 2005). Form concerns vocabulary spoken and written form and word parts. Meaning concerns forms of meaning, concept and references, and association. Use concerns vocabulary functions, collocation, and constraints on use. With this concept of vocabulary knowledge, the aspects of vocabulary that can be tested are vocabulary size (breadth) and vocabulary depth. Vocabulary size (breadth) is the number of the known words in the specific list by a learner. Vocabulary depth is the knowledge of a learner about a word in its associations including concepts, referents, grammatical functions, collocations, and constraints on use of given words. However, this study will focus only on the vocabulary size that is from the particular word lists.

As mentioned earlier that vocabulary size is the size of specific word lists, General Services List – GSL (West, 1953) and Academic Word List – AWL (Coxhead, 2000) were recommended to use for the EFL learners (Cobb, 2002). The main reason for choosing these two word lists is their coverage. GSL and AWL together can cover the around 85% for non-fiction text and 95% for fiction text, and only AWL provides more 4% coverage of newspapers and 8.5-10% coverage of academic text (Cobb, 2002; Schmitt et. al., 2001).

The instruments that were frequently used to test vocabulary size is Vocabulary Level Test – VLT that was developed by Nation (1983). The test was also developed in the 1990 version to extend its version from monolingual to other languages versions including Simplified Chinese, Traditional Chinese, Vietnamese, Indonesian, Russian, Samoan, Tagalog, Tongan, Japanese, Korean, and Thai version. However, this test is a matching test that can provide the ability in guessing; therefore, Srisawat and Poonpon (2014) has designed the new test format from the matching into translation test and named the test as Revised Vocabulary Level Translation Test (RVLTT). The test is recommended to use with Thai students due to its really high reliability at 0.95. The results revealed the insufficient vocabulary size of Thai university students that the average vocabulary size of all 371 university students in the study was about 1,039 English words (out of 2,570 word size) or 40.43%. And the results of three word levels - 1,000 word level, 2,000 word level, and the academic word level showed the size of 587 words (out of 1,000 words or 58.63%), 354 words (out of 1,000 words or 35.34%), and 94 words (out of 570 words or 17.42%), respectively.

The previous study of Srisawat and Poonpon (2014) was done with the public university in Thailand. And from the investigating of the researchers, the results of Rajabhat University in Rajabhat University group have never been collected by using this format of the test with high reliability. Rajabhat Maha Sarakham University is one of the universities that develop materials and books to use with our students especially in English Program. In order to develop the appropriate and suitable English materials to provide for our students, students' proficiency (i.e. students' vocabulary size) must be investigated. RVLTT, therefore, will be provided to first year students in English program, Faculty of Humanities and Social Sciences, Rajabhat Mahasarakham University to check the exact students' vocabulary knowledge. When the English vocabulary size of Rajabhat Mahasarakham University Students are known, we will know the point where vocabulary should be taught. The results of the study will be the base for further materials design and development in English Program, Faculty of Humanities and Social Sciences, Rajabhat Mahasarakham University and might be valuable for other Rajabhat Universities.

## MATERIALS AND METHODS

### 1. Objectives of the study

The objective is to investigate vocabulary size of first year students in English program, Faculty of Humanities and Social Sciences, Rajabhat Mahasarakham University with the main research question as follow:

1. What is the vocabulary size of Rajabhat Mahasarakham University students?

### 2. Scope of the study

## **2.1 Target Vocabulary Size**

The target vocabulary are selected from the General Service List - GSL (West, 1953) and the Academic Word List - AWL (Coxhead, 2000) that are most recommended for ESL/EFL learners to learn (Cobb, 2002; Read, 2000). Therefore, the target vocabulary in this study were 2,570 vocabulary size (2,000 words from GSL and 570 words from AWL).

## **2.2 Subjects of the study**

The population is 204 first year students in English Program, Faculty of Humanities and Social Sciences, Rajabhat Mahasarakham University in semester 1, academic year 2017. The subjects of the study were selected by clustering sampling method. The subjects consists of 3 sections of students. The number of subjects were 94 students in total. Fifteen to thirty percent of population is considered appropriate number when the population is less than thousand people. Therefore, 94 students as a sample group is appropriate.

## **3. Materials**

### **3.1 Word lists**

In order to determine the vocabulary size before testing, the particular vocabulary word list must be determined. In this study, two recommended word lists were selected consisting of General Service List (West, 1953) and Academic Word List (Coxhead, 2000).

#### **3.1.1 General Service List – GSL (West, 1953)**

The General Service List or GSL (West, 1953) is the list of 2,284 words (both content words and function words) from 5,000,000 running words written corpus covering all fields. Although the list is criticized in its age – i.e. some words in the list are out of date (e.g. crown and canal) whereas some new words are not included in (e.g. computer), the list is still useful until now because of its high coverage and its wide range. The General Service List was used in this study as the base for the first 2,000 words that are suggested to know for those who study English as a second/foreign language (Cobb, 2002; Nation & Waring, 1997). GSL was selected as the vocabulary size because its 2,284 words cover 80 to 95 percent of non-fiction and fiction respectively (Cobb, 2002; Schmitt et al., 2001).

#### **3.1.2 Academic Word List – AWL (Coxhead, 2000)**

The Academic Word List was compiled by Coxhead (2000) from the corpus of four disciplines that covers Commerce, Law, Science and Arts. The whole corpus contained 3.5 million running words. The words that were considered to be in the list were excluded from the General Service list (West, 1953) and were content words only (whereas GSL contain both content words and function words). The result was the list of 570 word families divided into 10 groups – the first nine groups of 60 words and the last one group contains only 30 words - separated by the frequently used rate. The list is used as the base for another suggested 570 words to know further the GSL. The AWL can be combined with the GSL and make the entire word families into around 3,000 words that cover around 85% for non-fiction text and 95% for fiction text, and only AWL provides more 4% coverage of newspapers and 8.5-10% coverage of academic text (Cobb, 2002; Schmitt et. al., 2001).

### **3.2 Vocabulary Size Test**

This section will tell you briefly about the Revised Vocabulary Level Translation Test and the development of the test, and how to calculate the score from the test.

#### **3.2.1 The Revised Vocabulary Level Translation Test – RVLTT (Srisawat & Poonpon, 2014)**

The Revised Vocabulary Level Translation Test (see Appendix A) is the test that was adapted from the Vocabulary Level Test (VLT) of Nation's 1990 Thai version (Fig. 1). Vocabulary Level Test or VLT was developed by Nation (1983) with five levels test that are 2,000 words level test, 3,000 words level, 5,000 words level test, the university words level test, and 10,000 words level test. At first the tests were tested in English format (monolingual) and then they was developed into Asian languages versions including Thai version in 1990. The format of the test is matching test 60 words and 30 definitions in every 1,000 words level. Each 1,000 words level is separated into 10 sub-sections with 6 words and 3 definitions.

1. could	
2. during	_____ ได้ สามารถ
3. this	_____ ระหว่าง
4. piece	_____ เพื่อจะ
5. of	
6. in order to	

Figure 1: The example of Vocabulary Level Test - Nation's 1990 Thai version

In the year 2012, Nation changed the format of his VLT into multiple choices test. The test is presented in monolingual and bilingual (i.e. Gujarati, Korean, Japanese, Mandarin, Tamil, Vietnamese, Russian, and Thai). The format of the test in each item starts with the target vocabulary and a sentence contains the target vocabulary and four choices are given for each item. The fifth choice of "I don't know the meaning" is given only in Thai version. The learners then choose the correct meaning from the choices. The test is divided into 14 subtests for 14 thousand-word levels.

The example of the test is as follows:

1. SEE: They saw it.

a. cut      b. waited for      c. looked at      d. started

Later Srisawat and Poonpon (2014) developed the new test design. The change is its format from matching test to translation test. The reason of format change is that VLT provides possibility in guessing as it appears in matching format, and this results in 16.66% excessive score over the exact knowledge of students (Li and MacGregor, 2010). And in order to avoid that kind of guessing, translation format is recommended to use (Nurweni and Read, 1999). The test includes 60 words from the 1,000 word level and 2,000 word level tests in VLT. The test requires test takers to write down the meaning of each word by their own instead of writing down the number of the correct answer in front of the meaning like the VLT requires. Additionally, in order to test vocabulary size of Academic Word List, 57 vocabulary from AWL were added. The target AWL words were selected by using systematic sampling method which is that one every ten words was selected from AWL. The examples of RVLTT are in fig.2.

could	during
in order to	indeed

Figure 2: The example of Revised Vocabulary Level Translation Test (Srisawat &amp; Poonpon, 2014)

### 3.2.2 Test scoring

The criteria for scoring the test are 1) one point is given to a correct meaning, 2) zero point goes to an incorrect given meaning, and 3) zero point goes to a left blank space. The given meanings were checked according to two dictionaries – LEXITRON dictionary version 2.1 (RD-I, NECTEC, NSTDA, MOST, 2009), and Oxford Riverbooks English Thai Dictionary (2010). The total score is 117 points: 30 points from the first thousand word level test, 30 points from the second thousand word level test, 30 points for sublist 1-5 AWL word level test, and 27 points for sublist 6-10 AWL word level test. In order to calculate score into size, the scores from the 1,000 and 2,000 word level tests were divided by 30 and multiplied by 1,000 to makes the score becomes the size of 1,000 word size in each level and score from AWL word level test was multiplied by 10 to makes the score becomes the size of 570 word. Then, sum the score from the three parts - the 1,000 and 2,000 word level tests and the academic word level test - together to form the total size of 2,570 words size

## 4. Procedure

The test was given to each section in separated sessions. The test session began with the researcher as the proctor described how to complete the RVLTT test and announce the roles. Students' names or students ID that can specify them were not collected. The researcher announced that students have to sit in their seats for at least 20 minutes before they are allowed to leave their seats in order to avoid students leave the test room without making enough efforts. The starting time was announced by the researcher. Students may take less than 20 minutes, but they had to sit in their seat. Students wrote the meaning of the words they know in the right column

of each word. They just skipped the words that they could not think of their meaning but only after taking much effort with the words. Remind them that they are not allowed leaving their seats before 20 minutes pass, so please take their times. The researcher announced when the 20 minute is over, let students who finish taking the test get out of the test room, and let students who want to continue doing the test do it. After 20 minutes pass, students could continue taking the test until only the words that they cannot think of the meaning left, but not more than an hour.

## RESULTS

### 1. The results of vocabulary size of Rajabhat Maha Sarakham University Students

This section will showed the results from the study on the vocabulary size of GSL and AWL in overall level of each test, the vocabulary size in the four separated levels, and the scores of students in RVLTT test. After getting the test result the reliability of the test was also examined by SPSS 17.0 and it showed the high reliability at 0.95.

#### 1.1 The result of vocabulary size of GSL and AWL of Rajabhat Maha Sarakham University Students

The main aim of the study is to investigate the vocabulary size of Rajabhat University Students. The RVLTT test was examined with 94 students. The results were shown in Table 1.

Table 1: The result of vocabulary size of GSL and AWL of Rajabhat Maha Sarakham University Students

Word levels	Mean raw score (points)	Percentage compared to the word lists (%)	The vocabulary size of students compared to the word lists (words)
GSL	25.55	42.59	852
AWL	5.15	9.03	52

The raw mean score of the test in GSL and AWL levels was 25.55 out of 60 points and 5.15 out of 27 points. According to Nation (2001), 80% of the score from the test in the particular word list means students has already known that word list. However, from the score of the test students get only 42.59% and 9.03% for GSL and AWL levels, respectively. That means Rajabhat Maha Sarakham University Students majoring in English has not reached these two levels. Considering the vocabulary size of students, the numbers from raw scores can be calculated into the vocabulary size of GSL and AWL level as 852 (851.77) words and 52 (51.5) words out of 2,000 and 570 vocabulary size, respectively.

#### 1.2 The result of vocabulary size of GSL and AWL in four separated levels

In order to examine the details of the vocabulary size of Rajabhat Maha Sarakham University students, the tests were separately calculated in four levels: the first thousand word level, the second thousand word level, the AWL sub-list 1-5 word level, and the AWL sub-list 6-10 word level. The results were shown in Table 2.

Table 2: The result of vocabulary size of GSL and AWL in four separated levels

Word levels	Mean raw score (points)	Percentage compared to the word lists (%)	The vocabulary sizes of students compared to the word lists (words)
GSL	16.91	56.38	564
first thousand word level			
GSL	8.64	28.79	288
second thousand word level			
AWL	5.15	9.03	33
Sublist 1-5 word level			
AWL	10.85	7.01	19
Sublist 6-10 word level			

The results of the raw score from each four levels consisting of the first thousand words level, the second thousand word level, the AWL sub-list 1-5 word level, and the AWL sub-list 6-10 word level were 16.9, 8.64, 10.85, and 7.01, respectively. The percentage of the score compared to the vocabulary size in each level were 56.38%, 28.79%, 10.85%, and 7.01%. These numbers also showed that students did not pass any vocabulary levels or they haven't reached any levels. The sizes from the calculation of each level were 564 (563.83) out of 1,000 word, 288 (287.94) out of 1,000 words, 33 (32.55) out of 300 words, and 19 (18.94) words, respectively.

### 1.3 The scores of students in RVLTT test

The results of the overall score of the vocabulary size test seem to be far from 80%. However, if we consider the score of students individually, there were some students who reach particular words levels. The details of students score were showed in Table 3.

Table 3: The scores of students in RVLTT test

Score	GSL first thousand word level (No. of students)	GSL second thousand word level (No. of students)	AWL Sublist 1-5 word level (No. of students)	AWL Sublist 6-10 word level (No. of students)
Higher than 80%	13	1	0	0
50-79%	49	12	2	0
Lower than 50%	32	80	76	82
0%	0	1	16	12

Interestingly, there were 13 students who got the score higher than 80% and reached the first thousand word level of GSL and only one of them also reached the second thousand word level of GSL. That means about 14 percent of the sample already know the first thousand word level of GSL. Additionally, there were 62 students who got the score higher than 50% in the first thousand word level of GSL and 13 students for the second thousand word level of GSL. For AWL, there were no one whose score were higher than 80%, but two students got the score higher than 50% in AWL sub-list 1-5 word level. In some levels, there were students who got 0 that might infer that they don't know any words in the particular word list.

## CONCLUSION AND DISCUSSION

The study was conducted with one main objective that is to investigate the vocabulary size of Rajabhat University first year Students majoring in English. The results showed that the average size compared with GSL and AWL were around 852 words and 52 words out of 2,000 and 570 vocabulary size, respectively. This number confirm the situation of Thai university students that they lack vocabulary knowledge. The situation was previously reported to occur in other institutions. Rajabhat Maha Sarakham University is located in North-eastern Thailand, and the previous investigation of Kotchana & Tongpoon-Patanasorn (2015) showed the results that sixth grade students in the Northeastern region of Thailand has the receptive vocabulary size of around 463 words and 293 words for their productive vocabulary size in GSL. The private university vocabulary in South-eastern Thailand – Khon Kaen University - students also has quite similar vocabulary size that their vocabulary size of GSL and AWL were 941 and 94 words (Srisawat & Poonpon, 2014). The situation of insufficient vocabulary size was also observed in the other region. According to the study of Supatranont (2005), Thai students in Rajamangala University of Technology Lanna (RMUTL) had the vocabulary size around 800 words and 103 words in GSL and AWL word level.

This is considered the big issue in language learning as mentioned earlier that the bigger size of vocabulary can result in the better language learning. Therefore, vocabulary instruction should be more focused in classroom. Materials and teaching techniques might be applied in classroom such as the use of flash card or extensive reading to help learners encounter more vocabulary and get more opportunities to remember. The point where vocabulary should be taught is another issue that should be concerned. According to the ideas of comprehensible input, students should learn the next step of knowledge further from what they already know. Therefore, this study give the guideline for the instructor, materials developer, course designer, and other involvers that maybe the first thousand word level might still be needed to teach for Rajabhat Maha Sarakham University students majoring in English.

One of the mistakes that can be observed from the test results that might take effects on the score of the test is the confusion (Appendix B). From this study, many confusing meanings were given for the target words.



The interesting example is the word 'breath' that was translated into other six different wrong meanings including the equivalence English words from the given Thai meaning as 'beast', 'beach', 'bread', 'baht', 'teeth', and 'beef'. This confusion might occur because the mispronunciation of the final sound and no pronunciation of /r/ as in 'beast', 'beach', and 'beef'. It also occurred because of the mispronunciation of vowels in the words like in 'bread' and 'baht'. The wrong meanings were also given to the mispronunciation of the first sound such as in 'teeth'; however, the pronunciation of the vowel is still correct. This leads to the suggestion that phonological awareness and morphological awareness should be practiced with Thai students so that they can aware of the different sounds or forms of vocabulary and are able to use them correctly in the context.

The limitation of the study is that this study was done with only English major students. The next studies might observe the situation with students in other faculties in Rajabhat Maha Sarakham University. And this limitation also raises the point that whether the score of Rajabhat University students in this study can be compared with the score from public university students in the previous study as the study of Srisawat and Poonpon (2014) was done with non-English major students. Therefore, for the effective vocabulary learning, vocabulary size test should be further studied with other faculty students as well. Moreover, the confusion is also the interesting problem that can be further studied in the future.

### ACKNOWLEDGEMENTS

I would like to express my gratitude to the Rajabhat Maha Sarakham University Research and Development Institute for supporting me fund to complete this research. I would like to thank you Khon Kaen University that allows me to use the license of SPSS 17.0 for alumni. My thanks are passed to my friends for their assistance, their moral supports, and their encouragement. It would have been the hardest time for me if they had not been beside me.

### REFERENCES

- Cobb, T. (2002). *Why and How to Use Frequency Lists to Learn Words*. Retrieved from <http://www.lex tutor.ca/research>
- Coxhead, A. (2000). *A New Academic Word List*. TESOL Quarterly, 34 (2), 213-238
- Kotchana, S. & Tongpoon-Patanasorn, A. (2015). EFL Learners' Vocabulary Size: A Case in the Northeastern Region of Thailand. *ASEAN Journal of Education*, 1 (1). Retrieved from [http://aje.research.dusit.ac.th/upload/file/Flie\\_journal\\_pdf\\_05-09-2016\\_090958.pdf](http://aje.research.dusit.ac.th/upload/file/Flie_journal_pdf_05-09-2016_090958.pdf)
- Li, L. & MacGregor, J. (2010). Investigating the receptive vocabulary size of university-level Chinese learners of English: how suitable is the Vocabulary Level Test?. *Language and Education*, 24 (3), 239-249.
- Nation, P. (1983). *Testing and Teaching Vocabulary*. Guidelines, 5 (1), 12-25.
- Nation, P. (1990). *Teaching and Learning Vocabulary*. New York: Newbury House.
- Nation, P. (2001). *Learning Vocabulary in Another Language*. Cambridge: Cambridge University Press.
- Nation, P. (2005). *Teaching vocabulary*. Retrieved from <http://engine.googlepages.com/teachingvocabularybyPaulNation.pdf>
- Nation, P. (2012). *The Vocabulary Size Test*. Retrieved from <https://www.victoria.ac.nz/lals/about/staff/publications/paul-nation/Vocabulary-Size-Test-information-and-specifications.pdf>
- Nation, P. & Waring, R. (1997). *Vocabulary size, text coverage, and word lists*. In Schmitt, N. & M. McCarthy (Eds.). *Vocabulary: description, acquisition and pedagogy*. (pp. 6-19). Cambridge: Cambridge University Press.
- Nurweni, A. & Read, J. (1999). The English vocabulary knowledge of Indonesian university students. *English for Specific Purposes*, 18 (2), 161-175.
- Read, J. (2000). *Assessing Vocabulary*. Cambridge: University Press.
- Schmitt, N., Schmitt, D. & Clapham, C. (2001). Developing and exploring the behaviour of two new versions of the Vocabulary Levels Test. *Language Testing* 18, 55-88.
- Srisawat C., & Poonpon K. (2014). An Investigation of Vocabulary Size of Thai University Students. *Proceedings in the 3rd International Conference 'Language, Society, and Culture in Asian Contexts' (LSCAC 2014) on Asian Dynamics: Prospects and Challenges*, pp 294 – 301.

Supratranton, P. (2005). Classroom Concordancing: Increasing Vocabulary Size for Academic Reading.  
*Proceeding in the 13th Annual KOTESOL International Conference Seoul, Korea: October 15-16, 2005.*  
West, M. (1953). *A General Service List of English Words*. London: Longman

## APPENDICES

### Appendix A: The 117 target words in RVLTT

#### 1,000 VLT

could	during
in order to	indeed
my	some
trouble	fact
car	put
give	use
line	night
man	kill
reply	advance
moment	separate
yellow	danger
stone	sister
breath	fear
hall	shoot
fit	warn

#### 2,000 VLT

justice	skirt
wage	flesh
salary	temperature
education	journey
scale	charm
lack	treasure
cream	pupil
wealth	climb
examine	surround
connect	limit
wander	burst
deliver	improve
original	private
total	ancient
difficult	holy

#### AWL sublist 1-5

analysis	reaction
context	technical
involved	access
principle	concentration
source	label
complex	principal
elements	stress
journal	academic
range	contact
strategies	medical
alternative	psychology
coordination	transition
link	evidence
achieve	exclude
goals	exposure

#### AWL sublist 6-10

abstract	dramatic
cited	inspection
inhibition	radical
neutral	vehicle
trance	incompatible
adaptation	ethical
converted	military
extract	relaxed
quotation	temporary
transmission	adjacent
conformity	forthcoming
explicit	innovation
abandon	accommodatio
panel	



**Appendix B: the confusing words found from the students' response**

Target Words	Given Thai Meaning	Equivalent English Meaning of Given Thai Meaning
<b>First thousand GSL</b>		
advanced	คำแนะนำ ผจญภัย	advice adventure
breath	อสูร บาท ฟัน ชายหาด ขนมปัง เนื้อ	beast baht teeth beach bread beef
car	ดูแล / ใส่ใจ	care
could	โอกาส หนาว ควร	change cold should
danger	นักเต้น เต้น	dancer dance
during	ดื่ม ทุเรียน	drink durian
fact	หน้า อ้วน	face fat
fit	แน่น ให้อาหาร ปลา	tight feed fish
fear	รู้ ไกล ยุติธรรม	fence far fair
give	ของขวัญ	gift
hall	กำแพง สูง นรก ห้าง เนินเขา	wall tall hell mall hill
indeed	ดัชนี	index
in order to	สั่ง / คำสั่ง ลำดับ เมนู ในทางกลับกัน	order order order on the other hand
kill	เก่ง	skill (ful)
line	ออนไลน์	online
put	นำเข้า ดึง ผลัก	import pull push
reply	เล่นใหม่ / อีกรอบ / อีกครั้ง ซ่อม	replay repair
shoot	สั้น / เตี้ย	short

Target Words	Given Thai Meaning	Equivalent English Meaning of Given Thai Meaning
	จุด ราก รองเท้า เสื้อสูท เลือก	dot root shoes suit choose
some	เหมือนกัน	same
stone	ห้องเก็บของ ขโมย ร้านค้า	store steal shop
trouble	สาม คู่	triple double
use	พวกเรา เคย	us used to
warn	อบอุ่น สวมใส่	warm wear / worn
<b>Second thousand GSL</b>		
ancient	คนเหยียดสีผิว อุบัติเหตุ	racist accident
burst	แปรง อก	brush breast
charm	ผู้ชนะ สงบ	champion calm
climb	กุ้ง หวี ตั้งแคมป์ อาชญากรรม	shrimp comb camp crime
connect	ต่อเนื่อง	continue
cream	ครีม	charm
difficult	แตกต่าง	different
flesh	สด แสง แข็ง	fresh flash freeze
holy	วันหยุด สยอง พระเจ้า	holiday horror
improve	พอใจ พิสูจน์ไม่ได้ นำเข้า	impress cannot be proved import
journey	รุ่นเล็ก	junior
lack	โชค ทักษะ ขา ทะเลสาบ	luck skill leg lake
original	องค์กร	organization
private	จังหวัด	province

Target Words	Given Thai Meaning	Equivalent English Meaning of Given Thai Meaning
	สุภาพ	polite
pupil	สาธารณะ ชา สีม่วง	public pill purple
salary	สรุป เลข	summary secretary
scale	กลัว คะแนน	scare score
skirt	สเก็ต ผิว	sketch / skateboard skin
surround	สำรวจ	survey
total	เต่า ห้องน้ำ โลหะ	turtle / tortoise toilet metal
transition	ตำแหน่ง ใบแสดงผลการเรียน สถานี	location / position transcript station
treasure	กางเกง ตัวอย่างหนัง การรักษา	trousers teaser treatment
wage	น้ำหนัก ปีก เกลือ	weight wing wax
wealth	น้ำหนัก อบอุ่น อากาศ สุขภาพ ล้อ	weight warm weather health wheel
<b>AWL 1-5 sub-list</b>		
access	สำเนียง ยอมรับ สำเร็จ ตรงข้าม มากไป	accent accept success across excess
academic	ตลก	comedy
achieve	ปวด นักกีฬา	ache athlete
alternative	พื้นเมือง	native
analysis	วิจัย	research
complex	ห้างสรรพสินค้า ศูนย์กลาง	mall (the name of a mall in Maha Sarakham) center
contact	จดจ่อ ภาษี	concentrate tax
context	ข้อความ	text

Target Words	Given Thai Meaning	Equivalent English Meaning of Given Thai Meaning
	ถัดไป สารบัญ ติดต่อ	next content contact
exclude	สรุป รวม	conclude include
goals	ทอง เทา	gold grey
involved	วิวัฒนาการ แก้ไข	evolve improve
journal	การเดินทาง นักข่าว เข้าร่วม	journey journalist join
label	บรรทัด แรงงาน	line labor
medical	ร้านขายยา ทางเคมี สื่อ ขนาดกลาง	pharmacy chemical media medium
principle	นายกรัฐมนตรี	prime minister
psychology	ฟิสิกส์ ชีววิทยา	Physics biology
reaction	ตำแหน่ง	location
source	แน่นอน	sure
stress	ถนน ตรงไป	street straight
strategies	ตรง	straight
transition	แปลภาษา	translation
<b>AWL 6-10 sub-list</b>		
abstract	กริยาทำทาง	action
ited	เมือง	city
dramatic	ไดนามิก	dynamic
extract	โจมตี ดึงดูด	attack attract
forthcoming	ลำดับที่ 4 สบาย	fourth comfortable
innovation	บอกโดยนัย	inference
neutral	ธรรมชาติ นิวตรอน	nature neutron
panel	แผน	plan
radical	คลื่นเสียง / วิทยุ	radio
temporary	อุณหภูมิ คำศัพท์	temperature vocabulary
transmission	ภารกิจ	mission

## SYSTEMATIC LEARNING RESOURCE KNOWLEDGE MANAGEMENT PROCESS DEVELOPMENT : MAGICAL GERMINATED RICE FOR HEALTH

Sarayuth Kunlong<sup>1</sup> Samrit Kangpheng<sup>2</sup> Songsak Jeerasombat<sup>3</sup> Suwattanapong Romsri<sup>4</sup> Chutipa Buddeevong<sup>5</sup>  
Peerapet Sirikul<sup>6</sup> and Aphisayarat Prarasri<sup>7</sup>

*Lecturer of the Philosophy Program in Educational Management for Local Development, Faculty of Education,  
Rajabhat Maha Sarakham University<sup>1-4</sup>*

*PhD candidate, Doctor of Philosophy Program in Educational Management for Local Development, Faculty of  
Education, Rajabhat Maha Sarakham University<sup>5-6</sup>*

*Supervisor, Secondary Education Service Area Office 27, Muang district, Roi-et, 45000, Thailand<sup>7</sup>*

### ABSTRACT

The research objective was to develop systematic learning resources knowledge management process in inputs, process, outputs, outcome, and feedback of Nong Kung Wittayakarn School. Research participants and key informants were 5 Mathayomsuksa One-Three level teachers, 34 students, 34 student parents, and 9 school board members totaling 82 people. Research tools were survey form, semi-structured interview form, learning resources evaluation form, sufficiency-oriented life satisfaction evaluation form, and meeting record form. The data analyses employed frequency, percentage, mean, standard deviation statistics and content analysis. Research findings reveal that systematic learning resources management process for magical germinated rice for health comprises 1) Inputs -- internal staff, external people, and supporting budget; 2) Process -- Define, Create, Capture, Share, and Use; 3) Outputs -- overall learning resources evaluation having 3.33 average from the 4-point scale with people at highest level followed in descending order by physical environment management, and outside relationship dimensions; 4) Outcome -- overall and detailed sufficiency-oriented life satisfaction evaluation are at high level with psychological dimension at the highest score followed in descending order by social, environmental, technological, and economic dimensions; and 5) Feedback with reflection cycle -- before action review (BAR), during action review (DAR), and after action review (AAR).

**KEYWORDS:** knowledge management, systematic learning resources, germinated rice.

## INTRODUCTION

The world sees sudden changes at present on economics, culture, society, politics and governance. Especially the influence from scientific and technological progress are accelerating factors for borderless world. Information are circulating in positive and negative ways with increasing complexity and disruption. Those above factors impact tremendously on individual's way of life causing myriad problems. The ideas behind Standardized National Education Administration and Second Decade of Educational Reform (BE 2551-2561) [1] were designed to solve the problems by designating quality long-life education and learning society for Thailand. This plan of long-life education for all will foster quality of life and integration among wisdom, ethics, and culture. All society's stakeholders have their part to engage in educational management according to the needs of students and local context (Local Administration Organization, Northwestern Provinces Group, 2014).[2] However, the previous 20<sup>th</sup> Century educational administration focused on knowledge transfer from teacher to student, but the 21<sup>st</sup> Century viewed learning as co-creation of knowledge among teachers, students, and stakeholders. The major role of school now is to study and interact with the community that becomes social laboratory for knowledge creation and collaborative learning. The communities altogether become knowledge-based society and economy in touch with the present world.

Each society must seek capacity to apply knowledge into innovation as the tool for driving social progress. The knowledge and innovation effect changes in paradigm shift for Thai society in order to survive all around pressures especially globalization with the model of *"Triangle Moving Mountain"* comprising three factors -- social movement, knowledge, and policy link. The model can systematically support structural changes in laws and regulations. The hardest factor to gain for this change is therefore knowledge (Panich, 2015).[3]

Since education is the heart of human capital development to become valuable resource with desirable characteristics to live happily in society, the education reform mentioned above aims education as significant tool for human and social development. The desirable characteristics of future Thai citizens are visionary, foresighted, goodness oriented, ethical, resilient against world changes, critical thinking oriented, and equal or above international standards. But to achieve the reform's mission, it depends on efficiency of educational management process that put school as final service outcome. The educational act also specifies in Section 29 that for educational administration schools should engage with individuals, families, communities, community organizations, local administration organizations, private agencies, professional organizations, religious institutions, business units, and others to strengthen community strength. Learning process inside community includes education and training on knowledge and information gathering, ability to access and choose wisdoms and academic disciplines for community development to fit with problems and needs and to learn ways to transfer and exchange community development experiences (The Office of the Basic Education Commission, 2013) [4] School administrator therefore is the most significant key success factor to coordinate and preserve the balance among major players -- teachers, school personnel, school board members, parents, local governments, and other government units -- to make sure students are developed to achieve desirable characteristics. They are good, smart, and happy citizens who can adjust and balance with the changing world.

Therefore, knowledge management is the necessary tool for learning resources acquisition through the process of data transformation with previous experience to apply with individual and organization. The process of knowledge management increases organization efficiency in the long run with increase organization knowledge and transformation into intelligent capital (Wijarn, 2010; Becerra et al., 2004; Debowski, 2006).[5] The knowledge management needs systematic process and opens community to engage in each step in order to achieve goal. This is in line with Wijarn (2010) [5] who summarizes that knowledge management must employ systematic participation action research in each step.

Nong Kung Wittayakarn School is a medium-sized opportunity expansion school which lacks management on internal and external learning resources necessary for learning activities on preservation and continuation of local culture into sustainable sufficiency-oriented life. The school should acquire systematic learning resources management to increase potential on learning services with engagement from stakeholders. (Nong Kung Wittayakarn School, 2016) [6] This research aimed to create systematic learning resources knowledge management in the community with participation action research method. The stakeholder groups would gain motivation, encouragement, and sense of belonging to accept the development guideline with their participation in order to get learning with

researchers. The knowledge of learning resources management process in this research can be applied to individual and community in the future.

### **RESEARCH QUESTION**

The research question was how to develop systematic learning resources knowledge management process in inputs, process, outputs, outcome and feedback of Nong Kung Wittayakarn School.

### **RESEARCH OBJECTIVE**

The research objective was to develop systematic learning resources knowledge management process in inputs, process, outputs, outcome and feedback of Nong Kung Wittayakarn School.

### **3.RESEARCH METHOD**

The researchers followed the participatory action research (PAR) of Kangpheng and Kunlong (2015) [7] adapted from Critical Participatory Action Research of Kemmis et al (2014).[8] The study was performed during 2016 school year (May 16, 2016 - April 30, 2017) with 2 circles of PAR each circle in one school semester. The study had three phases.

1. Research participant and key informant group included 5 secondary Mathayomsuksa One-Three level teachers, 34 students in those levels, 34 student parents, 9 school board members totaling 82people.

2. Variables studied were systematic learning resources management comprising inputs, process, outputs, outcome, and feedback.

3. Research phases

3.1 Preparing. This primary data survey phase included knowledge management, internal/external learning resources, and knowledge management process comprising inputs, process, outputs, outcome, and feedback. Research tools were 1) checklist form, 2) semi-structured interview form, and 3) general meeting record form. Data analysis employed frequency and percentage statistics together with content analysis.

3.2 Doing. This included the following.

3.2.1 Reconnaissance. This comprised opening communicative space, dialogues between system and life world, strategic action and communicative action, questions to identify a shared felt concern in relation to our practices and what holds our practices, and an initial statement about what you intend to do.

3.2.2 Planning. This comprised changing practices and practice architectures, and the product of planning a collective rationale and plan for change.

3.2.3 Reflection. This comprised spiral cycles of self-reflection.

3.3 Evaluating. This included evaluation on input, process, output, outcome and feedback from the previous phases that led to system-wide process improvement.

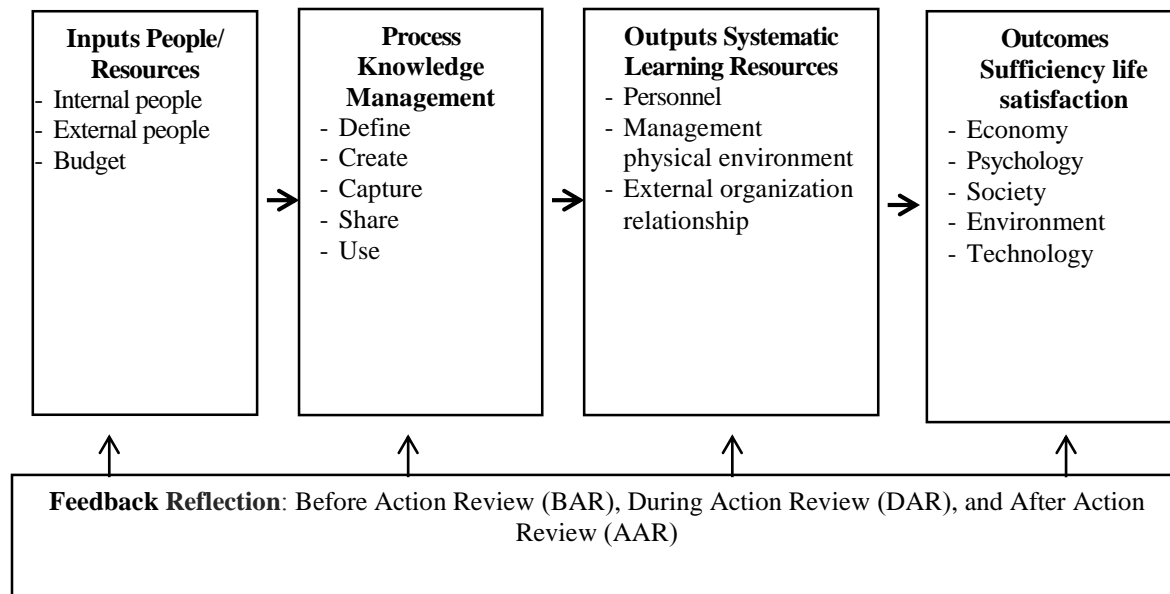
4. Data collection and analysis. Research tools were survey form, semi-structured interview form, learning resources evaluation form, sufficiency-oriented satisfaction form, and meeting record form. The data were analyzed by statistics of frequency, percentage, mean, standard deviation together with content analysis.

### **CONCLUSION**

Systematic learning resources knowledge management process development: magical germinated rice for health comprised the activities as the following. 1) Inputs -- including internal people, external people, and supporting budget; 2) Process -- including *Define* -- identifying types of intelligent capital or desired knowledge; *Create* -- fostering intelligent capital or utilizing existing resources, supplementary external study, learning others' successes, benchmarking, and collecting documents, data, knowledge according to interested group. 3) Outputs -- overall findings indicate 3.33 average point from the 4-point scale with people having highest score, followed in descending order as physical environmental management, and external organization relations management. 4) Outcome -- the findings indicate the sufficiency-oriented life satisfaction in overall and detailed categories are at high level with psychological dimension having highest score, followed in descending order as social, environmental, technological, and economic dimensions; and 5) Feedback -- the systematic learning resources management process with reflection cycle include before action review (BAR), during action review (DAR), and after action review (AAR) as shown in Diagram 1.



Diagram 1.



**Diagram 1** Systematic learning resources knowledge management process: germinated rice for health

## DISCUSSION

The systematic learning resources management process includes 1) Define -- identifying desirable body of knowledge. 2) Benchmark/Create -- creating intelligent capital, knowledge, benchmarking. 3) Capture -- seeking and storing body of knowledge. 4) Share -- sharing, exchanging, disseminating and transferring of knowledge; and 5) Use -- utilizing and/or implementing knowledge. From this study and from this study's literature review and empirical data collection and analysis with survey, interview, and meetings with related participants give congruent conclusion as the following. The first important point is that of identifying desirable intelligent capital or body of knowledge. Since intelligent capital or body of knowledge in any community exist in various types and forms. It is necessary to know and understand those to serve the needs and solve problems for each community. The understanding of the past, present, and future of a community enable for suitable planning to solve problems. The lack of standing or knowing only separate parts of the context not only results in failure but worsen the situation. This conclusion is in line with the findings of other academics. Probst, Raub and Romhardt (2000) [9] stated factors of knowledge management process. They are 1) knowledge identification for knowing learning resources and pattern of knowledge in organization; 2) knowledge acquisition for seeking and selecting external knowledge sources; 3) knowledge development for utilizing acquired knowledge in suitable form for organization management; 4) knowledge transfer for others to work and creating new knowledge among individuals, groups, and organization; 5) knowledge utilization for efficient application in organization; and 6) knowledge storage for sharing and re-use in the future.

Besides, Srikantiah and Koenig (2000) [10] point out that organization needs discipline in knowledge management process for effective results. They are 1) capturing, 2) evaluating, 3) sharing, and 4) information assets storing on knowledge management in the database and in organization policy. Tannonbaum and Alliger (2000) [11] offer 4 principal approaches for efficient knowledge management. They are 1) knowledge sharing, 2) knowledge accessibility, 3) knowledge assimilation, and 4) knowledge application. Moreover, Kucza (2001) [12] states 6 factors of operational knowledge management process. They are 1) identification of need for knowledge, 2) knowledge pull, 3) knowledge push, 4) knowledge creation, 5) knowledge collection and storage, and 6) knowledge update. Wiig (2003) [13] also gives factors for knowledge management process in continuous cycle as 1) knowledge acquisition, 2) knowledge storage and retrieval, 3) knowledge usage/utilization, 4) knowledge transfer/distribution/sharing, and 5) new knowledge creation.

Wijarn (2010) [5] also give 5 steps of knowledge management as 1) defining type of knowledge, 2) creating intelligent capital, 3) capturing and storing knowledge in organization systematically, 4) sharing knowledge, and 5) using knowledge. Thailand Productivity Institute (2005) [14] views knowledge management process as a tool to help organization understand how to develop knowledge within organization. There are 7 steps including 1) knowledge identification, 2) knowledge creation and acquisition, 3) knowledge organization, 4) knowledge codification and refinement, 5) knowledge access, 6) knowledge sharing, and 7) learning.

Therefore, the research findings indicate that systematic learning resources management process can be applied suitably to develop learning resources on local culture learning resources and conservation for sufficiency-oriented life quality. The process can also be utilized in other areas of development depending on the problems and needs of the community. The significant success factor index is to create and develop group awareness among teachers and stakeholders. At the same time for the sustainability of this effort there should be training of major responsible teachers to learn and understand the process well with systematic continuous cycle to become supplementary occupation with income for teachers and students.

## SUGGESTION

### 1. Suggestion for research application

1.1 The school should define clear and continuous policy on learning resources management. The other bodies of knowledge can be included such as knowledge management on network promoting education innovation for teachers or STEM study.

1.2 Schools' superior agency should arrange knowledge management training on other disciplines such as learning resources on Sufficiency Economy Principle, Professional Learning Community (PLC), or research for learning innovation development.

1.3 There should be systematic learning resources management centers in schools with modern equipment for searching knowledge such as computer, high speed internet.

1.4 There should be encouragement for teachers to apply learning resources management process in class with continuous evaluation of results.

### 2. Suggestions for further research

2.1 This research employed participatory action research (PAR) with limited generalization due to targeted schools and specific context. Further research should be on research and development on model of systematic learning resources management on other topics or contexts.

2.2 This research was on learning resources management on cultural preservation and continuation of local community for sustainable sufficiency-oriented on magical germinated rice for health which is suitable to the needs in specific locality. The research method can be applied to other topics according to specific problems and needs of other locality.

2.3 There should be expansion of systematic learning resources management in other schools with similar context or widely in other groups of school

## REFERENCES

- [1] Becerra-Fernandez, I., Gonzalez, A. and Sabherwal, R. (2004). *Knowledge Management: Challenges, Solutions, and Technologies*. New Jersey : Pearson Prentice-Hall.
- [2] Local Administration Organization, Northwestern Provinces Group. (2014). *A Framework for Lifelong Learning Management, Aiming at Local Professional Excellence*. Kalasin: Local Administration Organization. (in Thai).
- [3] Panich, V. (2015). *Knowledge Management*. Retrieved from [http://huahin.dusit.ac.th/bg/KM/KM\\_Article.pdf](http://huahin.dusit.ac.th/bg/KM/KM_Article.pdf). (in Thai).
- [4] The Office of the Basic Education Commission. (2013). *Student Support System for Improving the Quality of Life: And Solve the Social Crisis, the Path to Professional Teachers*. Bangkok: Chuanpim Printing. (in Thai).

- [5] Wijarn, B. (2010). *Development of Learning Organization*. (7<sup>th</sup>ed). Bangkok: Expernet. (in Thai).
- [6] Nong Kung Wittayakarn School. (2016). *Self-Assessment Report: 2015 Academic Year*. Maha Sarakham: Apichart Printing. (in Thai).
- [7] Kangpheng, S., and Kunlong, S. (2015). *Participatory Action Research. MahaSarakhm : The Degree of Doctor of Philosophy in Educational Management for Local Development*, Rajabhat Maha Sarakhm University. (in Thai).
- [8] Kemmis, S., McTaggart, R. and Nixon, R. (2014). *The Action Research Planner: Doing Critical Participatory Action Research*. New York: Springer.
- [9] Probst, G.; S.,Raub.; & K, Romhardt. (2000). *Managing Knowledge: Building Blocks for Success*. England: John Willey & Sons.
- [10] Srikantaiah, T. Kanti.; & Koenig, Michael E.D. (2002). *Knowledge Management for Information Professional*. New Jersey: Information Today.
- [11] Tannonbaum, S.I.; & Alliger, G.M. (2000). *Knowledge Management: Clarifying the Key Issue*. U.S.A. : the International Association for Human Resource Information Management.
- [12] Kucza, T. (2001). *Knowledge Management Process Model*. Retrieved April 15, 2015, from <http://www.Inf.vtt.f/pdf/publication/2001/p.455.pdf>
- [13] Wiig, K.M. (2003). *Knowledge Management Has Manta Facets*. Retrieved July 20, 2016, from <http://www..krii.com/downloads/Four KM Facets-pd>.
- [14] Thailand Productivity Institute. (2005). *Knowledge Management from Theory to Practice*. Bangkok: SeEd. (in Thai).

**AFFECTING SCIENCE TEACHER INTERPERSONAL BEHAVIOURS IN THE 21<sup>ST</sup> CENTURY  
THROUGH LEARNING ENVIRONMENT INVENTORIES FOR ENHANCING AND MOTIVATING  
SCIENCE LEARNING ACHIEVEMENT IN SCIENCE CLASSES IN LONG NOK THA SCHOOL**

Warachaya Wangwong<sup>a</sup>, Toansakul Santiboon<sup>b</sup>, and Nukun Koodthalhang<sup>c</sup>

<sup>a</sup>*Department of Master of Science Education, Faculty of Education, Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000*

*Corresponding author. Tel.: +66 6 1963 5145; Fax: +66 43 713 206, E-mail address: Hunnynoy@gmail.com*

<sup>b</sup>*Department of Master of Science Education, Faculty of Education, Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000*

*Corresponding author. Tel.: +66 6 6636 8528; Fax: +66 43 713 206, E-mail address: toansakul35@yahoo.com.au*

<sup>c</sup>*Department of Chemistry, Faculty of Science and Education; Rajabhat Maha Sarakham University  
Maha Sarakham, Thailand 44000*

*\* Corresponding author. Tel.: +66 8 0400 1572; fax: +66 43 722 257*

**ABSTRACT**

The aims of this research study were 1) to associate between students' perceptions of their science teacher interpersonal behaviours to be affected of their students' learning achievement motivation, 2) to associated between teacher-student interpersonal behaviours to their classroom learning environment inventories, and 3) to associate between students' perceptions of their learning environment inventories and their affecting motive of science learning achievements in science classes in Long Nok Tha School with a sample size consisted of 360 students at grade 7<sup>th</sup> – 12<sup>th</sup> level in 12 science classes. Using the 48-item *Questionnaire on Teacher Interaction* (QTI) that it has eight scales, the 25-item *My Class Inventory* (MCI) in five scales, and the 15-item *Atkinson Achievement Motivation Theory Questionnaire* (AAMQ) in three scales were assessed students' perceptions of their performances were associated. Most of three research instruments are valid and reliable were tried out. Analyzing statistically significant correlations with mean scores were associated. Students' perceptions of their science teacher interpersonal behaviours and their classroom learning environment inventories to their affecting motive of science learning achievements in science classes with the simple and multiple correlations, multiple regression validity are significant ( $p < 0.05$ ). It has found that: the  $R^2$  values indicate that of 55%, 51%, 50%, and 50% for the QTI; and 48%, 51%, 62%, and 66% for the MCI scales of their performances of *Need to Avoid Failure*, *Need to Achieve*, and *Attributes Performance Internally*, and *Totality* of the AAMQ, respectively, which results of the variance in student's learning achievement motivation outcomes were attributable to their perceptions. Suggestions that the effects of science teacher interpersonal behaviours through their learning environment inventories for enhancing and motivating science learning achievements of students' perceptions show relatively favourable perceptions of their science classroom environments with their science teacher interpersonal behaviours in Long Nok Tha School, significantly.

**KEYWORDS:** Effect, science teacher interpersonal behaviours, skills in the 21<sup>st</sup> century, learning environment inventories, enhancement, motivation, science learning achievements, science classes, and Long Nok Tha School

## INTRODUCTION

The National Education Act, BE 2542 (1999) and the Additional (No. 2), 2002, Section 48 instructional the agency and educational institution to have quality assurance system within the institution where the rules of the Ministry of Education and training to maintain internal quality assurance on a yearly basis in accordance with the quality assurance system within the school, such as; 1) internal quality assessment by educational institutions and agencies, 2) monitoring the quality of education by both educational institutions and agencies; and 3) developing quality of education at participating schools. The implementation of quality assurance within the institution, schools and agencies must implement the National Education Act, the Ministerial Regulation, and the quality assurance board's announcement within the basic education level. The guidelines and guidelines for quality assurance within the basic education level 2011. The standard of education is to provide the focus is on two management education; 1) All schools have standards comparable to the standard, and 2) Standards make it clear that education will improve the quality of education, which direction? If the quality of education is monitored to assess progress or is it assessed for certification by external organizations? Education can be prepared in that evaluation. (Educational Testing Center, 2011) <sup>[1]</sup>. However, Long Nok Tha School under the Secondary Educational Service Area Office 28, Yasothorn Province has never past one of four quality assurance board's announcement within the basic education level, what has this school happened; school environment, classroom environment, teach interpersonal behaviours, students' performances of their science skills in the 21<sup>st</sup> century, or their learning achievement motivations have not supported, yet (Long Nok Tha School, 2016) <sup>[2]</sup>.

Classroom learning environment inventory in the 21<sup>st</sup> century flipped learning, student blogging; these are becoming perceived staples of 21st-century learning. With such ambitious practices taking the spotlight for how people regard modern classrooms, it's not surprising that a murmur of impracticality or skepticism is still a frequent response when they're first introduced. Instead of requiring students to learn, work, and think in one place all day, consider how teachers' space might become more flexible (Wade, 2016) <sup>[1]</sup>. Modern realization of best practice in education no longer supports the idea of the teacher as an authoritarian figure standing in the front of the room scrawling on a chalkboard. As educators, our role can be reshaped so that we work beside students providing support and encouragement for their personal journey (Goerts, 2015) <sup>[2]</sup>. The instructional environment is the setting for all teaching. Teachers should be planed their instruction to make sure their students are able to comprehend by using different teaching practices, such as lecture, hands-on activities, cooperative learning groups and plenty of small group and individual practice (Firestone, 2015) <sup>[3]</sup>. The term "21st-century skills" is generally used to refer to certain core competencies such as collaboration; digital literacy, critical thinking, and problem-solving that advocates believe schools need to teach to help students thrive in today's world (Rich, 2010) <sup>[4]</sup>.

Teacher's role in the creation of the curriculum: A teacher can gauge whether an activity will fit into a specified time frame and engage students. When a teacher fails to properly implement a strong curriculum, she risks not covering standards or failing to implement effective practices in the classroom. Mar 2, 2015. Teachers own interest, ability and competence to teach the curriculum i.e confidence in teaching, attitudes and freeness to teach the subject (Patankar, 2013) <sup>[5]</sup>. In this research study, special attention was paid to the methods and procedures utilized to test theory that guides effective teacher behavior research, to integrate research from education and communication, and conclude with suggestions for future research in the communication discipline.

International research efforts involving the conceptualization, assessment and investigation of perceptions of psychosocial aspects of the classroom environment have firmly established the classroom environment as a thriving field of study (Fraser, 1994<sup>[6]</sup>; Fraser & Walberg, 1991<sup>[7]</sup>; Santiboon & Fisher, 2005<sup>[8]</sup>; Santiboon 2016<sup>[9]</sup>). Researchers in the Netherlands have extended this field by focusing specifically on the interpersonal relationships between teachers and their students as assessed by the Questionnaire on Teacher Interaction (QTI) (Wubbels, Creton, & Hooymayers, 1992<sup>[9]</sup>; Wubbels & Levy, 1993<sup>[10]</sup>). The original version of the QTI developed in the early 1980s in the Netherlands had 77 items (Wubbels, Creton, & Hooymayers, 1985<sup>[11]</sup>). Later, an American version of the QTI was developed that had 64 items (Wubbels & Levy, 1991<sup>[12]</sup>). The Australian version and the Thai version of the QTI has 48 items which are arranged in cyclic order in blocks of four to facilitate hand scoring by teachers (Santiboon & Fisher, 2005) <sup>[8]</sup>. Items 1 to 24 assess the four scales called Leadership, Understanding, Uncertain and Admonishing behaviors, and Items 25 to 48 assess the scales called Helping/Friendly, Student Responsibility/Freedom, Dissatisfied and Strict behaviors. At the bottom of the QTI are eight abbreviations corresponding to the subscales (DC = Leadership, CD =

Helping/Friendly, CS = Understanding, SC = Student Responsibility/Freedom, SO = Uncertain, OS = Dissatisfied, OD = Admonishing, and DO = Strict behaviours). Santiboon (2013) <sup>[13]</sup> adapted the QTI version from Australian version to Leadership (Lea), Helping/Friendly (HFr), Understanding (Und), Student Responsibility/Freedom (SRf), Strategies (Str), Morals and Relates (MRe), Emotional Quotient (EQu), and Unrestricting (Unr) behaviours that they were positive scales of science teacher interpersonal behaviours were modified in this study.

Classroom learning environment inventory obviously concerns the dynamics of classrooms or smaller learning environments, including how children feel and experience the characteristics of this milieu. Judgments as to the nature of the classroom climate are based on a student perceptual consensus about the educational, psychological, social, and physical aspects of the environment (Santiboon, 2013) <sup>[14]</sup>. Because numerous measures of school and classroom climates have been developed over the past few decades, the My Class Inventory (MCI-SF) was narrowed to only those self-report surveys (Sink and Spencer, 2015) <sup>[15]</sup>. Although various instruments fit several of the criteria, only the My Class Inventory and its corresponding abbreviated version (MCISF) appear to meet each of them (Sink and Spencer, 2015) <sup>[15]</sup>. Scores on the MCI were analyzed by class to provide a measure (mean score) on each scale of each classroom of the classroom learning environment as perceived by the pupils to provide a measure of these pupils' perceptions of their classroom environments (Gedamu, 2017) <sup>[16]</sup>. At the bottom of the MCI are five abbreviations corresponding to the subscales (S = Satisfaction, F = Friction, Cm = Competitiveness, D = Difficulty, and Ch = Cohesiveness). To determine the Satisfaction subscale score, simply add the scores for the first statement in each block, using the same process for determining scores on all five subscales. At this point, teacher has the scores for each student. The final level of sophistication is to administer the MCI twice: once with students indicating how the classroom actually is, and then filling in a second sheet (Fisher and Fraser, 1981) <sup>[6]</sup> was selected from Santiboon (2013) <sup>[14]</sup> in this research study.

Achievement motivation theory (Atkinson, 1964<sup>[17]</sup>) is one's desire to do well, to succeed and reach standards in one's own eyes and the eyes of others. It reflects a willingness to persist in behaviour that enables higher standards to be reached despite the possibility of failure' (Hill, 2001<sup>[16]</sup>). In contrast with theories of motivation based on biological and behavioral determinants are theories of motivation based on cognitive and social cognitive perspectives. Covington (1998<sup>[17]</sup>) cited the following study, reported by Ferdinand Hoppe, as one of the precursors to the study of achievement motivation and "the key to the question of how, psychologically, humans define success and failure" achievement motivation, described as a tendency to engage in an achievement-oriented task, is "a joint multiplicative function of motive, expectancy (subjective probability), and incentive" (Atkinson, 1957<sup>[18]</sup>). It is a model that offers an explanation for the selection of one task over other alternatives which differ in difficulty, and an explanation for the level of performance exhibited in a given task once initiated. Quotation of the following statement made by Atkinson in three scales, namely: *Need to Avoid Failure* (NAF), *Need to Achieve* (NACH), and *Attributes Performance Internally* (API) (Thomas, 2014) <sup>[19]</sup> and each scale contains with five items as 15 items, tantalization was selected in this research study.

## METHODOLOGY AND MATERIALS

### Research Aims

- To study of associations between students' perceptions of their science teacher interpersonal behaviours for affecting their learning achievement motivations in science courses in Long Nok Tha School.
- To study of associations between students' perceptions of their science teacher interpersonal behaviours for affecting their science classroom learning environments in Long Nok Tha School.
- To study of associations between students' perceptions of their science classroom learning environments for affecting their learning achievement motivations in science courses in Long Nok Tha School.

### Sample Size

Administrations which sample size consisted of 360 secondary students at the 8<sup>th</sup> – 12<sup>th</sup> grade levels, each educational classified level contained of two classes whose are taught by a science teacher, each class consisted of 30 students, 30 science teacher classes throughout the Science Learning Core Department were examined of their science and physical science courses in Long Nok Tha School under Secondary Educational Service Area Office 28.



## Research Instruments

- Students' perceptions of their science teacher Interpersonal behaviours were assessed with the 48-item *Questionnaire on Teacher Interaction* (QTI), which it uses a five-point responses format (from Never to Always. Student requires drawing circle the response alternatives on the questionnaire itself in eight scales that they contain six items, so that the minimum and maximum score possible on each of these scales is 6 and 30, respectively., namely; Leadership (Lea), Helping/Friendly (HFr), Understanding (Und), Student Responsibility/Freedom (SRf), Strategies (Str), Morals and Relates (MRe), Emotional Quotient (EQu), and Unrestricting (Unr) behaviours that they were positive scales of science teacher interpersonal behaviours.
- The science classroom learning environments with students' perceptions were assessed with the 25-item *My Class Inventory* (MCI) scales was modified to have five responses which are Almost Never, Seldom, Sometimes, Often, and Very Often for positive items. The condensed format with 25 items, asks respondents about their perceptions of five different dimensions: Satisfaction (items 1, 2, 3, 4, 5), Friction (items 6, 7, 8, 9, 10), Competitiveness (items 11, 12, 13, 14, 15), Difficulty (items 16, 17, 18, 19, 20), and Cohesiveness (items 21, 22, 23, 24, 25).
- Students' performances of their learning achievement motivation were assessed with the 15-item *Atkinson Achievement Motivation theory Questionnaire* (AAMQ) in three scales, namely; *Need to Avoid Failure* (NAF), *Need to Achieve* (NACH), and *Attributes Performance Internally* (API)

## Data Analysis

Assuming that the scaling of the items approximated a 5- point Likert scale, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the QTI, MCI and the AAMQ as specified. The multiple correlations, multiple regression, and determination efficient predictive analysis were significant of students' perceptions of their science teacher interpersonal behaviours in the 21<sup>st</sup> century through learning environment inventories for enhancing and motivating science learning achievements in science classes in Long Nok Tha School to associate were analyzed.

## RESULTS

To investigate of the affecting science teacher interpersonal behaviours in the 21<sup>st</sup> century through learning environment inventories for enhancing and motivating science learning achievements in science classes in Long Nok Tha School. The findings of this study, which were presented in next subsection under three main headings: (1) validation of the questionnaires; the *Questionnaire on Teacher Interaction* (QTI), the *My Class Inventory* (MCI), and the *Atkinson Achievement Motivation theory Questionnaire* (AAMQ) ; (2) associations between students' perceptions of their science teacher interpersonal behaviours (QTI) and their learning achievement motivation with the AAMQ in three scales and tantalization; (3) associations between students' perceptions of their science classroom learning environment inventory (MCI) and their learning achievement motivation with the AAMQ in three scales and tantalization. A summary of the main findings are provided that followed as:

### To Study of Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours for Affecting Their Learning Achievement Motivations in Science Courses in Long Nok Tha School.

#### *The Intercorrelations Circumplex Nature Scale of the Questionnaires*

To investigate the circumplex nature of the QTI, MCI and the AAMQ, correlations between the scales were calculated. The results are presented in Table 1, 2 and 3.



Table 1 Scale Intercorrelation Circumplex Nature for the QTI

	Lea	HFr	Und	SRf	Str	MRe	EQu	Unr
Lea								
HFr	0.66***							
Und	0.65***	0.77***						
SRf	0.64***	0.68***	0.33**					
Str	0.49***	0.54***	0.69***	0.92***				
MRe	0.58***	0.41***	0.53***	0.52***	0.75***			
EQu	0.48***	0.62***	0.30**	0.41***	0.61***	0.78***		
Unr	0.65***	0.68***	0.51***	0.61***	0.78***	0.74***	0.69***	

$N=360$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 2 Scale Intercorrelation Circumplex Nature for the MCI

	Satisfaction	Friction	Competitiveness	Difficulty	Cohesiveness
Satisfaction					
Friction	0.73***				
Competitiveness	0.65***	0.72***			
Difficulty	0.62***	0.70***	0.72***		
Cohesiveness	0.58***	0.69***	0.61***	0.72***	

$N=360$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 3 Scale Intercorrelation Circumplex Nature for the AAMQ

Scale	NAF	NACH	API
Need to Avoid Failure (NAF)			
Need to Achieve (NACH)	0.58***		
Attributes Performance Internally (API)	0.58***	0.72***	

$N=360$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

As expected, the results show that the correlation between a scale and the next scale in generally is high, and become lower for scales further away from that scale. This is illustrated using each scale in table 1, 2 and 3. In general, the circumplex natures of the QTI, MCI and the AAMQ have been confirmed.

#### Internal Consistency Cronbach Alpha Coefficient Reliability

Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales (Discrimination validity) were obtained the sample in this present study as indices of scale reliability and discriminant validity for the QTI, MCI and the AAMQ. The summary of these values obtained separately for the QTI, MCI and the AAMQ are reported in Table 4, 5 and 6.

As reported in Table 4, 5 and 6, the mean scores for the different scales, the QTI ranged from 3.29 (Morals and Relates scale) to 4.00 (Student Responsibility/Freedom scale). Students' responses of their average mean scores of the MCI ranged from 3.87 (Competitiveness scale) to 3.98 (Cohesiveness), and ranged from 3.91 to 3.96 (Need to Avoid Failure (NAF) scale) to 3.96 (Attributes Performance Internally (API) scale).

Table 4 Mean, Average Mean, Standard Deviation, Variance, Cronbach Alpha Reliability, Discrimination, and F-test for the QTI

Scale	Mean	Average Mean	Standard Deviation	Variance	$\alpha$ -Reliability	Discriminant	F-test
Leadership	23.70	3.94	4.47	19.94	0.87	0.89	3.30**
Helping/Friendly	23.31	3.88	4.36	19.04	0.82	0.90	8.03***
Understanding	23.34	3.89	4.32	23.34	0.84	0.90	11.49** *
Student							
Responsibility/Freedom	24.01	4.00	4.30	18.49	0.87	0.89	2.42*
Strategies	20.13	3.56	6.16	37.89	0.93	0.88	6.71***
Morals and Relates	19.74	3.29	6.79	46.11	0.95	0.88	8.58***
Emotional Quotient	19.41	3.23	7.09	50.35	0.96	0.88	5.18**
Unrestricting	22.04	3.67	5.05	25.49	0.88	0.89	2.52*

$N=360$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 5 Mean, Average Mean, Standard Deviation, Variance, Cronbach Alpha Reliability, Discrimination, and F-test for the MCI

Scale	Mean	Average Mean	Standard Deviation	Variance	$\alpha$ -Reliability	Discriminant	F-test
Satisfaction	19.81	3.92	3.80	14.45	0.86	0.82	3.68**
Friction	19.51	3.90	3.72	13.84	0.81	0.83	2.69*
Competitiveness	19.36	3.87	3.66	13.42	0.78	0.84	18.53** *
Difficulty	19.71	3.95	3.50	12.22	0.82	0.83	8.27***
Cohesiveness	19.92	3.98	3.77	14.18	0.86	0.82	5.49**

$N=360$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 6 Mean, Average Mean, Standard Deviation, Variance, Cronbach Alpha Reliability, Discrimination, and F-test for the AAMQ

Scale	Mean	Average Mean	Standard Deviation	Variance	$\alpha$ -Reliability	Discriminant	F-test
NAF	19.53	3.91	3.68	13.58	0.86	0.83	9.69***
NACH	19.49	3.90	3.55	12.61	0.82	0.86	2.78*
API	19.82	3.96	3.44	11.82	0.83	0.84	2.98*

$N=360$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

As reported in Table 4, 5 and 6, the reliability coefficients for the different scales of the QTI ranged from 0.82 (Helping/Friendly scale) to 0.96 (Emotional Quotient scale). In terms of the MCI, reliability coefficients ranged from 0.78 (Competitiveness scale) to 0.86 (Satisfaction and Cohesiveness scales) and ranged from 0.82 (Need to Achieve scale) to 0.86 (Need to Avoid Failure scale) for the AAMQ when using the individual student as the unit of analysis. On the whole, these results are acceptable although somewhat lower than obtained previously validation sample (Wubbels & Levy, 1993<sup>[10]</sup>; Santiboon, 2013<sup>[14]</sup>; Atkison, 1964<sup>[15]</sup> Thomas. 2014<sup>[19]</sup>.

### Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their Atkinson Achievement Motivation Theory Questionnaire (AAMQ) for NAF Scale

The simple correlation values ( $r$ ) are reported in Table 6, 7, 8 and 9 which show significant correlations ( $p<0.05$ ) between students' learning achievement motivation outcomes and their science teacher interpersonal behaviours all of eight scales. These associations are positive for the scales of Leadership (Lea), Helping/Friendly

(HFr), Understanding (Und), Student Responsibility/Freedom (SRf), Strategies (Str), Morals and Relates (MRe), Emotional Quotient (EQu), and Unrestricting (Unr) scales; there was a more favourable critical thinking abilities towards their science classroom environment climates.

Table 7 Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their AAMQ in NAF Scale

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.14**	0.19***
Helping/Friendly	0.15**	0.11**
Understanding	0.18**	0.15**
Student Responsibility/Freedom	0.16**	0.15**
Strategies	0.21***	0.17**
Morals and Relates	0.20***	0.18**
Emotional Quotient	0.18**	0.19***
Unrestricting	0.19***	0.17**
Multiple Correlation (R) 0.7389**		
Determination Efficient Predictive Value ( $R^2$ ) 0.5461**		

$N=360$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 8 Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their AAMQ in NACH Scale

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.17**	0.17**
Helping/Friendly	0.14**	0.16**
Understanding	0.18**	0.13**
Student Responsibility/Freedom	0.15**	0.17**
Strategies	0.13**	0.16**
Morals and Relates	0.18**	0.16**
Emotional Quotient	0.14**	0.14**
Unrestricting	0.16**	0.17**
Multiple Correlation (R) 0.7165**		
Determination Efficient Predictive Value ( $R^2$ ) 0.5134**		

$N=360$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 9 Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their AAMQ in API Scale

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.18**	0.16**
Helping/Friendly	0.15**	0.16**
Understanding	0.11**	0.14**
Student Responsibility/Freedom	0.22***	0.18**
Strategies	0.16**	0.16**
Morals and Relates	0.16**	0.16**
Emotional Quotient	0.15**	0.14**
Unrestricting	0.19***	0.18**
Multiple Correlation (R) 0.7056**		
Determination Efficient Predictive Value ( $R^2$ ) 0.4979**		

$N=360$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 10 Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their Totalized AAMQ

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.19***	0.20***
Helping/Friendly	0.17**	0.14**
Understanding	0.17**	0.15**
Student Responsibility/Freedom	0.18**	0.18**
Strategies	0.15**	0.18**
Morals and Relates	0.17**	0.16**
Emotional Quotient	0.18**	0.14**
Unrestricting	0.17**	0.13**
Multiple Correlation (R) 0.7065**		
Determination Efficient Predictive Value ( $R^2$ ) 0.5018**		

$N=360$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

The more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the QTI and their learning achievement motivation outcomes towards science when the effect of relationships between the scales were controlled. The findings of associations between students' perceptions of their science teacher interpersonal behaviours and their learning achievement motivation outcomes for Need to Avoid Failure (NAF), Need to Achieve (NACH), and Attributes Performance Internally (API) scales, and tantalization of the AAMQ, respectively. The multiple correlations ( $R_s$ ) are significant for science classroom learning environment with students' perceptions of their science teacher interpersonal behaviours and their learning achievement outcomes with the AAMQ and showed that when the scales are considered together there is a significant ( $p<.05$ ) association with the AAMQ. The  $R^2$  values indicate that 55%, 51%, 50%, and 50% of their learning achievement motivation outcomes for Need to Avoid Failure (NAF), Need to Achieve (NACH), and Attributes Performance Internally (API) scales, and totality of the AAMQ, respectively, which results of the variance in student's learning achievement motivation outcomes were attributable to their perceptions of their science teacher interpersonal behaviours. The beta weights ( $\beta$ ) shows that in science classroom environment inventory perceived greater leadership, helping/friendly, understanding, student responsibility/freedom, strategies, morals and relates, emotional quotient, and unrestricting scales, there were a more favorable learning achievement outcomes towards science.

**Associations between Students' Perceptions of their Science Classroom Environment Inventory (MCI) toward their Atkinson Achievement Motivation Theory Questionnaire (AAMQ) in NAF Scale**

The simple correlation values ( $r$ ) are reported in Table 10, 11, 12 and 13 which show significant correlations ( $p < 0.05$ ) between students' learning achievement motivation outcomes and their science teacher interpersonal behaviours all of eight scales. These associations are positive for the scales of Satisfaction, Friction, Competitiveness, Difficulty, and Cohesiveness scales; there was a more favourable attitude towards their science classroom environment climates.

Table 11 *Associations between Students' Perceptions of their Science Classroom Environment Inventory (MCI) toward their AAMQ in NAF Scale*

Scale	Simple Correlation ( $r$ )	Standardized Regression Weight Validity ( $\beta$ )
Satisfaction	0.19***	0.16**
Friction	0.23***	0.20***
Competitiveness	0.26***	0.15**
Difficulty	0.26***	0.22***
Cohesiveness	0.22***	0.16**
Multiple Correlation ( $R$ ) 0.6923**		
Determination Efficient Predictive Value ( $R^2$ ) 0.4793**		

$N=360$ , \* $p < .05$ , \*\* $p < .05$ , \*\*\* $p < .05$

The analysis consisted of the more conservative standardized regression coefficient ( $\beta$ ) which measures the association of the MCI and their AAMQ towards science when the effect of relationships between the scales is controlled. Table 11, 12, 13, and 14 reported the findings of associations between students' perceptions of their science classroom learning environment inventories and their learning achievement motivation outcomes for Need to Avoid Failure (NAF), Need to Achieve (NACH), and Attributes Performance Internally (API) scales, and tantalization of the AAMQ, respectively.

**Associations between Students' Perceptions of their Science Classroom Environment Inventory (MCI) toward their Atkinson Achievement Motivation Theory Questionnaire (AAMQ) in NACH Scale**

Table 11 *Associations between Students' Perceptions of their Science Classroom Environment Inventory (MCI) toward their AAMQ in NACH Scale*

Scale	Simple Correlation ( $r$ )	Standardized Regression Weight Validity ( $\beta$ )
Satisfaction	0.16**	0.16**
Friction	0.22***	0.15**
Competitiveness	0.24***	0.18**
Difficulty	0.18**	0.13**
Cohesiveness	0.13**	0.19***
Multiple Correlation ( $R$ ) 0.7175**		
Determination Efficient Predictive Value ( $R^2$ ) 0.5148**		

$N=360$ , \* $p < .05$ , \*\* $p < .05$ , \*\*\* $p < .05$

**Associations between Students' Perceptions of their Science Classroom Environment Inventory (MCI) toward their Atkinson Achievement Motivation Theory Questionnaire (AAMQ) in NAF Scale**

Table 12 *Associations between Students' Perceptions of their Science Classroom Environment Inventory (MCI) toward their AAMQ in API Scale*

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Satisfaction	0.19***	0.18**
Friction	0.27***	0.25***
Competitiveness	0.30***	0.28***
Difficulty	0.25***	0.23***
Cohesiveness	0.17**	0.16**
Multiple Correlation (R)	0.7847***	
Determination Efficient Predictive Value ( $R^2$ )	0.6157***	

$N=360$ , \* $p<.05$ , \*\* $p<.05$ , \*\*\* $p<.05$

### Associations between Students' Perceptions of their Science Classroom Environment Inventory (MCI) toward their Atkinson Achievement Motivation Theory Questionnaire (AAMQ)

Table 13 *Associations between Students' Perceptions of their Science Classroom Environment Inventory (MCI) Science toward their AAMQ*

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Satisfaction	0.21***	0.20***
Friction	0.27***	0.26***
Competitiveness	0.30***	0.30***
Difficulty	0.27***	0.24***
Cohesiveness	0.20***	0.19***
Multiple Correlation (R)	0.8106***	
Determination Efficient Predictive Value ( $R^2$ )	0.6571***	

$N=360$ , \* $p<.05$ , \*\* $p<.05$ , \*\*\* $p<.05$

The  $R^2$  values indicate that 48%, 51%, 62%, and 66% of their learning achievement motivation outcomes for Need to Avoid Failure (NAF), Need to Achieve (NACH), and Attributes Performance Internally (API) scales, and totality of the AAMQ, respectively, which results of the variance in student's learning achievement motivation outcomes were attributable to their perceptions of their science classroom learning environment inventories. The beta weights ( $\beta$ ) shows that in science classroom environment inventory perceived greater Satisfaction, Friction, Competitiveness, Difficulty, and Cohesiveness scales; there were a more favorable learning achievement motivation outcomes towards science, significantly.

## CONCLSSIONS AND DISCISSIONS

Three decades of research on teacher–student relationships in classroom learning environment in science classes were explored and studies the entire world. The authors review the research that examines teaching from an interpersonal perspective using a communicative systems approach and propose a model to describe teacher–student relationships in terms of teacher behavior. The studies used the 48-items *Questionnaire on Teacher Interaction* (QTI) to collect data on students' and teachers' perceptions of the teacher–student relationship (Wubbels & Brekelmans, 2005) [22]. The authors review studies showing that teacher–student relationships appropriate for high student outcomes are characterized by a rather high degree of teacher influence and proximity towards students. A psychometric study with more than 2,800 upper-elementary-age students examined the reliability and factorial validity of the 25-items *My Class Inventory* (MCI) (Santiboon, 2013) [16]. Factor analytic and structural equation modeling results suggested that the original measure is a less than satisfactory approach to appraise various dimensions of classroom climate (Sink & Spencer, 2015) [17]. To determine the level of correlation between Achievement Motivation,

as measured by Atkinson's Risk Taking Model of Achievement, and student performance with the *Atkinson Achievement Motivation Theory Questionnaire* (AAMQ) (Thomas, 2014) <sup>[21]</sup> as measured by project completion for 7<sup>th</sup> – 12<sup>th</sup> grade secondary students at Long Nok Tha School under Secondary Educational Service Area Office 28, Long Nok Tha District, Yasothorn Province, Thailand, which sample size consisted of 360 students who responses of their perception in 12 science classes with 30 science teachers were assessed their perceptions with the QTI, MCI and the AAMD questionnaires in this research study was designed.

To associate between students' perceptions of their science teacher interpersonal behaviours to be affected of their students' learning achievement motivation, 2) to associated between teacher-student interpersonal behaviours to their classroom learning environment inventories in science classes, and 3) to associate between students' perceptions of their learning environment inventories and their affecting motive of science learning achievements in science classes in Long Nok Tha School were the aims of research study. Assuming that the scaling of the items approximated a 5- point Likert scale, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the QTI, MCI and the AAMQ as specified. The multiple correlations, multiple regression, and determination efficient predictive analysis were significant of students' perceptions of their science teacher interpersonal behaviours in the 21<sup>st</sup> century through learning environment inventories for enhancing and motivating science learning achievements in science classes in Long Nok Tha School to associate were analyzed.

The procedures appropriated statistically significant included scale analysis with the circumplex nature scales, Cronbach alpha, and discriminant validity. As expected, the results show that the correlation between a scale and the next scale in generally is high, and become higher for scales further away from that scale with the intercorrelation circumplex nature scales' analysis were illustrated of the QTI, MCI and the AAMQ have been confirmed., Internal consistency (Cronbach Alpha Reliability), the reliability coefficients for the different scales of the QTI ranged from 0.82 (Helping/Friendly scale) to 0.96 (Emotional Quotient scale). In terms of the MCI, reliability coefficients ranged from 0.78 (Competitiveness scale) to 0.86 (Satisfaction and Cohesiveness scales) and ranged from 0.82 (Need to Achieve scale) to 0.86 (Need to Avoid Failure scale) for the AAMQ when using the individual student as the unit of analysis. On the whole, these results are acceptable although somewhat lower than obtained previously validation sample (Wubbels & Levy, 1993<sup>[10]</sup>; Santiboon, 2013<sup>[14]</sup>; Atkison, 1964<sup>[15]</sup> Thomas. 2014<sup>[19]</sup>, which appropriation of statistical procedures were used, in order to the questionnaire.

In this study, it was also considered important to investigate associations between students' perceptions of their science teachers' interpersonal behaviours and their science classroom learning environment inventories with their Atkinson's Achievement Motivation theory toward science. The selection of an evaluation and assessment instrument suitable was required. The simple correlation values ( $r$ ), which show significant correlations ( $p < 0.05$ ) between students' learning achievement motivation outcomes and their science teacher interpersonal behaviours all of eight scales. These associations are positive for the scales of *Leadership*, *Helping/Friendly*, *Understanding*, *Student Responsibility/Freedom*, *Strategies*, *Morals and Relates*, *Emotional Quotient*, and *Unrestricting* scales for the QTI; and five scales of *Satisfaction*, *Friction*, *Competitiveness*, *Difficulty*, and *Cohesiveness* for the MCI. There were more favourable critical thinking abilities towards their science classroom environment climates. Associations between students' perceptions of their science teacher interpersonal behaviours and their learning achievement motivation outcomes for *Need to Avoid Failure* (NAF), *Need to Achieve* (NACH), and *Attributes Performance Internally* (API) scales, and Totalized of the AAMQ, respectively. Respectively, and showed that when the scales are considered together there is a significant ( $p < 0.05$ ) association with the AAMQ. The  $R^2$  values indicate that 48%, 51%, 62%, and 66% of their learning achievement motivation outcomes for *Need to Avoid Failure* (NAF), *Need to Achieve* (NACH), and *Attributes Performance Internally* (API) scales, and *Totality* of the AAMQ, respectively, which results of the variance in student's learning achievement motivation outcomes were attributable to their perceptions of their science teacher interpersonal behaviours and their science classroom learning environment inventories. The beta weights ( $\beta$ ) shows that in science classroom environment inventory perceived greater Satisfaction, Friction, Competitiveness, Difficulty, and Cohesiveness scales, there were more favorable learning achievement motivation outcomes towards science, significantly.



## ACKNOWLEDGEMENT

I would first like to thank my thesis super advisor Prof. Santiboon, T. of the Master of Science Education/ Faculty of Education; Advisor Dr. Nukoon Kootthalang of Faculty of Science and Technology at Rajabhat Maha Sarakham University, and the professional expert on science education, Dr. Chaiphat Plybour (Physics Department, Faculty of Science of Mahasarakham University), and Assist. Prof. Dr. Paisan Worakham, Faculty of Education, Rajabhat Maha Sarakham University who is the Director of thesis committee is improved.. The door to Prof. Santiboon was always open whenever I ran into a trouble spot or had a question about my research or writing. He/She consistently allowed this paper to be my own work, but steered me in the right the direction whenever he thought I needed it.

I would also like to thank the Long Nok Tha Schooling Administrators, 30-Science Core Learning Teacher Group who was involved in the validation survey for this research project. Without their passionate participation and input, the validation survey could not have been successfully conducted.

Finally, the great thanks to my parents, Dad and Mom, and my brother who supported of my study

## REFERENCES

- Educational Testing Center, Office of the Basic Education Commission. (2011). *Quality standards for basic education for internal quality assurance of educational institutions*. Retrieved from <http://satitprasarnmit.ac.th/pdf/qa.pdf>
- Long Nok Tha School, Academic Administration Group. (2016). *Annual report on quality assurance standards in the linguistics factory, 2016*. Retrieved from <http://ln.ac.th/th/>
- Wade, M. (2016). Visualizing 21<sup>st</sup>-century classroom design. *George Locus Educational Foundation*. Retrieved on 29 March 2016 from <https://www.edutopia.org/blog/visualizing-21st-century-classroom-design-mary-wade>
- Goerts, P. (2015). 10 signs of a 21<sup>st</sup> century classroom. *George Locus Educational Foundation*. Retrieved on 16 April 2015 from <https://www.edutopia.org/discussion/10-signs-21st-century-classroom>
- Firestone, M. (2015). What is a learning environment in classrooms? Retrieved on 14 June 2015 from <http://study.com/academy/lesson/learning-environment-in-the-classroom-definition-impact-importance.html>
- Rich, E. (2010). How do you define 21<sup>st</sup>-century learning. Retrieved on 11 October 2010 from <https://www.edweek.org/tsb/articles/2010/10/12/01panel.h04.html>
- Patankar, P. S. (2013). Role of teachers in curriculum development for teacher education. ResearchGate. Retrieved in October 2013 from [https://www.researchgate.net/publication/258023165\\_roleofteachers\\_incurriculum\\_development\\_for\\_teacher\\_education](https://www.researchgate.net/publication/258023165_roleofteachers_incurriculum_development_for_teacher_education)
- Fraser, B. J. (1994). Research on classroom and school climate. In D. Gabel (Ed.), *Handbook of research on science teaching and learning* (pp. 493-541). New York: Macmillan.
- Fraser, B. J., & Walberg, H. J. (Eds.). (1991). *Educational environments: Evaluation, antecedents and consequences*. Oxford, UK: Pergamon.
- Santiboon, T. & Fisher D. L. (2005). *Learning environments and teacher-student interactions in physics classes in Thailand*. Proceedings of the Fourth International Conference on Physics, Mathematics and Technology Education Sustainable Communities and Sustainable Environments: Envisioning a Role for Physics, Mathematics and Technology Education, Victoria, Vancouver, Canada.
- Wubbels, T., Creton, H. A., & Hoymayers, H. P. (1992). Review of research on teacher communication styles with use of the Leary model. *Journal of Classroom Interaction*, 27, 1-12.
- Wubbels, T., & Levy, J. (Eds.). (1993). *Do you know what you look like? Interpersonal relationships in education*. London: Falmer.
- Wubblels, T., Creton, H. A., & Hoymayers, H. P. (1985). *Discipline problems of beginning teachers: Interactional teacher behaviour mapped out*. Paper presented at Annual Meeting of the American Education Research Association, Chicago.
- Wubbels, T., & Levy, J. (1991). A comparison of interpersonal behaviour of Dutch and American teachers. *International Journal of Intercultural Relations*, 15, 1-18.

- Santiboon, T. (2013). Assessing science students' perceptions in learning activities achievements in physics laboratory classrooms in Udon Thani Rajabhat University. 2012 *International Conference on Education and Management Innovation IPEDR Vol.30* (2012) © (2012) IACSIT Press, Singapore.
- Santiboon, T. (2013). School environments inventory in primary education in Thailand. *Merit Research Journal of Education and Review* (ISSN: 2350-2282) Vol. 1 (10) pp. 250-258, November, 2013
- Sink, C. A., and Spencer, L. R. (2015). My class inventory-short form as an accountability tool for elementary school counselors to measure classroom climate. *American School Counselor Association*, Vol 2 (5) : pp. 245-256.
- Gedamu, A. D. (2017). Association between students' perceived EFL classroom environment and their achievement in English language: Ethiopian Secondary Schools in context. *International Journal of Languages' Education and Teaching Volume 5*, Issue 3, September 2017: pp. 1-11.
- Atkinson, J. W. (1964). *An introduction to motivation*. Princeton, N.J. Van Nostrand. CHAPTER 9. A *Theory of Achievement Motivation*. Duke University Library.
- Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. *Psychological Review*, 64 (6, Pt.1), pp. 359-372.
- Thomas, N. (2014). Achievement motivation theory (Atkinson, 1964). Retrieved on 31 October 2014 from <https://prezi.com/9q-elce2elmx/achievement-motivation-theory-atkinson-1964-12/>
- Wubbels, T., & Brekelmans, M. (2005). Two decades of research on teacher–student relationships in class. *International Journal of Educational Research* 43 (2005) : pp. 6–24.

# A STUDY OF SCIENCE TEACHER INTERPERSONAL LEARNING INVENTORY BEHAVIOUS AND CRITICAL THINKING ABILITIES OF UPPER SECONDARY STUDENTS UNDER SECONDARY EDUCATIONAL SERVICE AREA OFFICE 32

Orapan Laminon<sup>a</sup>, Tanawat Somtua<sup>b</sup>, and Wandee Rakrai<sup>c</sup>

<sup>a</sup>Department of Master of Science Education, Faculty of Education, Rajabhat Maha Sarakham University,  
Maha Sarakham, Thailand 44000

Corresponding author. Tel.: +66 9 8658 0878; Fax: +66 43 713 206, E-mail: jiew.wy@gmail.com

<sup>b</sup>Department of Master of Science, Faculty of Science and Technology, Rajabhat Maha Sarakham University,  
Maha Sarakham, Thailand 44000

Corresponding author. Tel.: +66 8 4844 7656; Fax: +66 43 713 206, E-mail: somtua.t@gmail.com

<sup>c</sup>Department of Science, Faculty of Science and Technology, Rajabhat Maha Sarakham  
Maha Sarakham, Thailand 44000

\* Corresponding author. Tel.: +66 8 1716 5946; fax: +66 43 722 257, E-mail: wandee.rakrai@gmail.com

## ABSTRACT

The aims of this research study were 1) to associate between students' perceptions of their science teacher interpersonal behaviours to be affected of their students' critical thinking abilities, 2) to associated between teacher-student interpersonal behaviours to their classroom learning environment inventories, and 3) to associate between students' perceptions of their learning environment inventories and their affecting critical thinking of science learning achievements in science classes under Secondary Service Area Office 32 with a sample size consisted of 379 students at upper secondary education in 11 schools. Using the 48-item *Questionnaire on Teacher Interaction* (QTI) of eight scales and the 24-item *Critical Thinking Ability* (CTA) Questionnaire in four scales was assessed. Most of two research instruments are valid and reliable were tried out. Analyzing statistically significant correlations with mean scores were associated. Students' perceptions of their science teacher interpersonal behaviours and their critical thinking abilities with simple and multiple correlations, multiple regression validity are significant ( $p < 0.05$ ). It has found that: the  $R^2$  values indicate that 30%, 29%, 31%, 26% and 35% of their *Leadership*, *Helping/Friendly*, *Understanding*, *Student Responsibility/Freedom*, *Strategies*, *Morals and Relates*, *Emotional Quotient*, and *Non-Strict* learning achievement critical thinking outcomes for *Activity Process*, *Thinking Principal*, *Critical Thinking Process*, *Critical Thinking Property*, and *Totalized* of the CTA, respectively. Comparisons between students' responses of their QTI and CTA in different schooling sizes also were found and differences of Extra, Large, Medium, and Small were differentiated, significantly ( $p < .05$ ), which results of the variance in student's learning achievement critical thinking outcomes were attributable to their perceptions of their science teacher interpersonal behaviours in student's critical thinking outcomes were attributable to their perceptions. Suggestions that the effects of science teacher interpersonal behaviours through their improving critical thinking abilities show relatively favourable perceptions with their science teacher interpersonal behaviours under Secondary Educational Service Area Office 32, significantly.

**KEYWORDS:** Science schooling classes, teacher interpersonal behaviours, learning environment inventory, critical thinking ability, upper secondary students, and Secondary Service Area Office 32

## INTRODUCTION

Education in Thailand is provided mainly by the Thai government through the Ministry of Education from pre-school to senior high school. A free basic education of twelve years is guaranteed by the constitution, and a minimum of nine years' school attendance is mandatory. In 2009 the Ministry of Education announced the extension of a free, mandatory education to fifteen years (UNICEF, 2016) <sup>[1]</sup>. Formal education consists of at least twelve years of basic education, and higher education. Basic education is divided into six years of elementary education and six years of secondary education, the latter being further divided into three years of lower- and upper-secondary levels. Kindergarten levels of pre-elementary education, also part of the basic education level, span 2–3 years depending on the locale, and are variably provided. Non-formal education is also supported by the state. Independent schools contribute significantly to the general education infrastructure. Administration and control of public and private universities are carried out by the Office of Higher Education Commission, a department of the Ministry of Education.

Educational system in Thailand with respect to the international measurements standards' reflects their weakness in delivering quality learning curriculum. Thai students are struggling to cope with English language proficiency due to which it has been spotted on 57th place on the international platform test PISA in 2015. Even when dealing with natural sciences, Students failed in tackling with critical problems. They were ranked by 54th place across the world in terms of science and mathematics (PISA, 2015) <sup>[2]</sup>. It's no secret the Thai education system has many problems, In recent years Thai government schools have been the object of much criticism, not only from sources within the country, but also from the international community. But why are Thai government schools performing so poorly, and is there everything that can be done to create a better learning environment for the thousands of students suffering in the dismally run national education system? (Ruhe, 2016) <sup>[3]</sup>. In this research study, research team would attempt to identify the biggest problems within Thai national education system, and at the end of this study we would like to explore some possible solutions to some of this study.

Although, the National Education Act, BE 2542 (1999) and educational institution to have quality assurance system within the institution where the rules of the Ministry of Education and training to maintain internal quality assurance on a yearly basis in accordance with the quality assurance system within the school developing quality of education at participating schools. The implementation of quality assurance within the institution, schools and agencies must implement the National Education Act, the Ministerial Regulation, and the quality assurance board's announcement within the basic education level. The guidelines and guidelines for quality assurance within the basic education level 2011. The standard of education is to provide the focus is on two management education; all schools have standards comparable to the standard, and standards make it clear that education will improve the quality of education, which direction? If the quality of education is monitored to assess progress or is it assessed for certification by external organizations? Education can be prepared in that evaluation. (Educational Testing Center, 2011) <sup>[4]</sup>. However, under the Secondary Educational Service Area Office 32, Buriram Province has never past one of four quality assurance board's announcement within the basic education level, what has this school happened; school environment, classroom environment, teach interpersonal behaviours, students' performances of their science skills in the 21<sup>st</sup> century, or their learning achievement critical thinking have not supported, yet.

According to the Royal Gazette, Volume 116, Section 74, dated August 19, 1999, Section 23 requires that the instructor be able to provide instructional media environment so that the learner can learn and be knowledgeable in the past 10 years. All students in each grade level tend to have a lower average of average grade point average. The results of this research (Santiboon & Fisher, 2005) <sup>[5]</sup> and the 4,675 samples were Grade 12th students. Boring teaching environment, teachers do not understand the students and have value in the punishment, do not teach on time, to give homework or give away a lot of time. Students want their teachers to friendly and understand with their modern instructional designing and fun teaching techniques. The classroom environment is a happy learning environment. Students will observe the teacher's teaching by seeing the problems and reflecting on these problems.

Classroom learning environment inventory in the 21<sup>st</sup> century flipped learning, student blogging; these are becoming perceived staples of 21st-century learning. With such ambitious practices taking the spotlight for how people regard modern classrooms, it's not surprising that a murmur of impracticality or skepticism is still a frequent response when they're first introduced. Instead of requiring students to learn, work, and think in one place all day, consider how teachers' space might become more flexible (Wade, 2016) <sup>[6]</sup>. Modern realization of best practice in education no longer supports the idea of the teacher as an authoritarian figure standing in the front of the room scrawling on a chalkboard. As educators, our role can be reshaped so that we work beside students providing support and encouragement for their personal journey (Goerts, 2015) <sup>[7]</sup>. The instructional environment is the setting for all teaching. Teachers should be planed their instruction to make sure

their students are able to comprehend by using different teaching practices (Firestone, 2015) <sup>[8]</sup>. The term "21st-century skills" is generally used to refer to certain core competencies such as collaboration; digital literacy, critical thinking, and problem-solving that advocates believe schools need to teach to help students thrive in today's world (Rich, 2010) <sup>[9]</sup>.

Teacher's role in the creation of the curriculum: A teacher can gauge whether an activity will fit into a specified time frame and engage students. When a teacher fails to properly implement a strong curriculum, she risks not covering standards or failing to implement effective practices in the classroom. Teachers own interest, ability and competence to teach the curriculum i.e confidence in teaching, attitudes and freeness to teach the subject (Patankar, 2013) <sup>[10]</sup>. In this research study, special attention was paid to the methods and procedures utilized to test theory that guides effective teacher behavior research, to integrate research from education and communication, and conclude with suggestions for future research in the communication discipline. Classroom learning environment inventory obviously concerns the dynamics of classrooms or smaller learning environments, including how children feel and experience the characteristics of this milieu. Judgments as to the nature of the classroom climate are based on a student perceptual consensus about the educational, psychological, social, and physical aspects of the environment (Santiboon, 2013) <sup>[11]</sup>.

International research efforts involving the conceptualization, assessment and investigation of perceptions of psychosocial aspects of the classroom environment have firmly established the classroom environment as a thriving field of study (Fraser, 1994<sup>[12]</sup>; Fraser & Walberg, 1991<sup>[13]</sup>; Santiboon & Fisher, 2005<sup>[5]</sup>; Santiboon 2016<sup>[11]</sup>). Researchers in the Netherlands have extended this field by focusing specifically on the interpersonal relationships between teachers and their students as assessed by the Questionnaire on Teacher Interaction (QTI) (Wubbels, Creton, & Hooyamers, 1992<sup>[14]</sup>; Wubbels & Levy, 1993<sup>[15]</sup>). The original version of the QTI developed in the early 1980s in the Netherlands had 77 items (Wubbels, Creton, & Hooyamers, 1985<sup>[16]</sup>). Later, an American version of the QTI was developed that had 64 items (Wubbels & Levy, 1991<sup>[17]</sup>). The Australian version and the Thai version of the QTI has 48 items which are arranged in cyclic order in blocks of four to facilitate hand scoring by teachers (Santiboon & Fisher, 2005) <sup>[5]</sup>. Items 1 to 24 assess the four scales called Leadership, Understanding, Uncertain and Admonishing behaviors, and Items 25 to 48 assess the scales called Helping/Friendly, Student Responsibility/Freedom, Dissatisfied and Strict behaviors. At the bottom of the QTI are eight abbreviations corresponding to the subscales (DC = Leadership, CD = Helping/Friendly, CS = Understanding, SC = Student Responsibility/Freedom, SO = Uncertain, OS = Dissatisfied, OD = Admonishing, and DO = Strict behaviours. Santiboon (2013) <sup>[18]</sup> adapted the QTI version from Australian version to Leadership (Lea), Helping/Friendly (HFr), Understanding (Und), Student Responsibility/Freedom (SRf), Strategies (Str), Morals and Relates (MRe), Emotional Quotient (EQu), and Non-Stricting (NTr) behaviours that they were positive scales of science teacher interpersonal behaviours were modified in this study.

In essence, critical thinking requires human to use their ability to reason. It is about being an active learner rather than a passive recipient of information. In addition to the critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action (Patterson, 2014) <sup>[19]</sup>. Critical thinking was described by Richard W. Paul (1995) <sup>[20]</sup> as a movement in two waves (1995) (Glaser, 1941) <sup>[20]</sup>. The "first wave" of critical thinking is often referred to as a 'critical analysis' that is clear, rational thinking involving critique. Its details vary amongst those who define it. According to Edward M. Glaser (Glaser, 1941) <sup>[21]</sup>, critical thinking means making clear, reasoned judgments. During the process of critical thinking, ideas should be reasoned, well thought out, and judged (Walters, 1994) <sup>[22]</sup>. The U.S. National Council for Excellence in Critical Thinking (Elkins, 2014) <sup>[23]</sup> defines critical thinking as the "intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action." (The Foundation for Critical Thinking, 2017) <sup>[24]</sup>. Contemporary critical thinking scholars have expanded these traditional definitions to include qualities, concepts, and processes such as creativity, imagination, discovery, reflection, empathy, connecting knowing, feminist theory, subjectivity, ambiguity, and inconclusiveness. Some definitions of critical thinking exclude these subjective practices (Walters, 1994) <sup>[22]</sup>.

Focused on the critical thinking in this research study was just deliberately and systematically processing information so that students can make better decisions and generally understand things better because critical thinking requires students to apply diverse intellectual tools to diverse information. The value of critical thinking doesn't stop with college, however. Once students get out into the real world, critical thinking matters even more (Roberts, 2013) <sup>[26]</sup>. In this research study, as resecher team hope instructor now see, learning to think critically will benefit instructor both in the classroom and beyond. Because our learning to think critically is a lifelong journey, and there's always more to learn in this class. Then, we designed using the 24-items *Critical Thinking*



*Ability* (CTA) Questionnaire (Santiboon, 2017) [27] was adapted and assessed graduate students in Science schooling classes in Secondary Educational Service Area Office 32, Buriram Province in this research study.

To devote to students' perceptions of psychosocial and science skill characteristics of classroom has been to make this exciting research tradition in science education more accessible to wider audiences. In its attempt to portray prior work, attention has been given to instruments for assessing classroom. Associations between outcomes and environment to use of environment dimensions as dependent variables, classroom environment instruments' differentiates between learning environments questionnaires which assesses the whole-class environment, learning environment assessments should be used in addition to student learning outcome measures to provide information about subtle but important aspects of classroom life for enhancing science education. Research team modified the strongest tradition in past classroom environment research has involved investigation of associations between students' cognitive and affective learning outcomes and their perceptions of psychosocial characteristics of their classrooms with the QTI and CTA questionnaires were selected in this research study.

## METHODOLOGY AND MATERIALS

### Research Aims

1. To investigate of students' perceptions of their science teacher interpersonal behaviours for affecting their learning achievement with their critical thinking abilities in science classes in upper secondary educational students under Secondary Educational Service Area Office 32.
2. To compare of upper secondary students' perceptions of their science teacher interpersonal behaviours according to the different schooling sizes under Secondary Educational Service Area Office 32.
3. To compare between the differentiated schooling sizes with upper secondary students' perceptions of their science classroom learning environments for enhancing their critical thinking abilities in science classes under Secondary Educational Service Area Office 32.
4. To associate between students' perceptions of their science teacher interpersonal behaviours and their critical thinking abilities in science classes under Secondary Educational Service Area Office 32.

### Sample Size

Administrations which sample size consisted of 379 upper secondary students at the 10<sup>th</sup> – 12<sup>th</sup> grade levels, each educational classified level contained of 11 schools whereas they are taught by the science teachers, each science schooling classes consisted of 30-40 students, approximately, and totalized sample size of 379 students under Secondary Service Area Office 32, Buriram Province.

### Research Instruments

1. Students' perceptions of their science teacher interpersonal behaviours were assessed with the 48-item *Questionnaire on Teacher Interaction* (QTI), which it uses a five-point responses format (from Never to Always. Student requires drawing circle the response alternatives on the questionnaire itself in eight scales that they contain six items, so that the minimum and maximum score possible on each of these scales is 6 and 30, respectively., namely; Leadership (Lea), Helping/Friendly (HFr), Understanding (Und), Student Responsibility/Freedom (SRf), Strategies (Str), Morals and Relates (MRe), Emotional Quotient (EQu), and Non-Stricting (NSt) behaviours that they were positive scales of science teacher interpersonal behaviours.
2. Students' performances of their learning achievement within critical thinking were assessed with the 24-item *Critical Thinking Ability* (CTA) Questionnaire in three scales, namely; Activity Process (ACP), Thinking Principal (TPR), Critical Thinking Process, and Critical Thinking Property (CTPO)

### Data Analysis

Assuming that the scaling of the items approximated as Never to Always, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the QTI and the CTA as specified. The multiple correlations, multiple regression, and determination efficient predictive analysis were significant of students' perceptions of their science teacher interpersonal behaviours in the 21<sup>st</sup> century through learning environment inventories for enhancing and improving science learning achievements in science classes in Under Secondary Service Area Office 32 to associate were analyzed.

## RESULTS

To investigate of the affecting science teacher interpersonal behaviours in the 21<sup>st</sup> century through learning environment inventories for enhancing and improving science learning achievements in science classes under Secondary Educational Service Area Office 32. The findings of this study, which were presented in next subsection under three main headings: (1) validation of the questionnaires; the *Questionnaire on Teacher Interaction* (QTI), and the *Critical Thinking Ability* (CTA) ; (1) To investigate of students' perceptions of their science teacher interpersonal behaviours for affecting their learning achievement with their critical thinking abilities in science courses in upper secondary educational students under Secondary Educational Service Area Office 32; (2) To compare of upper secondary students' perceptions of their science teacher interpersonal behaviours according to the different schooling sizes under Secondary Educational Service Area Office 32. (3) To compare between the differentiated schooling sizes with upper secondary students' perceptions of their science classroom learning environments for enhancing their critical thinking abilities in science classes under Secondary Educational Service Area Office 32, and (4) To associate between students' perceptions of their science teacher interpersonal behaviours and their critical thinking abilities in science classes under Secondary Educational Service Area Office 32. A summary of the main findings are provided that followed as:

### Investigations of Students' Perceptions of their Science Teacher Interpersonal Behaviours for Affecting their Learning Achievement with their Critical Thinking Abilities in Science Classes

Using factor loading analysis, intercorrelation circumplex nature scales, and internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales (Discrimination validity) were obtained the sample in this present study as indices of scale reliability and discriminant validity for the QTI, and the CTA. The summary of these values obtained separately for the QTI are reported in Table 1, 2 and 3.

Table 1 *Factor Loading Analysis for the QTI*

item	Factor Loading							
	Lea	HFr	Und	Sre	Str	MRe	EQu	NSt
2	0.777							
3	0.768							
4	0.737							
1	0.736							
6	0.716							
5	0.385							
8		0.780						
12		0.741						
9		0.728						
11		0.710						
7		0.691						
10		0.439						
14			0.806					
13			0.796					
16			0.739					
17			0.737					
15			0.733					
18			0.717					
22				0.774				
20				0.754				
19				0.722				
23				0.718				
21				0.704				
24				0.704				
25					0.755			
29					0.754			
26					0.733			
30					0.731			
28					0.713			



item	Factor Loading							
	Lea	HFr	Und	Sre	Str	MRe	EQu	NSt
27					0.693			
36						0.775		
34						0.754		
35						0.735		
33						0.734		
32						0.731		
31						0.695		
41							0.793	
39							0.779	
40							0.770	
42							0.749	
37							0.745	
38							0.695	
46								0.769
45								0.767
47								0.764
48								0.747
44								0.734
43								0.658
% of variance	48.990	47.714	57.057	53.275	53.303	54.432	57.130	55.529
	2.939	2.863	3.423	3.197	3.198	3.266	3.428	3.332

\* Loading smaller than 0.30 omitted. N=379

### Factor Loading Analysis

Factor loadings represent how much a factor explains a variable in factor analysis. Factor analysis is a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factors. Factor analysis is related to principal component analysis and use to analyze two are not identical. There has been significant controversy in the field over differences between the two techniques, Table 1 and 2 reported on exploratory factor loading analysis versus principal components analysis. Exploratory factor analyses indicated that two factors structured the eight scales. These two factors (with an eigenvalue larger than 1) explained 86% of the variance and could be interpreted as Influence and Proximity dimensions and displays the factor loadings of the two factors found.

To investigate the circumflex nature of the QTI that correlations between the scales were calculated. The results are presents in Table 1 showed the circumflex nature QTI scales. Analyses also indicated that students' perceptions on the two dimensions had predictive validity: both dimensions were positively related to both cognitive and affective student outcomes.

In table 1 and 2, the forms of the QTI and the CTA were subjected to separate principal component factor analyzes (with verimax rotation) involving the individual students' score. The factor structure that emerged replicated extent, and list the items which were found to have factor loadings greater than 0.30 (which is the minimum value conventionally accepted as meaningful in factor loading analysis).

Table 2 Factor Loading Analysis for the CTA

Scale	Item	ACP	TPR	CTPR	CTPO
Activity Process (ACP)	5	0.756			
	3	0.754			
	4	0.734			
	1	0.710			
	6	0.682			
	2	0.605			
Thinking Principal (TPR)	8		0.812		
	9		0.780		
	10		0.763		
	11		0.714		

Scale	Item	ACP	TPR	CTPR	CTPO
Critical Thinking Process (CTPR)	7		0.691		
	12		0.941		
	15			0.788	
	14			0.784	
	13			0.765	
	16			0.758	
	18			0.692	
Critical Thinking Property (CTPO)	17			0.684	
	22				0.804
	20				0.767
	21				0.765
	19				0.743
	23				0.732
	24				0.668
% of variance		50.232	54.124	55.689	55.894
Eigenvalue		3.014	3.247	3.341	3.354

\*Loading smaller than 0.20 omitted.  $N = 379$

On the whole, it appears that the items had factor loadings greater than 0.30 with their a priori scales, and hence, the results lend support to the factorial validity of the QTI and the CTA.

### *The Intercorrelations Circumplex Nature Scale of the Questionnaires*

In statistics, the interclass correlation of intercorrelation coefficient is an inferential statistical that can be used when quantitative measurements are made on unit that are organized into groups. It describes how strongly units in the same group resemble each other. While it is viewed as a type of correlation, unlike most other correlation measures it operates on data structured as groups, rather than data structured as paired of analysis. To investigate the circumplex nature of the QTI and the CTA, correlations between the scales were calculated. The results are presented in Table 3 and 4.

Table 3 Scale Intercorrelation Circumplex Nature for the QTI

	Lea	HFr	Und	SRf	Str	MRe	Equ	NTr
Lea		0.620***	0.638***	0.573***	0.560***	0.621***	0.598***	0.671***
HFr			0.793***	0.691***	0.569***	0.656***	0.643***	0.698***
Und				0.756***	0.760***	0.798***	0.766***	0.782***
SRf					0.728***	0.753***	0.722***	0.731***
Str						0.779***	0.738***	0.715***
MRe							0.844***	0.811***
Equ								0.830***
NTr								

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

As expected, the results show that the correlation between a scale and the next scale in generally is high, and become lower for scales further away from that scale. This is illustrated using each scale in table 1, 2 and 3. In general, the circumplex nature of the QTI and the CTA have been confirmed. Student Responsibility/Freedom (SRf), Strategies (Str), Morals and Relates (MRe), Emotional Quotient (Equ), and Non-Stricting (NSt)

Table 4 Scale Intercorrelation for the CTA

Scale	ACP	TPR	CTPR	CTPO
Activity Process (ACP)		0.760***	0.755***	0.696***
Thinking Principal (TPR)			0.789***	0.767***
Critical Thinking Process (CTPR)				0.757***
Critical Thinking Property (CTPO)				

$N = 379$ ,  $*p < .05$ ,  $**p < .01$ ,  $***p < .001$

### Internal Consistency Cronbach Alpha Coefficient Reliability

Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales (Discrimination validity) were obtained the sample in this present study as indices of scale reliability and discriminant validity for the QTI and the CTA. The summary of these values obtained separately for the QTI, and the CTA are reported in Table 5 and 6.

Table 5 Mean, Average Mean, Standard Deviation, Variance, Cronbach Alpha Reliability, Discrimination, and F-test for the QTI

Scale	Mean	Average Mean	Standard Deviation	Variance	$\alpha$ -Reliability	Discriminant	F-test	Sig.
Leadership	19.192	3.199	3.669	13.463	0.691	0.815	2.848*	.014
Helping/Friendly	19.493	3.249	3.727	13.896	0.688	0.815	2.835*	.015
Understanding	19.039	3.173	3.499	12.250	0.849	0.792	7.787***	.000
Student Responsibility/ Freedom	19.032	3.172	3.372	11.375	0.823	0.796	2.436*	.033
Strategies	19.332	3.222	3.343	11.175	0.824	0.796	10.123**	.000
Morals and Relates	19.127	3.188	3.453	11.926	0.832	0.794	1.349*	.024
Emotional Quotient	19.298	3.216	3.491	12.189	0.849	0.792	1.986*	.048
Unrestricting	19.501	3.250	3.361	11.293	0.837	0.795	18.110**	.000

$N=379$ ,  $*p < .05$ ,  $**p < .01$ ,  $***p < .001$

As reported in Table 5 and 6, the mean score ranged from 3.172 reliability coefficients for the different scales of the QTI ranged from 0.688 to 0.849. In terms of the CTA, reliability coefficients ranged from 0.800 to 0.840 when using the individual student as the unit of analysis. On the whole, these results are acceptable although somewhat higher than obtained previously validation sample (Wubbels & Levy, 1993<sup>[10]</sup>; Santiboon, 2013<sup>[14]</sup>; Elkins, 2014<sup>[22]</sup>).

Table 6 Mean, Average Mean, Standard Deviation, Variance, Cronbach Alpha Reliability, Discrimination, and F-test for the CTA

Scale	Mean	Average Mean	Standard Deviation	Variance	$\alpha$ -Reliability	Discriminant	F-test	Sig.
Activity Process	21.058	3.510	3.859	14.891	0.800	0.835	5.235***	.000
Thinking Principal	21.079	3.513	3.965	15.724	0.826	0.827	2.359*	.038
Critical Thinking Process	21.251	3.542	4.118	16.961	0.840	0.822	9.925***	.000
Critical Thinking Property	21.839	3.640	4.188	17.543	0.840	0.822	10.651***	.000

$N=379$ ,  $*p < .05$ ,  $**p < .01$ ,  $***p < .001$

The outcomes of this study indicate that a reliable and valid adaptation of the QTI for the Thailand context could be made. The instrument consisted of 48 items and displayed high reliability. Also, the instrument could clearly distinguish between classes, because intra-class correlations were very high.

### Comparisons between Upper Secondary Students' Perceptions of their Science Teacher Interpersonal Behaviours according to the Different Schooling Sizes under Secondary Educational Service Area Office 32

The QTI has a five-point response scale, ranging from Never/Not at All to Always/Very. It is scored on the basis of eight sectors or two summarising dimensions of Influence (or DS) and Proximity (or CO). The QTI has demonstrated acceptable reliability and validity. Cronbach's  $\alpha$  coefficient of the eight scales was high (between 0.688 and 0.849 at the class level) and intra-class correlations of the scales ranged between 0.621 and 0.844, indicating that the instrument was capable of distinguishing between classes.

Table 7 Comparisons between Upper Secondary Students' Perceptions of their Science Teacher Interpersonal Behaviours according to the Different Schooling Sizes under Secondary Educational Service Area Office 32

Schooling Size	Accounting Sample		Total Average mean	Standard Deviation	Paired Sample Size	t-test	ANOVA Results ( $\eta^2$ )	Sig.
	School	Students						
Extra	2	69	3.229	0.459	Extra-Large Size	0.241	0.547***	0.810
Large	3	105	3.207	0.545	Extra-Medium Size	0.126	0.537***	0.900
Medium	5	175	3.219	0.474	Extra-Small Size	3.492**	0.803***	0.002
Small	1	30	2.806	0.444	Large-Medium Size	0.037	0.385***	0.971
					Large-Small Size	2.804**	0.933***	0.009
					Medium-Small Size	3.557***	0.677***	0.001

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 8 Comparisons between Upper Secondary Students' Perceptions of their Critical Thinking Abilities according to the Different Schooling Sizes under Secondary Educational Service Area Office 32

Schooling Size	Accounting Sample		Total Average mean	Standard Deviation	Paired Sample Size	t-test	ANOVA Results ( $\eta^2$ )	Sig.
	School	Students						
Extra	2	69	3.740	0.578	Extra-Large Size	1.426	0.601***	0.159
Large	3	105	3.590	0.601	Extra-Medium Size	0.806	0.558***	0.423
Medium	5	175	3.652	0.773	Extra-Small Size	3.636***	0.839***	0.001
Small	1	30	3.189	0.470	Large-Medium Size	-1.363	0.398**	0.176
					Large-Small Size	2.322*	0.778***	0.027
					Medium-Small Size	4.323***	0.784***	0.000

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

To compare between the differentiated schooling sizes with upper secondary students' perceptions of their science classroom learning environments for enhancing their critical thinking abilities in science classes under Secondary Educational Service Area Office 32. The class means of students' schooling sizes, the standard deviations and the  $t$ -test results for statistical significances of Extra-Large Schooling Sizes, Extra-Medium Schooling Sizes, Extra-Small Schooling Sizes, Large-Medium Schooling Sizes, Large-Small Schooling Sizes, and Medium-Small Schooling Sizes. Table 7 and 8 reveal that the differences between the compared means on the Extra-Small Schooling Sizes, Large-Small Schooling Sizes, and the Medium-Small Schooling Sizes of the QTI and CTA scales were statistically significant at the 0.01 level.

### Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their Critical Thinking Ability (CTA) Questionnaire for NAF Scale

The simple correlation values (r) are reported in Table 9, 10, 11, 12 and 13 which show significant correlations ( $p < 0.05$ ) between students' critical thinking abilities outcomes and their science teacher interpersonal behaviours all of eight scales.

Table 9 Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their CTA in Active Process Skill

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.457***	0.223***
Helping/Friendly	0.371***	-0.093
Understanding	0.452***	0.023
Student Responsibility/Freedom	0.459***	0.175*
Strategies	0.410***	-0.045
Morals and Relates	0.461***	-0.030
Emotional Quotient	0.500***	0.261**
Unrestricting	0.487***	0.096
Multiple Correlation (R) 0.551***		
Determination Efficient Predictive Value ( $R^2$ ) 0.303***		
F-test 20.117***		

$N=379$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 10 Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their CTA in Thinking Principal Skill

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.447***	0.169**
Helping/Friendly	0.417***	0.037
Understanding	0.477***	0.114*
Student Responsibility/Freedom	0.442***	0.058
Strategies	0.428***	0.027
Morals and Relates	0.456***	-0.070
Emotional Quotient	0.493***	0.228*
Unrestricting	0.483***	0.060
Multiple Correlation (R) 0.540***		
Determination Efficient Predictive Value ( $R^2$ ) 0.292***		
F-test 19.080***		

$N=379$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 11 Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their CTA in Critical Thinking Process Skill

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.409***	0.080
Helping/Friendly	0.397***	-0.019
Understanding	0.529***	0.381***
Student Responsibility/Freedom	0.436***	0.049
Strategies	0.394***	-0.102
Morals and Relates	0.437***	-0.159*
Emotional Quotient	0.486***	0.204**
Unrestricting	0.496***	0.155*
Multiple Correlation (R) 0.560***		
Determination Efficient Predictive Value ( $R^2$ ) 0.314***		
F-test 21.171***		

$N=379$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 12 *Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their CTA in Critical Thinking Property*

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.385***	0.128*
Helping/Friendly	0.347***	-0.045
Understanding	0.429***	0.106*
Student Responsibility/Freedom	0.409***	0.112*
Strategies	0.382***	0.005
Morals and Relates	0.391***	-0.219**
Emotional Quotient	0.472***	0.339***
Unrestricting	0.452***	0.126***
Multiple Correlation (R) 0.508***		
Determination Efficient Predictive Value ( $R^2$ ) 0.258***		
F-test 16.55***		

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

These associations are positive for the scales of Leadership (Lea), Helping/Friendly (HFr), Understanding (Und), Student Responsibility/Freedom (SRf), Strategies (Str), Morals and Relates (MRe), Emotional Quotient (Equ), and Non-Stricting (NTr) scales; there was a more favourable critical thinking abilities towards their science classroom environment climates. The multiple correlations R are significant for the QTI and CTA and show that when scales are considered together there are significant ( $p<0.001$ ) associations with critical thinking abilities with the five scales of Activity Process (ACP) (Table 9), Thinking Principal (TPR) (Table 10), Critical Thinking Process (CTPR) (Table 11), and Critical Thinking Property (CTPO) (Table 12), and Totalized of the CTA (Table 13).

Table 13 *Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their Totalized CTA*

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.469***	0.164**
Helping/Friendly	0.424***	-0.033
Understanding	0.523***	0.175*
Student Responsibility/Freedom	0.483***	0.108*
Strategies	0.446***	-0.032
Morals and Relates	0.482***	-0.135*
Emotional Quotient	0.539***	0.286**
Unrestricting	0.531***	0.122*
Multiple Correlation (R) 0.589***		
Determination Efficient Predictive Value ( $R^2$ ) 0.347***		
F-test 24.546***		

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

The more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the QTI and their learning achievement critical thinking outcomes towards science when the effect of relationships between the scales were controlled. The findings of associations between students' perceptions of their science teacher interpersonal behaviours and their learning achievement critical thinking outcomes for Activity Process (Table 9), Thinking Principal (Table 10), Critical Thinking Process (Table 11), and Critical Thinking Property (Table 12), and Totalized of the CTA (Table 13) scales were associated.

The multiple correlations (Rs) are significant for science classroom learning environment with students' perceptions of their science teacher interpersonal behaviours and their learning achievement outcomes with the CTA and showed that when the scales are considered together there is a significant ( $p<0.05$ ) association with the CTA. The  $R^2$  values indicate that 30%, 29%, 31%, 26% and 35% of their learning achievement critical thinking outcomes for Activity Process, Thinking Principal, Critical Thinking Process, and Critical Thinking Property, and Totalized of the CTA, respectively, which results of the variance in student's learning achievement critical thinking outcomes were attributable to their perceptions of their science teacher interpersonal behaviours. The



beta weights ( $\beta$ ) shows that in science classroom environment inventory perceived greater leadership, helping/friendly, understanding, student responsibility/freedom, strategies, morals and relates, emotional quotient, and unrestricting scales, there were a less favorable learning achievement outcomes towards science.

### CONCLSSIONS AND DISCISSIONS

In this study, research on teacher–student relationships in classroom learning environment in science classes was explored and studies the entire world. The authors review the research that examines teaching from an interpersonal perspective using a communicative systems approach and propose a model to describe teacher–student relationships in terms of teacher behavior. The studies used the 48-items *Questionnaire on Teacher Interaction* (QTI) to collect data on students' and teachers' perceptions of the teacher–student relationship (Wubbels & Brekelmans, 2005) [12]. behaviors for which science teachers reported higher perceptions overall on eight scales of the QTI than their students' leading, helpful/friendly and understanding, student responsibility and freedom, strategies, morals and relates, emotional quotient, and non-strict behaviours have found to be positively related to students' critical thinking abilities. To determine the level of correlation between critical thinking, as measured by Atkinson's Risk, and student performance with the *Critical Thinking Ability (CTA) Questionnaire* (Thomas, 2014) [21] as measured upper secondary students under Secondary Service Area Office 32, Buriram Province, Thailand, which sample size consisted of 379 students who responses of their perception in 11 science schooling classes with the QTI, and the CTA questionnaires in this research study was designed.

The aims of this research study focused on students' perceptions in upper secondary educational students under Secondary Educational Service Area Office 32, were to investigate and compare of students' perceptions of their science teacher interpersonal behaviours with their critical thinking abilities in science classes according to the different schooling sizes, and associate between students' perceptions of their science with the QTI in eight scales and the CTA in four scales in science classes under Secondary Educational Service Area Office 32. Assuming that the scaling of the items approximated a 5- point Likert scale, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the QTI and the CTA as specified. The multiple correlations, multiple regression, and determination efficient predictive analysis were significant of students' perceptions of their science teacher interpersonal behaviours in the 21<sup>st</sup> century through learning environment inventories for enhancing and improving science learning achievements in science classes in under Secondary Service Area Office 32 to associate were analyzed. The procedures appropriated statistically significant included scale analysis with factor loading analysis, the circumplex nature scales, Cronbach alpha, and discriminant validity. As expected, the results show that the correlation between a scale and the next scale in generally is high, and become higher for scales further away from that scale with the intercorrelation circumplex nature scales' analysis were illustrated of the QTI and the CTA have been confirmed.

In this study, it was also considered important to investigate associations between students' perceptions of their science teachers' interpersonal behaviours and their critical thinking theory toward science. The selection of an evaluation and assessment instrument suitable was required. The simple correlation values ( $r$ ), which show significant correlations ( $p < 0.05$ ) between students' critical thinking abilities outcomes and their science teacher interpersonal behaviours all of eight scales. These associations are positive for the scales of *Leadership, Helping/Friendly, Understanding, Student Responsibility/Freedom, Strategies, Morals and Relates, Emotional Quotient*, and *Unrestricting* scales for the QTI. There were more favourable critical thinking abilities towards their science classroom environment climates.

Associations between students' perceptions of their science teacher interpersonal behaviours and their critical thinking outcomes for *Activity Process, Thinking Principal, Critical Thinking Process, and Critical Thinking Property* scales, and Totalized of the CTA, respectively, and showed that when the scales are considered together there is a significant ( $p < 0.05$ ) association with the CTA. The  $R^2$  values indicate that 30%, 29%, 31%, 26% and of their critical thinking outcomes for *Activity Process, Thinking Principal, Critical Thinking Process, and Critical Thinking Property* and *Totality* of the CTA, respectively, which results of the variance in student's critical thinking outcomes were attributable to their perceptions of their science teacher interpersonal behaviours, there were more favorable learning achievement critical thinking outcomes towards science, significantly.

### ACKNOWLEDGEMENT

I would first like to thank my thesis of the Master of Science Education/ Faculty of Education; Advisor Dr. Tanawat Somtua and Dr. Wandee Rakrai of Faculty of Science, Faculty of Education, Rajabhat Mahasarakham University. I also thank to the 379-secondary students in 11 schools under Service Area Office 32, Buriram Province. The door to Prof. Santiboon was always open whenever I ran into a trouble spot or had a question about my research or writing. He consistently allowed this paper to be my own work, but steered me in the right the



direction whenever he thought I needed it. Finally, the greater thank to my family, Dad and Mom, and my parents who supported of this research has been going on work, completely.

## REFERENCES

- [1] UNICEF. (2016). *Overview of Thailand education*. Retrieved from [https://www.unicef.org/thailand/education\\_303.html](https://www.unicef.org/thailand/education_303.html)
- [2] PISA. (2015). *Collaborative problem solving: PISA results 2015*. Retrieved from <http://www.oecd.org/pisa/>
- [3] Ruhe, J. (2016). *Why the Thai education system is running so poorly: The main problems & Possible solutions 2016*. Retrieved from <http://jaiguytravels.com/2016/02/06/why-the-thai-education-system-is-running-so-poorly-the-main-problems-and-possible-solutions-2016/>
- [4] Educational Testing Center, Office of the Basic Education Commission. (2011). *Quality standards for basic education for internal quality assurance of educational institutions*. Retrieved from <http://satitprasarnmit.ac.th/pdf/qa.pdf>
- [5] Santiboon, T. & Fisher, D. (2005). *Learning environments and teacher-student interactions in physics classes in Thailand*. Proceedings of the Fourth International Conference on Physics, Mathematics and Technology Education Sustainable Communities and Sustainable Environments: Envisioning a Role for Physics, Mathematics and Technology Education, Victoria, Vancouver, Canada.
- [6] Wade, M. (2016). Visualizing 21<sup>st</sup>-century classroom design. *George Locus Educational Foundation*. Retrieved on 29 March 2016 from <https://www.edutopia.org/blog/visualizing-21st-century-classroom-design-mary-wade>
- [7] Goerts, P. (2015). 10 signs of a 21<sup>st</sup> century classroom. *George Locus Educational Foundation*. Retrieved on 16 April 2015 from <https://www.edutopia.org/discussion/10-signs-21st-century-classroom>
- [8] Firestone, M. (2015). What is a learning environment in classrooms? Retrieved on 14 June 2015 from <http://study.com/academy/lesson/learning-environment-in-the-classroom-definition-impact-importance.html>
- [9] Rich, E. (2010). How do you define 21<sup>st</sup>-century learning. Retrieved on 11 October 2010 from <https://www.edweek.org/tsb/articles/2010/10/12/01panel.h04.html>
- [10] Patankar, P. S. (2013). Role of teachers in curriculum development for teacher education. ResearchGate. Retrieved in October 2013 from [https://www.researchgate.net/publication/258023165\\_roleofteachers'incurriculum\\_development\\_for\\_teacher\\_education](https://www.researchgate.net/publication/258023165_roleofteachers'incurriculum_development_for_teacher_education)
- [11] Santiboon, T. (2013). School environments inventory in primary education in Thailand. *Merit Research Journal of Education and Review* (ISSN: 2350-2282) Vol. 1 (10) pp. 250-258, November, 2013
- [12] Fraser, B. J. (1994). Research on classroom and school climate. In D. Gabel (Ed.), *Handbook of research on science teaching and learning* (pp. 493-541). New York: Macmillan.
- [13] Fraser, B. J., & Walberg, H. J. (Eds.). (1991). *Educational environments: Evaluation, antecedents and consequences*. Oxford, UK: Pergamon.
- [14] Wubbels, T., Creton, H. A., & Hooymayers, H. P. (1992). Review of research on teacher communication styles with use of the Leary model. *Journal of Classroom Interaction*, 27, 1-12.
- [15] Wubbels, T., & Levy, J. (Eds.). (1993). *Do you know what you look like? Interpersonal relationships in education*. London: Falmer.
- [16] Wubbels, T., Creton, H. A., & Hooymayers, H. P. (1985). *Discipline problems of beginning teachers: Interactional teacher behaviour mapped out*. Paper presented at Annual Meeting of the American Education Research Association, Chicago.
- [17] Wubbels, T., & Levy, J. (1991). A comparison of interpersonal behaviour of Dutch and American teachers. *International Journal of Intercultural Relations*, 15, 1-18.
- [18] Santiboon, T. (2013). Assessing science students' perceptions in learning activities achievements in physics laboratory classrooms in Udon Thani Rajabhat University. 2012 *International Conference on Education and Management Innovation IPEDR Vol.30* (2012) © (2012) IACSIT Press, Singapore.
- [19] Patterson, R. (2014). 7 ways to improve your critical skills and abilities. Retrieved from <https://collegeinfo geek.com/improve-critical-thinking-skills/>
- [20] Paul, W. R. (1995). *Critical thinking: How to prepare students for a rapidly changing world*. 4th ed. Foundation for Critical Thinking. Retrieved 2017-03-22.
- [21] Glaser, E. D. (1941). *An Experiment in the Development of Critical Thinking*, Teacher's College, Columbia University, 1941).
- [22] Walters, K. (1994). *Re-Thinking Reason*. Albany: State University of New York Press. pp. 181-98.

- [23] Elkins, J. R. (2014). Alternating currents in one teacher's thinking about the critical thinking movement. Retrieved from <http://myweb.wvnet.edu/~jelkins/critproj/overview.html>
- [24] The Foundation for Critical Thinking (2017). Improving education in colleges, universities, and primary through secondary schools using the critical thinking. <http://www.criticalthinking.org//>
- [25] Roberts, A. (2013). *The source of several of the seven ways to think more critically*. Retrieved from <https://www.amazon.com/Thinking-Students-Guide-College-Education-ebook/>
- [26] Santiboon, T. (2017). An instructional design model based learning strategies for fostering students' critical thinking abilities. *Educational Research and Reviews*. Vol. 12 (15) : pp. 712 – 724.
- [27] Elkins, J. R. (2014). Alternating currents in one teacher's thinking about the critical thinking movement. Retrieved on 23 March 2014 from <http://myweb.wvnet.edu/~jelkins/critproj/overview.html>
- [28] Thomas, N. (2014). Achievement motivation theory (Atkinson, 1964). Retrieved on 31 October 2014 from <https://prezi.com/9q-elce2elmx/achievement-motivation-theory-atkinson-1964-12/>

## MODEL DEVELOPMENT OF KNOWLEDGE MANAGEMENT FOR MODERN AGRICULTURE RICE FARMING TO PROMOTE GOOD QUALITY OF LIFE FOR FARMER GROUPS IN MIDDLE NOARTHEASTERN PROVINCES

Chutipa Buddeevong<sup>1</sup>Kamol Trachoo<sup>2</sup> Udon Arakul<sup>3</sup>Sarayuth Kunlong<sup>4</sup>andSamrit Kangpeng<sup>5</sup>

*PhD candidate ,Doctor of Philosophy Program in Educational Management for Local Development Faculty of  
Education, Rajabhat Maha Sarakham University,MahaSarakham 44000, Thailand<sup>1</sup>*

*Lecturer of the Philosophy Program in Educational Management for Local Development, Faculty of Education,  
Rajabhat Maha Sarakham University,MahaSarakham 44000, Thailand<sup>2</sup>*

### ABSTRACT

The research objectives were to (1) analyze and compare the present and desirable condition and needs of knowledge management, (2) develop model of knowledge management, and (3) create handbook and effect memorable of understanding of implementation of the model of knowledge management for modern agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces. The three-phase study started by collecting data from the sample of 741 farmers with questionnaire. The second phase involved multi-case study from three Best Practice organizations with case study form and in-depth interview form for data collecting. The model confirmation employed connoisseurship meeting. The third phase involved creating implementation hand book and agreement. Data analyses comprised descriptive statistics, Paired-Samples t-Test, Modified Priority Index (PNImodified), content analysis, and inductive summary. The findings are the following. (1) The present condition has the operation at low level and the desirable condition at high level with .01 statistically significant difference in all dimensions. The needs are present in all dimensions too. (2) The model of knowledge management for modern agriculture rice farming consists of analysis of farmers' condition with SOAR Analysis, and formation of shared policy and shared vision with farmers. The knowledge management process comprises 4 dimensions. The suitability and feasibility assessment is rated high over all. And (3) the handbook and implementation agreement are concluded successfully.

**KEYWORDS:** knowledge management model ; modern agriculture rice farming and good quality of life

## INTRODUCTION

The implementation according to the Twelfth National Economic and Social Development Plan (2017-2021) has followed the following concept and principle. 1) Pursuing and applying the Sufficiency Economy Principle. 2) Participative human-centered development. 3) Supporting and promoting national reform concept. And 4) Development towards security, wealth and sustainability for peaceful society. (Office of the National Economic and Social Development Board, 2017) [1] Moreover, Model Thailand 4.0 directs economic structural reform emphasizing innovation and technology for development. The model sees the agricultural sector as the main core but evolving to Model Agriculture with Smart Farmer capability and agriculturalist as entrepreneur. The driving mechanism depends on the Strength from Within with three key principal mechanisms 4.1) Innovation Driven Proposition from each sector of the country, 4.2) Entrepreneur Driven Proposition as social ideology, and 4.3) Community Driven Proposition. All three must be engaged concurrently and efficiently (Secretariat of the House of Representatives, 2016) [2]

The concepts above are in line with National Strategy Formulation Committee (2015) [3] which formulates 20-Year National Strategy in promoting national competitiveness to developed country. The strategy views upgrading production and innovation for competitiveness and sustainable development in agricultural sector and service sector with food security and safety, trade and entrepreneurial competitiveness, and future economic infrastructure. The upgrading is under the reform framework and all strategically developing factors infrastructure and logistical systems, science, technology and innovation, human capital development and government and private management. This framework must follow major guidelines production and service sector development based on innovation upgrading and environmental friendliness, digital use and strong trading for value-added and production and service expansion with the purpose of excellence in world and regional standing in various industries and services according to changing life and business pattern.

In the agricultural sector the national strategy emphasizes building strong and sustainable production infrastructure for competitiveness, and promoting small agriculturalists to adapt sustainable production that is friendly to environment, and collaborating farmers for strong career, and developing agricultural goods and food that have potential, clean, and safe for the world market. But at present farmer groups face difficulties in their occupation. Rice farming is still barely enough for living and selling due to higher cost of living. Farmers with traditional agriculture cannot increase their income driving them to find employment in cities causing various subsequent social problems.

However the government and concerned agencies have tried to find ways to solve the problems and help farmers gain income continuously. But those methods cannot solve the problems for sustainability due to the traditional farming cannot create income to compete with increasing expenses. Therefore the idea of Modern Agriculture is increasingly interested to the farmers in order to develop better quality of life. The Modern Agricultural rice farming is the grouping of farmers for collaborative activities beginning with learning and business style operation. After the farmers gain strength other good things will return to the group and community such as community rice promoting production center (Kongpila, 2011) [4]

Although the government gives help to the farmers as a whole, but it is still found that the potential and the quality of life level in many dimensions are still lower than target and not in line with knowledge-based economic development and with the challenge of further national development. The Total Factor Productivity (TFP) is not high enough for upgrading value chain. The slow productivity structure improvement from low to high value agriculture product and to processed agriculture industry, and to service industry. Therefore the idea of productivity promotion for small farmer comes in by research and development of agricultural products that are suitable to the locality, and to give income guarantee instead of price guarantee. This idea also promote cost reduction with supporting product factors for systematic income increase with emphasis on knowledge management for innovation and collaborative business operation to achieve continuous and sustainable productivity.

The major cause of the problems above comes from lack of knowledge management system for the people in many occupations. The medium or large organizations are able to have the system and network to create property rights and ability for innovation or adaptation. But the small farmers groups are ignored. The good knowledge management should have the characteristics of small investment with high positive impact. The principal basis of

knowledge management is the concept of Learning Organization and the members must be Learning Persons. The concept is found by Trachoo (2015)[5] who states that individual learning for strength and readiness for community and local development involves these factors: 1) awareness of the needs and importance of learning, 2) having critical and problem solving skills, 3) learning-orientees for self-learning process and suitable application, and 4) having opportunity for learning choices in various forms with continuity, flexibility, quality, as needed, and according to one's ability. The imagination and creativity are necessary for innovation building (Knowledge Management Institute, 2005)[6]

Therefore knowledge management is the creation and distribute knowledge systematically with relation to information processing in and outside organization gathering experiences from individual groups in order to create knowledge and innovation. The knowledge can be applied to performing tasks in and outside organization for effectiveness and efficiency and later to the benefits of the public (Collison and Parcell, 2004[7], Stoll et al., 2006[8], Cannata, 2007[9], Kenoyer, 2012)[6]

The researchers who support the network of farmers groups were interested to the issues above and performed the study on model development of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces. This study will lead to farmer quality of life development and the starting point for innovation for Modern Agriculture rice farming based on wisdom and local community to achieve collaboration, promotion, and building community economy based on self-reliance in order to achieve security, wealth and sustainability according to national development goals.

### Research Question

1. What are the present and desirable condition and needs of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces?
2. What are the factors of the model of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces?
3. What is the handbook and agreement with target group for the application of the model of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces?

### Research Objective

1. To analyze and compare present and desirable condition and needs of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces.
2. To develop model of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces.
3. To write handbook and effect agreement with target group for the application of the model of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces.

### Limit of Study

#### 1 Population, Sampling and Target Group

1.1 Population and Sampling. The population is 645 rice farmer groups in the Middle Northeastern provinces. The sample size is determined by Yamane equation with 5 percent error and with multi stage random sampling. The sample is derived from 247 group with 3 for each totaling 741 persons.

1.2 The target group is the best practice organization on knowledge management and Modern Agriculture rice farming. The three are: 1) Maha Sarakham College of Agriculture and Technology, Amphoe Mueang, Maha Sarakham. 2) Nam Om Rice Farming Group, Amphoe Kho Wang, Yasothon; and 3) Bak Ruea Farming Group, Amphoe Maha Chana Chai, Yasothon. The stakeholders include 12 persons. Nine experts give in-depth interview. Twenty-five for model investigation and confirmation. Thirty rice farmer group members from Ban Kut Wa, Kut Wa Sub District, Amphoe Kuchinarai, Kalasin volunteer for the project.

## 2 Research variable

2.1 Variable on Modern Agriculture rice farming knowledge management. This variable includes knowledge management process, information technology management, cultural management, human management, and organization leadership.

2.2 Variable on promotion good quality of life for farmers. The variable includes dimensions on physical, mental, social relations, environment, and learning.

## RESEARCH METHODOLOGY

This study is a Research and Development and Mixed Methods Research with explanatory sequential design. It starts with quantitative data collection followed by qualitative one. This method is used due to the literature review can give researchers adequate data for developing research conceptual framework and collecting tools (Creswell, 2015)[10]. The study is divided by 3 phases as the following.

**Phase 1.** Study of present, desirable condition and needs of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces.

1. Study of documents, concept, theories, and related research papers.
2. Survey study on analysis and comparison of the present and desirable condition and needs of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces. The data were collected from 247 rice farmers groups 3 persons from each totaling 741 persons with multi stage sampling. They were surveyed by the 5-rating scale questionnaire with 0.95 reliability. The data were analyzed with descriptive statistics and paired samples t-test and with Modified Priority Needs Index (PNI modified) technique.

3. Creating model of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces. The operation is as following.

- 3.1 Multi-Case Study. The researchers examined 3 Best Practice organizations cited for knowledge management and Modern Agriculture rice farming between December 9, 2017 to February 15, 2017. They are 1) Mahasarakham College of Agriculture and Technology, Amphoe Mueang, Maha Sarakham. 2) Nam Om Rice Farming Group, Amphoe Kho Wang, Yasothon; and 3) Bakruea Farming Group, Amphoe Mahachanachai, Yasothon. The data collecting tool was case study form. The data analysis employed content analysis and inductive summary.

- 3.2 In-depth interview. The informants were selected by snowball sampling getting advises from experts for targeted informants. The interviews were conducted between February 20 2017 to March 30, 2017. The 9 interviewees were selected by their experiences from knowledge management and modern rice farming. They are categorized as 1) high-ranking executives responsible for Modern Agriculture, 2) school administrators managing learning centers of Sufficiency Economy Principle, 3) outstanding farmers, 4) local wise men or local wisdom experts who have outstanding work on Modern Agriculture, and 5) academics or persons whose main task is knowledge management. The data collecting tool was semi-structured interview form. The analysis employed content analysis.

4. With the information on documentary study, concepts, theories, and related research papers, survey, multi-case study, and in-depth interview, the researchers created the draft model of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces.

**Phase 2** The development of model of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces.

1. Prior model evaluation, the draft model was evaluated from 12 stakeholders with experiences on knowledge management and modern rice farming. The evaluation was on suitability and possibility with 5-level rating scale. The model was improved according to suggestions.

2. Examination and confirmation of model with connoisseurship. The meeting was participated by 25 experts on April 29, 2017 at Gold Mountain Wangnamkeaw Resort, Wang Nam Khiao District, Nakhon Ratchasima.



The experts comprised 1) high-ranking executive responsible for modern rice farming, 2) school administrators who manage learning centers of Sufficiency Economy Principle, 3) Expert education supervisors responsible for learning management according to Sufficiency Economy Principle, 4) academics on knowledge management and modern rice farming, and 5) experts from universities. The data collecting tool was check list form. Data analysis employed percentage statistics and comparing with pre-defined criteria.

**Phase 3** Writing handbook and effect agreement with target group for applying the model of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces.

1 The researchers created handbook for applying the model of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces from the results of Phase 2. The handbook was written for easy understanding. The dissertation committee members checked the validity and then the book was printed.

2 The researchers brought the handbook to the representative of the target group for reading together with the draft of memoranda of understanding between Rajabhat Maha Sarakam University through Educational Management for Local Development (EMLD) program and the target group. The agreement were signed by both parties.

3 The researchers defined plan and table of applying the model, monitoring and evaluation.

## RESEARCH RESULTS

6.1 The study findings on the present condition of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces are as follow. It is found that the present knowledge management is at medium level with the averages between 2.47-2.87 points. The desirable condition of knowledge management for Modern Agriculture rice farming is very high in all items with the averages between 4.69 – 4.94. The needs of knowledge management for Modern Agriculture rice farming are indicated in all items more than 0.30 point. The present quality of life is at low or medium level with the averages between 2.42-2.87. The desirable condition for good quality of life is at very high level in all items with averages between 4.85-4.94. The needs of good quality of life is above 0.30 in all items. The needs of knowledge management for Modern Agriculture rice farming for good quality of life are indicated in all items (PNI modified = 0.75 – 0.92).

6.2 The results of developing model of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces are the following. The model comprises 1) analysis of farmers with SOAR technique, 2) shared direction and vision, 3) knowledge management process, 4) information technology management, 5) cultural management, 6) human management, 7) organization leadership, 8) community of learning in occupation, 9) evaluation of good quality of life, and 10) feedback. The experts confirmed the developed model.

6.3 The result of handbook writing and making agreement with target group for applying the model of model of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces. It is found that the target group collaborated by making memo of understanding with EMLD.

Issues to be discussed from the research results are as follow.

1. The resulted statistically significant difference between the present and desirable condition indicates the influence of change and innovation toward farmers especially the rice farmer groups. The government and public sector emphasize more on development of commercial rice production. The government puts forward policy to promote technology for farmers and encourages farmers to set up group to reduce cost and become entrepreneur. This trend is stated Secretariat of the House of Representatives (2016), mentioning Thailand 4.0 policy to transform traditional farming to Modern Agriculture with innovation in management and technology to increase farmers' income and becoming entrepreneurs. On the needs of knowledge management for Modern Agriculture rice farming to promote good quality of life, the research results indicate needs in all items. So the government must keep on this policy for prosperity and sustainability. Both the ASEAN Information Center. (2016)[11] and the Secretariat of the House of Representatives (2016) agree that in the past the government and private sector have



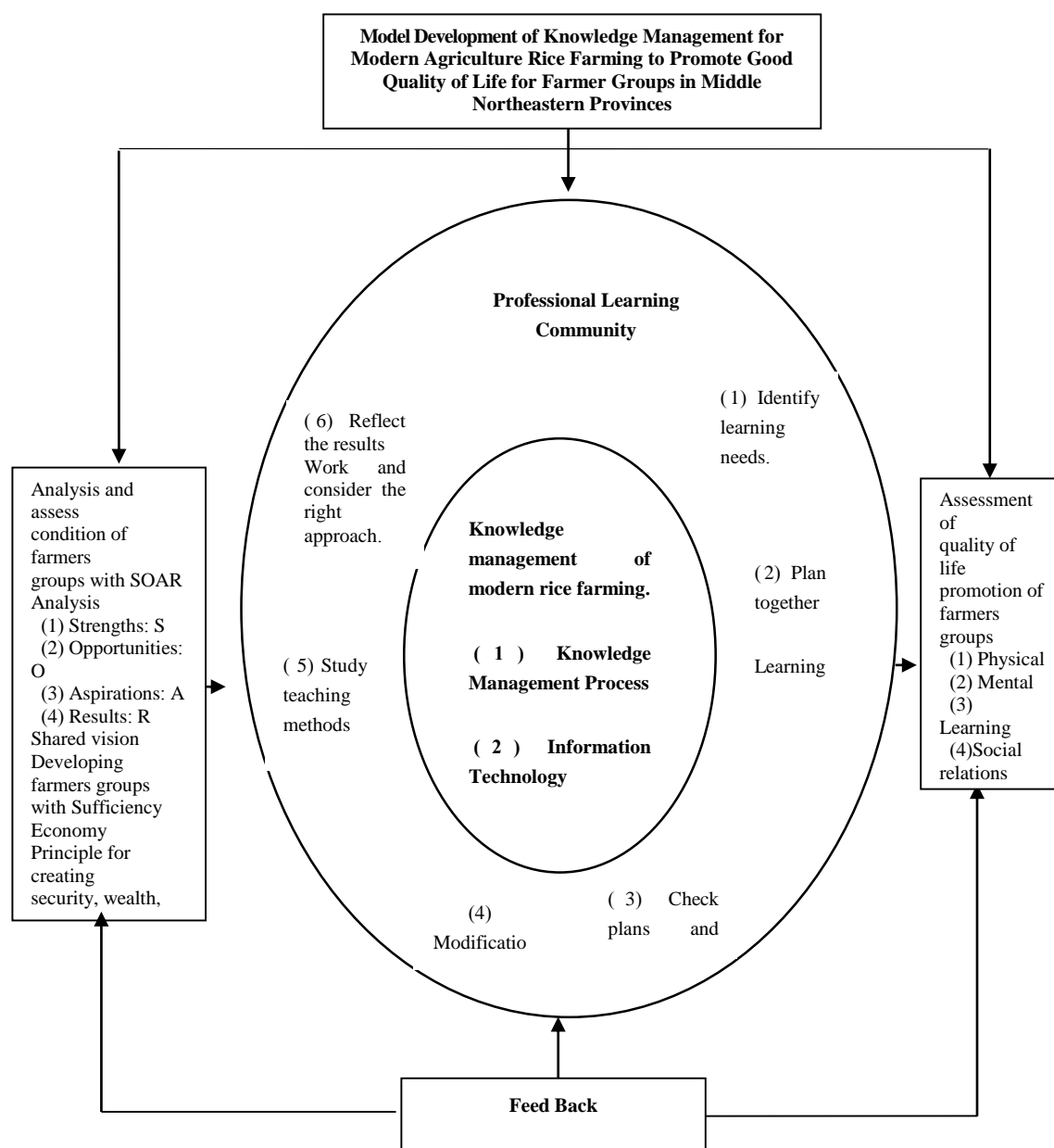
worked to respond the farmers' needs separately. In case of collaboration the government contracted off the private sector to invest and implement the farming support policy. But the past practice is not adequate to face the complex problems of the present and future. Therefore new alternatives and innovation are needed for governance. The best practice is to unite both the government and private sector strengths systematically and with transparency, or bringing "the best of both worlds" for making difference in rice farming production.

2. The developed model of knowledge management from the research is founded that it is useful, possible for implementation, valid, and suitable especially on the knowledge management process and information technology management. The rice farmers need knowledge and modern technology for their occupation. Most rice farmers finished only primary or basic education, they need support from government organizations for shared learning and various innovation techniques. This is in line with Collison and Parcell (2004) [7] who study knowledge management success that comprises 3 integrating actors -- people, process, and technology. The process of promoting community of learning (CL) also help farmers to get together for shared learning on rice farming -- a significant mechanism for sustainable knowledge management. The professional learning community (PLC) in any organization can effect synergic collaboration suitable for its context and culture all state that supporting collaborative culture help develop in any activities. Jarongkiatikul (2015) [12] who studied guidelines long life education for driving community of learning suitable for context and culture of Thailand, found major factors of long life education and outcome of long life education for driving community of learning.

3. The research results from writing handbook and effect agreement with target group for applying the model of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces. It was found that the target group representatives collaborate with EMLD. Since knowledge management for Modern Agriculture rice farming is the interested issue among the group members, the group participated in knowledge seeking, knowledge creation, knowledge storing, and knowledge using. The professional learning community mechanism also supports the movement collaboratively. The mechanism comprises identifying with researchers on farmer's needs, shared planning on knowledge learning, applying knowledge, monitoring plan and implementation, adjusting based on feedback, finding ways for shared learning, testing new methods, and reflecting work process and finding suitable methods. The PLC promotes collaboration and confidence for shared knowledge. The finding is In line with Senge (1990) [13] who stated that learning organization is the unit comprising all members at all levels participating in developing each member's and organization's potential to achieve desired quality performance. Creating strong learning organization is to promote collaborative working as team to uplift organization achievement and shared satisfaction. The findings from this research reveal that effective knowledge management depends on professional learning community mechanism to promote sustainable knowledge management.

## CONCLUSION

The model of knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups in Middle Northeastern provinces after research results can be presented as the diagram below.



## SUGGESTIONS

The suggestions for further research are the following.

### Suggestions for implementation.

8.1.1 Ministry of Agriculture and Cooperatives and agricultural cooperatives can employ the model as pilot projects for rice farming over Thailand. The project can start with strong farmer groups with continuous monitoring as the example. The support budget should be spent continuously.

8.1.2 Government units such as provincial and district agricultural offices should apply the model to rice farmers in their jurisdiction with monitoring to promote rice farming culture concretely and continuously.

8.1.3 Each rice farming group should apply the model according to its context.

### Suggestion for further research.

8.2.1 Other researchers should study and develop the full process of the knowledge management for Modern Agriculture rice farming to promote good quality of life for farmer groups. This research involved only

three months of implementation and measured only farmers' satisfaction. The implementation should cover the full cycle of the start of rice farming to the rice harvest and quality of life measurement to evaluate effectiveness and efficiency of the project.

8.2.2 There should be in-depth research on effectiveness and efficiency of the participation on the knowledge management for Modern Agriculture rice farming to promote good quality of life for rice farmers. The present research covers only the suitability, feasibility and satisfaction of the model for specific rice farmer groups.

8.2.3 Other research projects on knowledge management model of Modern Agriculture rice farming to promote good quality of life for rice farmers should include handbook for implementation and agreement on academic support between educational institute and target group.

### ACKNOWLEDGEMENT

This research has been greatly supported by dissertation advisers Dr. Kamol Trachoo and Udon Arakul together with other experts for their time on research tool validation, and advise on in-depth interview. The help also include multi-case study and connoisseurship meetings. The researchers would like to thank them. Not forgettable are Dr. Suthipong Hoksuan, Assistant Professor Dr. Sarayuth Kunlong, Dr. Samrit Kangpheng, and Dr. Thaksin Sittisak who gave expert advices and quantitative and qualitative data

### REFERENCE

- [1] Office of the National Economic and Social Development Board. (2017). *The Twelfth National Economic and Social Development Plan (2017- 2021)*. Retrieved November 24, 2017, from [http://www.nesdb.go.th/ewt\\_dl\\_link.php?nid=6422](http://www.nesdb.go.th/ewt_dl_link.php?nid=6422)
- [2] Secretariat of the House of Representatives. (2016). *Thailand 4.0*. Retrieved November 8, 2016, from [http://library2.parliament.go.th/ejournal/content\\_af/2559/jul2559-5.pdf](http://library2.parliament.go.th/ejournal/content_af/2559/jul2559-5.pdf)
- [3] National Strategy Formulation Committee. (2015). *Twenty-Year National Strategy Draft BE 2560-2579, Summary*. Retrieved from [http://www.prachinburi.go.th/news\\_paked\\_total/2559/mar59/yutchad20years.pdf](http://www.prachinburi.go.th/news_paked_total/2559/mar59/yutchad20years.pdf), [March 20, 2017]. (in Thai).
- [4] Kongpila, K. (2011). *Teaching Model Development*. Retrieved April 6, 2017, from <http://www.kksec.go.th/webinfo25/abstract/kachane01.pdf>
- [5] Trachoo, K. (2015). *Local Education: Education for Society and Community*. Retrieved April 15, 2017, from <http://www.emld-rmu.com>
- [6] Knowledge Management Institute. (2005). *Knowledge Management*. Retrieved November 1, 2016, from [http://www.bic.moe.go.th/fileadmin/BIC\\_Document/KM/WedJuly2005-9-16-35-Introduce\\_KM.pdf](http://www.bic.moe.go.th/fileadmin/BIC_Document/KM/WedJuly2005-9-16-35-Introduce_KM.pdf),
- [7] Collison, C.; & Parcell, G. (2004). *Learning to Fly : Practical Knowledge Management from some of the world's leading learning organization*. (2<sup>nd</sup>ed). West Sussex : Capstone.
- [8] Stoll, L et al. (2006). *Professional Learning Communities: A review of the literature*. *Journal of Education Change*. 7: 221-258.
- [9] Cannata, M. (2007). *Teacher Community in Elementary Charter Schools*. Education Policy Analysis Archives. Vol. 15 No. 11 (May 15, 2007): 1-31.
- [10] Creswell, J. W. (2015). *A concise introduction to mixed methods research*. Thousand Oaks, CA : Sage.
- [11] ASEAN Information Center. (2016). *Thailand Model 4.0*. Retrieved November 24, 2017, from [http://www.asean thai.net/ewt\\_news.php?nid=6100&filename=index](http://www.asean thai.net/ewt_news.php?nid=6100&filename=index).
- [12] Jarongkiatikul, S. (2015). *Life-Long Education Educational Management Guideline for Learning Community Movement under Thai Social and Cultural*. Research Report. Faculty of Education. Chulalongkorn University.
- [13] Senge, P. (1990). *The Fifth Discipline: The Art and Practice of the Learning Organization*. New York: Currency Doubleday.

# MODEL DEVELOPMENT OF COMMUNITY PARTICIPATION TO PROMOTE LIFE AND MODERN AGRICULTURE CAREER SKILLS IN SCHOOL UNDER OFFICE OF THE BASIC EDUCATION COMMISSION IN THE NORTHEAST

Peerapet Sirikul<sup>1</sup> Kamol Trachoo<sup>2</sup> Udon Arakul<sup>3</sup> Samrit Kangpeng<sup>4</sup>  
Sarayuth Kunlong<sup>5</sup> Prachakorn Boriboon<sup>6</sup> and Suwattanapong Romsri<sup>7</sup>

*PhD candidate, Doctor of Philosophy Program in Educational Management for Local Development, Faculty of Education, Rajabhat Maha Sarakham University, Maha Sarakham 44000, Thailand<sup>1</sup>*

*Lecturer of the Philosophy Program in Educational Management for Local Development, Faculty of Education, Rajabhat Maha Sarakham University Maha Sarakham 44000, Thailand<sup>2-7</sup>*

*Corrections were made and changed to light blue letters as the following: 1) Spacing, 2) wording, 3) grammar 4) reference items in line with citation in the content.*

## ABSTRACT

This search and development study objectives were to 1) explore the present and desirable condition and needs of community participation, 2) develop model of community participation, and 3) create handbook and effect memorable of understanding of implementation the model of community participation to promote life and Modern Agriculture career skills of schools under Office of the Basic Education Commission in the Northeast. The three-phase study were as follow. 1) Exploring present and desirable condition from the sample of 388 schools with 1,940 respondents. The target group consisted of 4 best practice organizations and experts. Data collecting tools were questionnaire, multi-case study form and interview form. 2) Developing the model with experts and model confirmation by connoisseurship using evaluation form and check list form. 3) Writing handbook and effect agreement with target group. The group comprised members of Ban Kok Wittayakom School, Somdet District, Kalasin with satisfaction evaluation form. The data were analyzed with descriptive statistics, PNI<sub>modified</sub> technique, and content analysis. The findings are the following. The present condition for community participation is at medium level practice. Desirable condition is at very high level. The needs of community participation are required in all items. The model comprises 1) analysis of school condition with shared policy and vision with community; 2) community process including brainstorming, planning, taking action, monitoring, mutual benefits, and network building; 3) evaluation for life and modern agriculture career skills including building relations with others, problem solving, communication, creativity on innovation and technological application, and sufficiency; and 4) feedback on suitability and possibility at very high and high model approval. The handbook is written and agreement with target group is achieved.

**KEYWORDS:** community participation, life and career skills, modern agriculture

## INTRODUCTION

From the present condition and changing context the country has been facing, the Twelfth National Economic and Social Development Plan (2017-2021) defines the vision with upgrading education and learning quality equally and equitably. The plan has 4 outlines. 1) Reforming educational management with accountability. 2) Reforming educational financing for better quality and effectiveness by direct budgeting to learners and promoting collaboration from the private sector. 3) Developing teacher quality system-wise starting from teacher education, teacher searching, and teacher selection for good and smart teacher including education evaluation and qualification based on learner outcome. And 4) Reforming learning based on human capacity building system-wise from primary level to long-life learning and learning media, curriculum improvement and educating human resources suitable for the change and needs of market, including research and technology use for learning media. The reform above is in line with the vision -- Thailand is a wealthy, sustainable and developed country with development according to Sufficiency Economy Principle. Or the national motto -- Security, Wealth, Sustainability (Office of the National Economic and Social Development Board, 2015[1], National Strategy Committee, 2015).[2]

Thailand 4.0 national policy drives to transform all system of 4 main factors. 1) Transforming traditional farming to modern agriculture emphasizing on management and smart farming to achieve wealth for farmers and becoming entrepreneurs. 2) Transforming from traditional SMEs being supported continuously to smart enterprises and startups with high potential. 3) Transforming from traditional services with low value creation to high value services. And 4) Transforming from low skilled workers to high skilled workers with knowledge and expertise. The Thailand 4.0 policy factors mentioned above is the economic reform with innovation and technology while the agricultural sector is still the core but changing traditional agriculture to modern agriculture creating smart farmers and entrepreneurs (Secretariat of the House of Representatives, 2016, p. 2).[3]

The reform concept above requires quality education especially on schools which have major role in educating citizens to desirable characteristics. The people should be smart, good, and happy with suitable livelihood. They should be able to learn and develop all skills continuously for life. Therefore developing modern agriculture career skills in school is the main concept all schools must integrate into the curriculum to follow the national policy goals. The emphasis should be on planting and animal raising which is the main occupation for Thai farmers. This emphasis would lead to grass root community economy and social enterprise. The promotion of SMEs to be able to compete in the world market is the answer to the problems and challenges in all dimensions. The upgrading of capacity, skills is to fulfil people potential to further face the outside changes (Public Relations Department, 2016).[4]

The present condition for basic education schools in the Northeast is beset with quality problems. Most parents in this countryside earn little income by rice farming so they can hardly support their children's education. Moreover, many schools lack budget and personnel (Office of Basic Education Commission, 2015, p.23).[5] The government has been solving the problems but does not succeed either merging smaller schools to large ones or implementing magnet schools. The problem solving by management is the least cost but the highest efficiency. The management by community participation for educational management for developing students is the future trend. The participative management has many meanings and concepts. The multi-dimension participation techniques all have common similarities. They promote development, share mutual benefits equally, give confidence for decision-making for policy formation, and implement social and economic plans.

However, to see the whole picture of participation, one must look at the context by defining meaning and understanding to enable the process of encouraging all level of organization members or stakeholders to share work and management duty, decision-making, implementing and evaluating. Baksh (1995),[6] Hoy and Miskel, (2001) [7], Ramesh and Rao, (1990).[8] This is in line with Trachoo (2015) [9] stating quality community development for shared school improvement. The community needs lifelong learning strategy and can access learning technology for community network building together with continuous lifelong learning innovation.

Schools should implement the Sufficiency Economy Philosophy (SEP) model into teaching tool as the overall concept and implementation guideline including SEP process drive step by step for widespread use. The process would create resistance for Thai society to face outside changes. Suitable risk management can help balance and sustain development. This is in line with the policy of Office of Basic Education Commission (OBEC) to stress creation and development of innovation with STEM for learning improvement as the major mechanism for promotion and development of innovation as a whole Avery and Bergsteiner, (2011) [10], Office of Public-Private Collaboration Project, (2016).[11]

From the above background together with the government policy to promote research and development of technology and innovation on personnel and infrastructure investment, management, entrepreneurship role in technology and innovation, and utilization of research for business and public with property rights protection for

school, the researchers were interested to study model development of community participation to promote life and modern agriculture career skills in schools under Office of the Basic Education Commission in the Northeast. This study would answer research problems in basic education school to achieve learning and sufficiency society according to social environment, and effective education quality development of the country as a whole.

### RESEARCH QUESTION

1. What level are the present, desirable condition, and needs of community participation to promote life and modern agriculture career skills in schools under Office of the Basic Education Commission in the Northeast?
2. What is the model of community participation to promote life and modern agriculture career skills in schools under Office of the Basic Education Commission in the Northeast?
3. What is the satisfaction of the handbook and agreement with target group for implementation of the model of community participation to promote life and modern agriculture career skills in schools under Office of the Basic Education Commission in the Northeast?

### RESEARCH OBJECTIVES

1. To explore the present, desirable condition, and needs of community participation to promote life and modern agriculture career skills in schools under Office of the Basic Education Commission in the Northeast.
2. To develop the model of community participation to promote life and modern agriculture career skills in schools under Office of the Basic Education Commission in the Northeast.
3. To write the handbook and make agreement with target group for implementation of the model of community participation to promote life and modern agriculture career skills in schools under Office of the Basic Education Commission in the Northeast.

### LIMIT OF STUDY

#### 1. Research population, sample and target group

**Phase 1.** The population and sample comprised 25,044 schools under Office of the Basic Education Commission in the Northeast. The sample size of 388 schools was derived with Yamane equation with 0.05 error coefficient. The target group included 4 best practice organizations. The 9 experts for in-depth interview were obtained from purposive sampling and snowball sampling.

**Phase 2.** The target group comprised 9 model evaluation experts and 24 connoisseurship participants for model confirmation.

**Phase 3.** The target group comprised members of Ban Kok Wittayakom School, Somdet District, Kalasin. The 65 participants were 1) school administrator, 2) teachers, 3) school board members, 4) community leaders, and 5) student parents.

#### 2. Research variable

The research variable is the community participation to promote life and modern agriculture career skills. It comprises the following.

2.1 Community participation. It has 6 variables -- 1) brainstorming participation, 2) planning participation, 3) taking action participation, 4) monitoring participation, 5) mutual benefits participation, and 6) network building participation.

2.2 Promotion life and modern agriculture career skills. It has 5 variables -- 1) building relations with others, 2) problem solving, 3) communication, 4) creativity on innovation and technological application, and 5) sufficiency.

### RESEARCH METHOD

**Phase 1.** Study of present, desirable condition, and needs of the community participation to promote life and modern agriculture career skills.

1. Document study and synthesis of factors.

2. Survey of present, desirable condition and needs of the community participation to promote life and modern agriculture career skills. The sample comprises 388 schools under Office of the Basic Education Commission in the Northeast. Each school provided 5 respondents-- 1) school administrator, 2) teachers, 3) school board members, 4) community leaders, and 5) student parents. The total number of 1,940 people were derived from multi-stage sampling and simple random sampling. The data collecting tool is rating scale questionnaire with 0.98 reliability. The data analysis employed descriptive statistics, and Modified Priority Needs Index (PNI<sub>modified</sub>) technique.



3. Multi-case study. Participants of 4 best practice organizations on community participation and promotion of life and modern agriculture career skills gave data between December 7, 2016 to January 15, 2017. They are 1) Suranaree University of Technology, Mueang District, Nakhon Ratchasima, 2) Mahasarakham College of Agriculture and Technology, Khwao Subdistrict, Mueng District, Maha Sarakham, 3) Ban Jot Na Tan School, Na Than Subdistrict, Kham Mueang District, Kalasin and 4) Sathyasaith School, Huai Hin Subdistrict, Chai Badan District, Lop Buri. The data were collected from documents, observation, and interview. The analysis employed content analysis.

4. In-depth interview. Nine expert participants derived from snowball sampling were given in-depth interview between January 20, 2017 to March 15, 2017. They were 1) 2 high-ranking experts responsible for modern agriculture, 2) 3 school administrators who manage Sufficiency Economy Principle learning centers, 3) 2 education supervisors responsible for learning management according to SEP, and 4) 2 agricultural promotion academics. The collecting tool was semi-structured interview form and the data were analyzed with content analysis.

5. Draft model of community participation to promote life and modern agriculture career skills in schools under Office of the Basic Education Commission in the Northeast.

**Phase 2.** Developing model of community participation to promote life and modern agriculture career skills.

1. Evaluation of the model of community participation to promote life and modern agriculture career skills in schools under Office of the Basic Education Commission in the Northeast. Nine experts met to evaluate the model. They were 1) 2 educational service area administrators, 2) 3 school administrators who manage SEP learning center, 3) 2 education supervisors responsible for learning management according to SEP, and 4) 2 modern agriculture academics. The data collecting tool was 5-level rating scale evaluation form. The collected data were adjusted to suggestions with frequency, percentage, mean, and standard deviation statistics.

2. Model confirmation with connoisseurship. On April 28, 2017 at Gold Mountain Wangnamkeaw Resort, Wang Nam Khiao District, Nakhon Ratchasima, 24 experts met for connoisseurship. They were 1) 11 university experts, 2) 5 high-ranking administrators responsible for modern agriculture, 3) 5 school administrators who manage SEP learning centers, and 4) 3 education supervisors responsible for SEP learning management. The data collecting tool was check list form. The data were analyzed with percentage statistics.

**Phase 3.** Writing handbook and making agreement with target group for implementation of the model of community participation to promote life and modern agriculture career skills.

1. Handbook writing for the model implementation that was approved by experts. The handbook comprises background, objectives, factors and indicators, role and responsibility, process, evaluation, and success factors.

2. Organizing project and activities for workshop for handbook writing and making agreement with target group in schools under the Office of Basic Education Commission in the Northeast. The school was selected with purposive sampling from those having pre-primary, primary, and lower mathayomsuksa (secondary) levels. The selected school was Ban Kok Wittayakom School, Somdet District, Kalasin. The meeting was held on June 22, 2017 with 65 participants. They were 1) school administrator, 2) 18 teachers, 3) 13 school board members, 4) 5 community leaders, and 5) 28 student parents. The data were collected with model satisfactory evaluation form. The data were analyzed with frequency, percentage, mean and standard deviation statistics.

## RESEARCH RESULTS

The research find the following.

1. The present condition of community participation to promote life and modern agriculture career skills as a whole is of medium level practice ( $\bar{X} = 2.69, SD = 0.31$ ) with the desirable condition at very high level ( $\bar{X} = 4.83, SD = 0.32$ ). The needs of community participation to promote life and modern agriculture career skills is required in all items ( $PNI_{\text{modified}} = 0.65 - 0.90$ ).

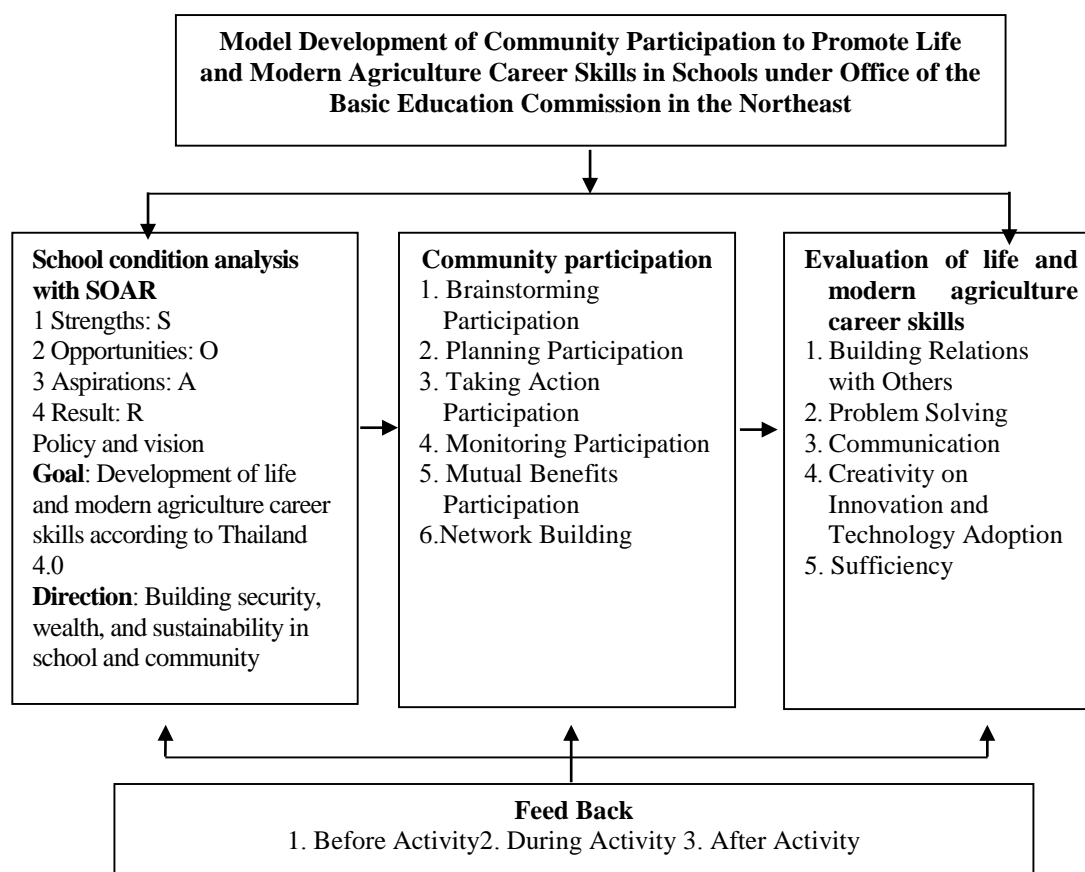
2. The model of community participation to promote life and modern agriculture career skills comprises 1) analysis of school condition with shared policy and vision with community 2) community process includes 6 dimensions - - brainstorming participation, planning participation, taking action participation, monitoring participation, mutual benefits participation, and network building 3) evaluation for life and modern agriculture career skills including building relations with others, problem solving, communication, creativity on innovation



and technological application, and sufficiency; and 4) feedback on suitability and possibility at very high level ( $\bar{X} = 4.50$ ,  $SD=0.51$ ) as a whole, the model confirmation gets 95 per cent approval.

3. Handbook writing and making agreement for the model. It is found that school administrator, teachers, community leaders, school board members, and student parents are satisfied with the project at very high level ( $\bar{X} = 4.52$ ,  $SD=0.45$ ).

Summary with picture and explanation of the model of community participation to promote life and modern agriculture career skills in schools under Office of the Basic Education Commission in the Northeast is below.



**Picture 1.** Model of community participation to promote life and modern agriculture career skills in schools under Office of the Basic Education Commission in the Northeast

## DISCUSSION

The research finds that the model of community participation to promote life and modern agriculture career skills has 4 main factors -- 1) school condition analysis with policy and vision, 2) community participation process, 3) evaluation of life and modern agriculture career skills, and 4) feedback. The discussion is the following.

1. School condition analysis with policy and vision. This is the prerequisite before other factors. The analysis includes goal and direction of Thailand 4.0 in order to be in line with possible changing national development direction. The researchers employed SOAR analysis with outstanding trait on school-based management emphasizing bottom-to-top approach. All organization members fully participate in the analysis, planning, and taking action. This technique helps engage full participation to achieve goal better than the SWOT method which is a top-to-bottom approach. The technique also promotes positive organization culture, focusing strengths and past achievements, aspiration for success, inspiring to shared goal. It also can define performance in each step and connect vision, mission and goals to concrete planning that fits with the present competitive condition Stavros and Hinrichs (2009) [12] Stavros, (2013) [13] Stavros and Cole, (2013) [14], Cox, 2014).[15]

Therefore, school leader who focusses on positive energy, and positive organizational change can suitable employ SOAR analysis for strategic planning.

2. Community participation process. Community participation includes shared decision-making and shared action. This process encourages sense of ownership with positive results to engage all in various development projects. Community members know best what they need, what problems they are facing, and how to solve the problems. The open access to involve community in developing activities helps respond to real needs of the community. In line with Guthrie (1995) [16] finding that the success of school-based management comes from school leader's facilitative leadership that increases participation from community and effective communication among stakeholders giving them satisfaction. In the opposite, the lack of community participation brings less help and lackluster involvement to school (Pauline, 2003).[17]

3. Evaluation of life and modern agriculture career skills. The evaluation of project in all dimensions can indicate the performance success and progress of all activities, either the whole system or organization results. The evaluation seeks the relations among system success, organization performance, and comparing with the best organizations. This benchmarking finds the best way to take action, or best practice for others to adapt and achieve success of their own. However, this evaluation must cover desirable goals that focus on creation of innovation for life and modern agriculture career skills. Partnership for 21st Century Skills (2014) [18], Sarigalaya and Vongkusolkiet (2016) [19], and Tienruek (2014) [20] all emphasize on creative thinking skills on innovation that are in line with Thailand 4.0 education skills.

4 Feedback. Feedback is one of the main factors that indicate success or failure of activity. The feedback can apply before action, during action, and after action. This concept is in line with Kangpheng (2017) [21] and Cambridge International Examinations (2017) [22] that mention the Reflective Cycle focusing on feedback with activities according to Reflection Cycle including design, doing, review, and evaluation. The cycle involves before action review (BAR), during action review (DAR), and after action review (AAR).

Moreover, the implementation of the model of community participation to promote life and modern agriculture career skills in school resulted in very high level of satisfaction among school administrator, teachers, school board members, community leaders, and student parents. This finding is in line with the suitability and possibility evaluation of the model at the very high level. The reason is the model has been through the academic process of design, draft, and evaluation with analysis of school condition together with the vision of the school's higher authority. The model also has been through community participation process of brainstorming for planning making sense of ownership that helps encourage participation in each step. The model also has flexibility for adapting to local context and simple and concise enabling easy implementation. This is in line with Joyce, Weil, and Calhoun (2009) [23] stating good model should be created with analysis of basic data, turning main issue into principle and goal with factors and evaluation of the model for efficiency. Oxford Dictionary (2017) [24] and Kanpheng (2017) [21] describe good model as simple, concise, valid and can be checked with real phenomenon or easily implemented. However this model application was limited by time so that the evaluation for implementation covered only suitability and possibility.

## SUGGESTIONS

From the research results, there are suggestions for application and further study as the following.

### 1. Suggestions for application

1.1 The Office of Basic Education Commission (OBEC) should use the model of community participation to promote life and modern agriculture career skills for other schools giving lower and higher level mathayomsuksa (secondary level) for life and career skills development with participation. The testing of the model in this research finds that stakeholders or participants have very high satisfaction. STEM education in the teaching system can be integrated with agricultural subject into what is called STEAM Science/Technology/Engineering/Agriculture/Mathematics). The government should give continues support for research and development budget.

1.2 The Northeast educational service areas should use the model of community participation to promote life and modern agriculture career skills to apply to extension schools with monitoring for concrete innovation development.

1.3 The OBEC school administrators in the Northeast or other regions should use the model of community participation to promote life and modern agriculture career skills to apply with adjustments to suit the context of the schools.

### 2. Suggestion for further study

2.1 There should be research according to the developed model with complete research and development process. The extension of model use in this research was limited to workshop and evaluation on

stakeholders' satisfaction. The new research should spend one school year and measure success on life and career skills of those trained, and efficiency and effectiveness of the whole process.

2.2 There should be in-depth research with emphasis on efficiency and effectiveness of community participation to promote life and career skills in school with higher mathayomsuksa (secondary) level. This model has been developed according to the context of suitability, possibility and satisfaction of school for pre-primary, primary and lower secondary levels.

## REFERENCES

- [1] Office of National Economic and Social Development Board. (2015). *Direction of 12<sup>th</sup> National Economic and Social Development Plan (2017-2021)*. Retrieved from <http://www.sukhothai.go.th/mainredcross/7I.pdf>, [September 8, 2016]. (in Thai).
- [2] National Strategy Committee. (2015). *Twenty-Year National Strategy Draft (2017-2036)*. Retrieved from [http://www.prachinburi.go.th/news\\_paked\\_total/2559/mar59/yutchad20years.pdf](http://www.prachinburi.go.th/news_paked_total/2559/mar59/yutchad20years.pdf), [September 8, 2016]. (in Thai).
- [3] Secretariat of the House of Representatives. (2016). *Thailand 4.0*. Retrieved from [http://library2.parliament.go.th/ejournal/content\\_af/2559/jul2559-5.pdf](http://library2.parliament.go.th/ejournal/content_af/2559/jul2559-5.pdf), [September 8, 2016]. (in Thai).
- [4] Public Relations Department. (2016). *Thailand Model 4.0*. Retrieved from [http://www.aseanhai.net/ewt\\_news.php?nid=6100&filename=index](http://www.aseanhai.net/ewt_news.php?nid=6100&filename=index). (in Thai).
- [5] Office of Basic Education Commission. (2015). *Annual Report. Bangkok: Agricultural Co-Operative Society of Thailand*. (in Thai).
- [6] Baksh, A.M. (1995). *The relationship between participative management and job attitudes*. Dissertation Abstracts International, 56 (1995) : 351-A.
- [7] Hoy, K., and Miskel, G. (2001). *Educational Administration: Theory Research and Practice*. New York: McGraw-Hill.
- [8] Ramesh, K., and Rao, N. (1990). *Participative Management: A Case Study*. New Delhi, India: Ajanta.
- [9] Trachoo, K. (2015). *Local Education: Education for Society and Community*. Retrieved from <http://www.emld-rmu.com>. [October 13, 2017]. (in Thai).
- [10] Avery, G.C. & Bergsteiner, H. (2011). *Sustainable Leadership: Honeybee and Locust Approaches*. New York: Routledge.
- [11] Office of Public-Private Collaboration Project. (2016). *Public-Private Collaboration*. Retrieved from <http://www.xn--72cgs7alq1bbn1c4digdj.com/>, [October 13, 2016]. (in Thai).
- [12] Stavros, J.M. and Hinrichs, G. (2009). *Thin Book of SOAR: Building Strengths-based Strategy*. Bend, OR: Thin Book Publishers.
- [13] Stavros, J. (2013). The Generative Nature of SOAR: Applications, results, and the new SOAR Profile. *AI Practitioner*, 15 (3), 7–30.
- [14] Stavros, J. M., and Cole, M. L. (2013). SOARing towards positive transformation and change. *The ABAC ODI Visions, Action, Outcome*, 1 (1), 10-34.
- [15] Cox, J. (2014). *An Evaluation of the Relationship between Emotional Intelligence, SOAR, and Collaboration: Implications for Teams*. Doctoral dissertation, College of Management, Lawrence Technological University.
- [16] Guthrie, J. (1995). *School-Based Management (SBM) : Definitions and Assumptions*. In *School-Based Management as School Reform*, ed. by Murphy J. and Lynn C. vii-xi. Thousand Oaks: Corwin Press.
- [17] Pauline, R. (2003). *Community Participation in School Policy and Practice in Malawi: Balancing local knowledge, national policies and international agency priorities*. Compare: A Journal of Comparative and International Education Vol. 33, Iss. 1.
- [18] Partnership for 21st Century Skills. (2014). *Framework for 21st Century Learning*. Retrieved from [http://www.p21.org/storage/documents/1.\\_p21\\_framework\\_2- pager.pdf](http://www.p21.org/storage/documents/1._p21_framework_2- pager.pdf), [October 1, 2016].
- [19] Sarigalaya, C. and Vongkusolkiet, I. (2016). *Model Agriculture Development*. Retrieved from <http://www.xn--2cgs7alq1bbn1c4digdj.com/>, [October 13, 2016]. (in Thai).
- [20] Tienruek, C. (2014). *Model Measurement Development of Life and Career Skills of Higher Secondary School Students for the 21<sup>st</sup> Century*. Thesis. Master of Education. Chulalongkorn University. (in Thai).
- [21] Kangpheng, S. (2017). *Curriculum Leadership: Development and Implementation Strategies*. ed. 2. Mahasarakham: Aphichart. (in Thai).

- [22] Cambridge International Examinations. (2017). *Implementing the Curriculum with Cambridge: A Guide for School Leaders*. Retrieved from <http://www.cie.org.uk/images/134557-implementing-the-curriculum-with-cambridge.pdf>.
- [23] Joyce, B.; Weil, M.; and Calhoun, E. (2009). *Model of Teaching, 8th ed.* Boston, MA: Allyn Bacon & Pearson.
- [24] Oxford Dictionary. (2017). *Model*. Retrieved from <http://www.oxforddictionaries.com/definition/english/model>.
- Ramesh, K., and Rao, N. (1990). *Participative Management: A Case Study*. New Delhi, India: Ajanta.
- Secretariat of the House of Representatives. (2016). *Thailand 4.0*. Retrieved from [http://library2.parliament.go.th/ejournal/content\\_af/2559/jul2559-5.pdf](http://library2.parliament.go.th/ejournal/content_af/2559/jul2559-5.pdf), [September 8, 2016]. (in Thai).
- Stavros, J.M. and Hinrichs, G. (2009). *Thin Book of SOAR: Building Strengths-based Strategy*. Bend, OR: Thin Book Publishers.
- Stavros, J. (2013). The Generative Nature of SOAR: Applications, results, and the new SOAR Profile. *AI Practitioner*, 15 (3), 7–30.
- Stavros, J. M., and Cole, M. L. (2013). SOARing towards positive transformation and change. *The ABAC ODI Visions, Action, Outcome*, 1 (1), 10-34.
- Tienruek, Chanada. (2014). *Model Measurement Development of Life and Career Skills of Higher Secondary School Students for the 21st Century*. Thesis. Master of Education. Chulalongkorn University. (in Thai).
- Trachoo, K. (2015). *Local Education: Education for Society and Community*. Retrieved from <http://www.emld-rmu.com>. [October 13, 2017]. (in Thai).

**ASSESSING STUDENTS' PERCEPTIONS OF THEIR LEARNING PARTICIPATIONS IN PHYSICS LABORATORY CLASSES TO THEIR AFFECTING CRITICAL THINKING SKILLS FOR UPPER SECONDARY STUDENTS UNDER SECONDARY EDUCATION SERVICE AREA OFFICE 29**Kanjana Bootjomchai<sup>a</sup>, Toansakul Santiboon<sup>b</sup>, and Sarin Thongthammachart<sup>c</sup><sup>a</sup> *Department of Master of Science Education, Faculty of Education; Rajabhat Maha Sarakham University  
Maha Sarakham, Thailand 44000**Corresponding author. Tel.: +66 9 9471 9990; Fax: +66 43 713 206, E-mail address:  
bootjomchaikanjana@gmail.com*<sup>b</sup> *Department of Master of Science Education, Faculty of Education; Rajabhat Maha Sarakham University  
Maha Sarakham, Thailand 44000**\* Corresponding author. Tel.: +66 8 6636 8528; fax: +66 43 713 206, E-mail address:  
toansakul35@yahoo.com.au*<sup>c</sup> *Department of Chemistry, Faculty of Science and Technology; Rajabhat Maha Sarakham University  
Maha Sarakham, Thailand 44000**\* Corresponding author. Tel.: +66 8 9619 5397***ABSTRACT**

To investigate the correlation quantitative research were to 1) assess students' perceptions of their learning participations in physics laboratory environment inventory, 2) students' performances of their perceptions to their critical thinking skills were assessed, and 3) analyzed the associations between students' perceptions of their learning participations and critical thinking skills in physics laboratory environment inventory. The learning environment perceptions were obtained using the 35-item *Physics Laboratory Environment Inventory* (PLEI). Students' perceptions of their critical thinking skills were assessed with the 24-item *Critical Thinking Skill Assessment* (CTSA), both of two instruments composed of five scales, and validity and reliability with Cronbach Alpha Reliability were tried out. Administrations were designed of a sample size consisted of 367 students in 12 schools under Secondary Educational Service Area Office 29. Associations between students' perceptions of their learning participations environment and their critical thinking skills toward physics were correlated and predicted. In has found that statistically significant was simple correlations ( $r$ ) ( $p < .01$ ), multiple correlations ( $R$ ), and standardized regression weight validity ( $\beta$ ) ( $p < .001$ ), significantly. Associations are positive for on all five scales. The conservative standardized regression coefficient ( $\beta$ ) with the simple and multiple correlations which measures the association between students' perceptions on each scale of the PLEI and facilitating critical thinking abilities towards their physics classes when the effect of relationships between the scales are controlled. The  $R^2$  values indicate that 41%, 36%, 35%, 33%, and 39% of their critical thinking abilities outcomes for the PLEI scales to the Process of Activities and Skills, Concept of Conceptual Thinking, Critical Thinking Process, Characteristics of Critical Thinking scales of the CTSA, respectively. Suggestion that this research study was assessed students' perceptions of their learning participations in physics laboratory classes to their affecting critical thinking abilities for upper secondary students under Secondary Educational Service Area Office 29, significantly.

**KEYWORDS:** Assessment, students' perceptions, learning participations, physics laboratory classes, critical thinking skills, upper secondary students, and Secondary Educational Service Area Office 29



## INTRODUCTION

Education in Thailand is provided mainly by the Thai government through the Ministry of Education from pre-school to senior high school. A free basic education of twelve years is guaranteed by the constitution, and a minimum of nine years' school attendance is mandatory. In 2009 the Ministry of Education announced the extension of a free, mandatory education to fifteen years (UNICEF, 2016) <sup>[1]</sup> Formal education consists of at least twelve years of basic education, and higher education. Basic education is divided into six years of elementary education and six years of secondary education, the latter being further divided into three years of lower- and upper-secondary levels. Kindergarten levels of pre-elementary education, also part of the basic education level, span 2–3 years depending on the locale, and are variably provided. Non-formal education is also supported by the state. Independent schools contribute significantly to the general education infrastructure. Administration and control of public and private universities are carried out by the Office of Higher Education Commission, a department of the Ministry of Education (Ministry of Education, 2016) <sup>[2]</sup>.

The school structure is divided into four key stages: The upper secondary level of schooling consists of Matthayom 4–6 for age groups 16–18 and is divided into academic and vocational streams. There are academic upper secondary schools; Students who choose the academic stream usually intend to enter a university. Admission to an upper secondary school is through an entrance exam. On the completion of each level, students need to pass the NET (National Educational Test) to graduate. Children are required to attend six years of elementary school and at least the first three years of high school. Those who graduate from the sixth year of high school are candidates for two decisive tests: O-NET (Ordinary National Educational Test) and A-NET (Advanced National Educational Test) (UNESCO Institute for Statistics, 2015) <sup>[3]</sup>. Thai students are underperforming their peers in several Asian countries as their scores were below the international average in all three subjects tested in the 2015. The 2015 Programme for International Student Assessment (PISA) shows sharp falls in mathematics, sciences and reading scores for students in Thailand. PISA, which is funded by the Organization for Economic Cooperation and Development (OECD), surveyed the knowledge and skills in mathematics, sciences and reading of more than half a million 15-year-olds across 70 countries worldwide meaning throughout the evaluation takes place every three years. Thailand has participated in the evaluation since 2000 (Dumrongkiat Mala, 2015) <sup>[4]</sup>

According to the survey released, Thailand ranked 54th for sciences, and Thai students scored 421 points, much worse than the international average of 493. Acting Education Minister Thailand's performance in reading and sciences has dropped sharply from 2012 when students scored 444 points in sciences and 441 in reading. Standing at 54th, Thailand's overall performance is far below other Asian countries. Singapore was the top performer in all three subjects in the Pisa tests, followed by Japan in second place, Taiwan in fourth, China in sixth, while Vietnam did well at eighth (Teerakiat Jareonsettasin, 2016) <sup>[5]</sup>. The Thai education system for more than four years and during this time learned quickly how bad the education system in Thailand really has become. Even here though, the school falls under Ministry of Education bureaucracy, which is one of the most ridiculously inept in the world. Rules change every semester, new guidelines are handed down to teachers regarding course content, lesson plans, testing etc at the beginning of each new semester, then change again the following semester. Teachers are told to pass students, even though they've failed, and a blind eye is turned to serious problems like plagiarizing (Tasty Thailand. (2016) <sup>[6]</sup>. What have happened on Education in Thailand, the teacher, the students, the classroom learning inventory, the laboratory environments whereas non improvement of students' learning achievements of their learning outcomes, only research would be answered of these problems.

However, student learning outcome performances clearly state the expected knowledge, skills, attitudes, competencies, and habits of mind that students are expected to acquire at an institution of higher education. Transparent student learning outcomes statements are; specific to institutional level and/or content level, clearly expressed and understandable by multiple audiences, prominently posted at or linked to multiple places across the other context, to be updated regularly to reflect current outcomes, and to be receptive to feedback or comments on the quality and utility of the information provided. One of the most important things a teacher can do is provide a positive learning experience. Setting up a positive learning environment is tricky, but not difficult. Get ready to learn about how to do this and why (Firestone, 2015) <sup>[7]</sup>. The science teachers, according to field notes about the physical laboratory environment: The laboratory has basic glassware neatly organized in trays and commonly used chemicals; acids, alkalis, iodine, indicators etc. in sets of ten stored on the shelf. All the work displayed on the walls is from upper secondary science classes. No work on the walls is from students in the study class. With the ensuing enthusiasm in learning environment research, studies began to emerge in countries such as Singapore, Korea, Taiwan, Thailand and Indonesia, some of which can be regarded as pioneering in the field. Those studies focused on students' and teachers' perceptions of classroom learning environments and science laboratory classes. Overall, much progress has been achieved in the conceptualization, assessment and



investigations of learning environment (Fraser, 1998a) [8], for example: The way in which studies in various Asian countries covering different types of learning environments have gained momentum in the last decade is illustrated in Goh and Khine's (2002) [9], Santiboon and Fisher (2005) [10], Santiboon (2012) [11].

Many research studies show that learning environments not only have the positive correlation with the students' outcomes, motivation, and attitudes. Furthermore, there are some research studies on learning environments which focus on student outcomes, students' and teachers' perceptions, and evaluation of the strategies (Fraser, Fisher, & McRobbie, 1996) [12]. Since the laboratory classroom learning instruments were applied and adapted version from the Science Laboratory Environment Inventory (SLEI) that it was developed by Fraser and his colleagues (1993) [13] with an awareness of the importance of laboratory lessons, aspects of laboratory classroom environments have been widely investigated in various settings. Using the SLEI, and adapted the Test Of Science-Related Attitudes (TOSRA) were associated with students' cognitive and affective outcomes were found in Australia (Fisher, Henderson & Fraser, 1997) [14], Singapore (Quek, Wong & Fraser (2002) [15]. The SLEI has been used in various contexts, including countries across most high schools throughout the USA, Australia, Asian and South Pacific (Giddings & Waldrup, 1996) [16], Tasmania and Australia (Harrison, Fisher & Fraser, 1995) [17], India (Koul & Fisher, 2005) [18], and Thailand (Santiboon & Fisher, 2005) [11], (Santiboon, 2012) [12].

Santiboon and Fisher (2005) [11] decided to adapt the personal form of the SLEI to create the PLEI because of the purposes of this research study are to investigate in students' perceptions of their physics laboratory classroom environments. In this research study, using the PLEI-instrument research from Santiboon and Fisher (2005) [11], which the PLEI has five scales (each with seven items) and the five response alternatives are Almost Never, Seldom, Sometimes, Often and Very Often to the 35-item *Physics Laboratory Environment Inventory* (PLEI) was used in this research study. The PLEI has five scales and each scale contains with seven items. This instrument is appropriate for the upper secondary education which contains 35 items and five scales which are *Student Cohesiveness* (SC), *Open-Endedness* (OE), *Integration* (IN), *Rule Clarity* (RC), and *Material Environment* (ME) and the five response alternatives are *Almost Never*, *Seldom*, *Sometimes*, *Often* and *Very Often* that it was used to assess students' perceptions of their learning participations in physics laboratory classes to their affecting critical thinking skills for upper secondary students under Secondary Educational Service Area Office 29

Get a glimpse of the Watson Glaser Critical Thinking Appraisal (WGCTA) (Glaser, 1992) [19] test with our sample questions, or start preparing for the test. Adapted thinking of Watson Glaser Critical Thinking Appraisal (WGCTA) practice pack offers unique content, providing preparation for your critical thinking test. The pack contains a complete selection of Watson Glaser-style questions, including practice drills for each section of the test, all of which are accompanied by solving strategies and tips. Get hundreds of original questions with our Watson Glaser practice pack for your best chance at success to the 24-item *Critical Thinking Skill Assessment* (CTSA) in four scales, namely; *Process of Activities and Skills* (PAS), *Concept of Conceptual Thinking* (CCT), *Critical Thinking Process* (CTP), *Characteristics of Critical Thinking* (ChCT) scales of this research study.

## METHODOLOGY

### Research Aims

1. To assess students' perceptions of their learning participations in physics laboratory classes to upper secondary students under Secondary Educational Service Area Office 29.
2. To assess students' perceptions of their critical thinking skills towards physics to upper secondary students under Secondary Educational Service Area Office 29
3. To analyze the associations between students' perceptions of their learning participations in physics laboratory classes and their affecting critical thinking skills for upper secondary students under Secondary Educational Service Area Office 29

### Research Instruments

#### 1. *The Physics Laboratory Environment Inventory (PLEI)*

To create the PLEI because of the purposes of this research study are to investigate in students' perceptions of their physics laboratory classroom environments. In this research study, using the PLEI-instrument research from Santiboon and Fisher (2005) [12], which the PLEI has five scales (each with seven items) and the five response alternatives are Almost Never, Seldom, Sometimes, Often and Very Often to the 35-item *Physics Laboratory Environment Inventory* (PLEI) was used. The PLEI has five scales and each scale contains with seven items. This instrument is appropriate for the upper secondary education which is *Student Cohesiveness* (SC), *Open-Endedness*

(OE), Integration (IN), *Rule Clarity* (RC), and *Material Environment* (ME) and the five response alternatives are *Almost Never*, *Seldom*, *Sometimes*, *Often* and *Very Often*.

## 2. The Critical Thinking Skill Assessment (CTSA),

Adapted and modified Watson Glaser Critical Thinking Appraisal (WGCTA) (Glaser, 1992) <sup>[19]</sup> test with our sample questions, or start preparing for the test. The WGCTA practice pack offers unique content, providing preparation for your critical thinking test. The pack contains a complete selection of Watson Glaser-style questions, including practice drills for each section of the test, all of which are accompanied by solving strategies and tips. Get hundreds of original questions with our Watson Glaser practice pack for your best chance at success to the 24-item *Critical Thinking Skill Assessment* (CTSA) in four scales, namely; Process of Activities and Skills (PAS), Concept of Conceptual Thinking (CCT), Critical Thinking Process (CTP), Characteristics of Critical Thinking (ChCT) scales The 24-item *Critical Thinking Skill Assessment* (CTSA),

### Sample

Administrations to the sample size consisted of 357 upper secondary students in 10 secondary educational schools under the Secondary Educational Service Area Office 29 Office (Ubon Ratchthani and Amnat Charoen) were selected to assess students' perceptions of their learning participations in physics laboratory classes to their affecting critical thinking skills for upper secondary students.

### Data Analysis

The scaling of the items approximated a 5- point Likert scale, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the PLEI forms and the CTSA as specified. Factorial validity and adequacy of fit for the dimensionality of the PLEI and the CTSA were assessed through principal component analyses. The multiple correlations were significant of students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory classes according to enhance critical thinking skills toward science for the PLEI with students' critical thinking skills to associate were analyzed.

## RESULTS

To investigate the correlation quantitative research were to 1) assess students' perceptions of their learning participations in physics laboratory environment inventory, 2) students' performances of their perceptions to their critical thinking skills were assessed, and 3) analyzed the associations between students' perceptions of their learning participations and critical thinking skills in physics laboratory environment inventory. The learning environment perceptions were obtained using the 35-item *Physics Laboratory Environment Inventory* (PLEI). Students' perceptions of their critical thinking skills were assessed with the 24-item *Critical Thinking Skill Assessment* (CTSA). The results have been reported in subsection that followed as:

### Students' Perceptions of their Learning Participations in Physics Laboratory Environment Inventory

The results given in Table 1, 2, and 3 show that on average item means for each of the five PLEI scales, that they contain seven items, so that the minimum and maximum score possible on each of these scales is 7 and 35, respectively. Because of this difference in the number of items in the five scales, the average item mean for each scale was calculated so that there is a fair basis for comparison between different scales. These means were used as a basis for constructing the simplified plots of significant differences between forms of the PLEI. For the remaining five scales, *Student Cohesiveness* (SC), *Open-Endedness* (OE), Integration (IN), *Rule Clarity* (RC), and *Material Environment* (ME) scales, indicated to moderate; Factor Loading, Intercorrelation circumplex Nature scales, internal consistency (Cronbach alpha) reliability, respectively.

Table 1 *Factor Loading Analysis for the PLEI*

Item	SC	Item No.	OE	Item No.	IN	Item No.	RC	Item No.	ME
4	0.67	12	0.61	18	0.73	26	0.74	31	0.73
3	0.67	11	0.59	20	0.66	25	0.68	33	0.72
1	0.66	13	0.57	19	0.63	27	0.67	29	0.70
7	0.60	10	0.55	21	0.63	24	0.61	32	0.68
6	0.59	8	0.51	17	0.54	28	0.60	30	0.64
2	0.52	14	0.48	16	0.51	22	0.54	34	0.62
5	0.51	9	0.48	15	0.50	23	0.53	35	0.58
% of Variance	36.73		29.61		36.47		38.69		44.77
Eigenvalue	2.57		2.07		2.55		2.71		3.13

\* Loading smaller than 0.30 omitted. N=245

Table 2 *Scale Intercorrelations for the PLEI Form*

Scale	SC	OE	IN	RC	ME
Student Cohesiveness (SC)		0.42***	0.58***	0.53***	0.35***
Open-Endedness (OE)			0.54***	0.39***	0.27***
Integration (IN)				0.63***	0.49***
Rule Clarity (RC)					0.60***
Material Environment (ME)					

N=357, \* $p < .05$ , \*\* $p < .05$ , \*\*\* $p < .05$ Table 3 *Scale Internal Consistency (Cronbach Alpha Coefficient) Reliability, Discriminant Validity (Mean Correlation of a Scale with Other Scales), Mean Score, Average Mean Score, Standard Deviation, Variance, and F-test for the PLEI*

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach Alpha Reliability	Discriminant Validity	F-test
Student Cohesiveness (SC)	26.90	3.84	4.02	16.15	0.71	0.71	16.38***
Open-Endedness (OE)	25.11	3.59	3.65	13.31	0.61	0.73	10.29***
Integration (IN)	26.05	3.72	4.16	17.30	0.70	0.71	9.47***
Rule Clarity (RC)	24.88	3.56	4.44	19.39	0.73	0.71	26.67***
Material Environment (ME)	22.08	3.15	5.31	28.22	0.79	0.69	9.93***

N=357, \* $p < .05$ , \*\* $p < .05$ , \*\*\* $p < .05$ 

The results given in Table 1, 2, and 3 show that on average item means for each of the five PLEI scales, that they contain seven items, so that the minimum and maximum score possible on each of these scales is 7 and 35, respectively. Because of this difference in the number of items in the five scales, the average item mean for each scale was calculated so that there is a fair basis for comparison between different scales. These means were used as a basis for constructing the simplified plots of significant differences between forms of the PLEI. For the remaining four scales, *Student Cohesiveness* (SC), *Open-Endedness* (OE), *Integration* (IN), *Rule Clarity* (RC), and *Material Environment* (ME) scales, indicated to moderate; Factor Loading, Intercorrelation circumplex Nature scales, internal consistency (Cronbach alpha) reliability, respectively. On the whole, it appears that the items had factor loadings greater than 0.30 with their a priori scales, and hence, the results lend support to the factorial validity of the PLEI scales.

As reported in Table 3, the mean score ranged from 22.08 ( $\bar{X} = 3.15$ , S.D. = 5.31, Variance = 28.22, and F – test = 9.93) in Material Environment to 26.90 ( $\bar{X} = 3.84$ , S.D. = 4.02, Variance = 16.15, and F – test = 16.38) in Student Cohesiveness scale, the reliability coefficients for the different PLEI ranged from 0.61 to 0.79. The Discriminant Validity (Mean correlation of a scale with other scales) of physics laboratory classroom environment ranged from 0.69 to 0.73 when using the individual student as the unit of analysis. On the whole, these results are acceptable which was considered satisfactory for further use in this study.

## Students' Performances of their Perceptions to their Critical Thinking Skills

The results given in Table 4, 5, and 6 show that on average item means for each of the five PLEI scales, that they contain seven items, so that the minimum and maximum score possible on each of these scales is 7 and 35, respectively. Because of this difference in the number of items in the five scales, the average item mean for each scale was calculated so that there is a fair basis for comparison between different scales. The 24-item *Critical Thinking Skill Assessment* (CTSA) in four scales, namely; Process of Activities and Skills (PAS), Concept of Conceptual Thinking (CCT), Critical Thinking Process (CTP), Characteristics of Critical Thinking (ChCT) scales indicated to moderate; Factor Loading, Intercorrelation circumplex Nature scales, internal consistency (Cronbach alpha) reliability, respectively.

In Table 4 lists the items which were found to have factor loading greater than 0.30 (which is the minimum value conventionally accepted as meaningful in factor analysis)

Table 4 *Factor Loading Analysis for the CTSA*

Item	PAS	Item No.	CCT	Item No.	CTP	Item No.	ChCT
5	0.79	10	0.79	16	0.83	21	0.84
3	0.78	11	0.78	15	0.81	23	0.81
1	0.77	8	0.78	17	0.80	22	0.81
6	0.77	7	0.77	14	0.78	20	0.81
4	0.75	9	0.75	18	0.71	24	0.76
2	0.67	12	0.73	13	0.67	19	0.73
% of Variance	53.86		58.39		58.97		62.85
Eigenvalue	3.41		3.50		3.54		3.77

\* Loading smaller than 0.30 omitted. N=357

Table 5 *Scale Intercorrelations for the CTSA Form*

Scale	PAS	CCT	CTP	ChCT
Process of Activities and Skills (PAS)		0.82***	0.73***	0.66***
Concept of Conceptual Thinking (CCT)			0.73***	0.72***
Critical Thinking Process (CTP)				0.76***
Characteristics of Critical Thinking (ChCT)				

N=357, \* $p < .05$ , \*\* $p < .05$ , \*\*\* $p < .05$

In Table 5, to investigate the circumplex nature of the CTSA, correlations between the scales were calculated. Appropriate statically procedure was used, in order to validate the questionnaires.

Table 6 *Scale Internal Consistency (Cronbach Alpha Coefficient) Reliability, Discriminant Validity (Mean Correlation of a Scale with Other Scales), Mean Score, Average Mean Score, Standard Deviation, Variance, and F-test for the CTSA*

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach Alpha Reliability	Discriminant Validity	F-test
Process of Activities and Skills	21.06	3.51	4.10	16.78	0.85	0.87	6.69***
Concept of Conceptual Thinking	20.66	3.44	4.23	17.86	0.86	0.86	2.98*
Critical Thinking Process	20.99	3.50	4.43	19.64	0.86	0.86	2.69*
Characteristics of Critical Thinking	21.48	3.58	4.50	20.25	0.88	0.85	6.27***

N=357, \* $p < .05$ , \*\* $p < .05$ , \*\*\* $p < .05$

In Table 6, as reported, the mean score ranged from 20.66 ( $\bar{X} = 3.44$ , S.D. = 4.23, Variance = 17.86, and F – test = 2.98) in Concept of Conceptual Thinking skill to 21.48 ( $\bar{X} = 3.58$ , S.D. = 4.50, Variance = 20.25, and F – test = 6.27) (Student Cohesiveness), the reliability coefficients for the different CTSA ranged from 0.85 to 0.87. The Discriminant Validity (Mean correlation of a scale with other

scales) of physics laboratory classroom environment ranged from 0.85 to 0.87 when using the individual student as the unit of analysis. On the whole, these results are acceptable which was considered satisfactory for further use in this study.

Description of quantitative data of analyzing responses for students' assessments is reported in Table 4, 5, and 6. Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales were obtained for the sample in this present study as indices of scale reliability and discriminant validity for the CTSA. To investigate the circumplex nature of the CTSA, correlations between the scales were calculated. Appropriate statically procedure was used, in order to validate the questionnaires. The procedures included Cronbach alpha, discriminant validity and circumplex nature correlation. The PLEI form was subjected to separated principal components factor analyses (with varimax rotation) involving student's score. The factor structure that emerged replicated, to a large extent. Table 1 and 4 list the items which were found to have factor loading greater than 0.30 (which is the minimum value conventionally accepted as meaningful in factor analysis). As expected, the results show that the correlation between a scale and the next scale in generally is high, and become lower for scales further away from that scale. This is illustrated using each scale in Table 1-6. In general, the circumplex natures of the PLEI and the CTSA have been confirmed to assess students' perceptions of their learning participations in physics laboratory environment inventory and students' performances of their perceptions to their critical thinking skills were assessed, significantly.

### Associations between Students' Perceptions of their Learning Participations in Physics Laboratory Classes and their Critical Thinking Skill Assessment

Focusing on the PLEI, the statistical procedures also involved the investigation of associations between students' perceptions of their physics laboratory classroom learning environment and their critical thinking skills toward science. The simple correlation values ( $r$ ) are reported in Table 7-11 which show significant correlations ( $p < 0.05$ ) between students' critical thinking outcomes and physics laboratory classroom inventory all of five scales. These associations are positive for the scales of *Student Cohesiveness* (SC), *Open-Endedness* (OE), *Integration* (IN), *Rule Clarity* (RC), and *Material Environment* (ME); there was a more favourable the CTA towards their PLEI environment inventory. The second type of analysis consisted of the more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the PLEI and their critical thinking skills towards their CTSA in four and totalized scales when the effects of relationships between the scales are controlled.

Table 5 Associations between Students' Perceptions of their Physics Laboratory Classroom Learning Environment and their CTSA in terms of the Process of Activities and Skills

Scale	Simple Correlation Validity (r)	Standardized Regression Weight Validity ( $\beta$ )
Student Cohesiveness (SC)	0.39***	0.25***
Open-Endedness (OE)	0.44***	0.28***
Integration (IN)	0.36***	0.24***
Rule Clarity (RC)	0.45***	0.29***
Material Environment (ME)	0.31***	0.18**
Multiple Correlation (R)		0.6394***
Determination Efficient Predictive Value ( $R^2$ )		0.4089***

$N=357$ , \* $p < .05$ , \*\* $p < .05$ , \*\*\* $p < .05$

Table 6 Associations between Students' Perceptions of their Physics Laboratory Classroom Learning Environment and their CTSA in terms of the Concept of Conceptual Thinking Skill

Scale	Simple Correlation Validity (r)	Standardized Regression Weight Validity ( $\beta$ )
Student Cohesiveness (SC)	0.38***	0.20**
Open-Endedness (OE)	0.31***	0.19**
Integration (IN)	0.31***	0.18**
Rule Clarity (RC)	0.24***	0.17**
Material Environment (ME)	0.21**	0.16**
Multiple Correlation (R)		0.6021***
Determination Efficient Predictive Value ( $R^2$ )		0.3625***

$N=357$ , \* $p<.05$ , \*\* $p<.05$ , \*\*\* $p<.05$

Table 7 Associations between Students' Perceptions of their Physics Laboratory Classroom Learning Environment and their CTSA in terms of the Critical Thinking Process Skill

Scale	Simple Correlation Validity (r)	Standardized Regression Weight Validity ( $\beta$ )
Student Cohesiveness (SC)	0.30***	0.19**
Open-Endedness (OE)	0.25***	0.21**
Integration (IN)	0.25***	0.20**
Rule Clarity (RC)	0.26***	0.21**
Material Environment (ME)	0.28***	0.25***
Multiple Correlation (R)		0.5936***
Determination Efficient Predictive Value ( $R^2$ )		0.3524***

$N=357$ , \* $p<.05$ , \*\* $p<.05$ , \*\*\* $p<.05$

Table 8 Associations between Students' Perceptions of their Physics Laboratory Classroom Learning Environment and their CTSA in terms of the Characteristics of Critical Thinking Skill

Scale	Simple Correlation Validity (r)	Standardized Regression Weight Validity ( $\beta$ )
Student Cohesiveness (SC)	0.31***	0.19**
Open-Endedness (OE)	0.30***	0.18**
Integration (IN)	0.28***	0.17**
Rule Clarity (RC)	0.26***	0.19**
Material Environment (ME)	0.30***	0.18**
Multiple Correlation (R)		0.5786***
Determination Efficient Predictive Value ( $R^2$ )		0.3348***

$N=357$ , \* $p<.05$ , \*\* $p<.05$ , \*\*\* $p<.05$



Table 9 Associations between Students' Perceptions of their Physics Laboratory Classroom Learning Environment and their CTSA Totalized Skills

Scale	Simple Correlation Validity (r)	Standardized Regression Weight Validity ( $\beta$ )
Student Cohesiveness (SC)	0.39***	0.26***
Open-Endedness (OE)	0.35***	0.25***
Integration (IN)	0.34***	0.22***
Rule Clarity (RC)	0.28***	0.17**
Material Environment (ME)	0.31***	0.20**
Multiple Correlation (R)		0.6242***
Determination Efficient Predictive Value ( $R^2$ )		0.3896***

$N=357$ , \* $p<.05$ , \*\* $p<.05$ , \*\*\* $p<.05$

Table 7, 8, 9, 10 and 11 suggest that the scales of the PLEI and the CTSA are reliable for measuring critical thinking skills in seminar on education class. Using simple correlation (r), multiple correlations (R), Multiple Regression Validity ( $\beta$ ), and Determination Efficient Predictive value ( $R^2$ ) were associated and predicted in Process of Activities and Skills (PAS), Concept of Conceptual Thinking (CCT), Critical Thinking Process (CTP), Characteristics of Critical Thinking (ChCT) scales.

The simple correlation values (r) are reported in Table 7, 8, 9, 10, and 11 which show significant correlations ( $p<0.001$ ) between students' responses was assessed with the PLEI all of five scales. These associations are positive for the scales of Student Cohesiveness (SC), Open-Endedness (OE), Integration (IN), Rule Clarity (RC), and Material Environment (ME) scales. The second type of analysis consisted of the more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the PLEI and facilitating critical thinking skills towards their constructivist approach physics laboratory classes when the effect of relationships between the scales is controlled.

The multiple correlations (Rs) are significant for assessing students' perceptions of their learning participations in physics laboratory classes to their affecting critical thinking skills for upper secondary students for Process of Activities and Skills (PAS), Concept of Conceptual Thinking (CCT), Critical Thinking Process (CTP), Characteristics of Critical Thinking (ChCT) scales, respectively and showed that when the scales are considered together there is a significant in some scales of the PLEI association with the CTSA. The  $R^2$  values indicate that 41%, 36%, 35%, 33%, and 39% of their critical thinking skills outcomes for Student Cohesiveness (SC), Open-Endedness (OE), Integration (IN), Rule Clarity (RC), and Material Environment (ME) scales of the PLEI to the Process of Activities and Skills (PAS), Concept of Conceptual Thinking (CCT), Critical Thinking Process (CTP), Characteristics of Critical Thinking (ChCT) scales of the CTSA, respectively. Suggestion that this research study was assessed students' perceptions of their learning participations in physics laboratory classes to their affecting critical thinking skills for upper secondary students under Secondary Educational Service Area Office 29, significantly. In this study, it was also considered important to investigate associations between students' perceptions students' perceptions of their learning participations in physics laboratory classes with their affecting critical thinking skills for upper secondary students under Secondary Educational Service Area Office. The selection of an evaluation and assessment instrument suitable was required and analyzed the associations between students' perceptions of their learning participations and critical thinking skills in physics laboratory environment inventory.

The results have been found that associations between students' perceptions of their physics laboratory classroom learning environments were assessed with the PLEI and their critical thinking skills with the CTSA physics laboratory environment inventory, students' association outcomes of their the *Process of Activities and Skill* scale (the  $R^2$  value indicates that 41% or 146 students of 357 students of the valiance in students' *Process* of activities and skills were invented relatively evidence of accounting students' responses), the *Critical Thinking Process Skill* scale (the  $R^2$  value indicates that 36% or 128 students of 357 students of the valiance in students' critical thinking process skills were invented relatively evidence of accounting students' responses), the *Concept of Conceptual Thinking Skill* (the  $R^2$  value indicates that 35% or 125 students of 357 students of the valiance in students' concept of conceptual thinking skills were invented relatively evidence of accounting students' responses), and the *Characteristics of Critical Thinking Skill* scale (the  $R^2$  value indicates that 33% or 118 students of 357 students of the valiance in students' concept of conceptual thinking skills were invented relatively evidence of accounting students' responses), respectively.

Overall on students' critical thinking totalized skills, the  $R^2$  value indicates that 39% or 139 students of 357 students of the variance in students' critical thinking skills were invented relatively evidence of accounting students' responses to their physics class was attributable to their perceptions of their physics laboratory classroom environments.

## CONCLUSSIONS AND DISCUSSIONS

Thai students are underperforming their peers in several Asian countries as their scores were below the international average in all three subjects tested in the 2015. The 2015 Programme for International Student Assessment (PISA) shows sharp falls in mathematics, sciences and reading scores for students in Thailand. PISA, which is funded by the Organization for Economic Cooperation and Development (OECD), surveyed the knowledge and skills in mathematics, sciences and reading of more than half a million 15-year-olds across 70 countries worldwide meaning throughout the evaluation takes place every three years. Thailand has participated in the evaluation since 2000. Standing at 54th, Thailand's overall performance is far below other Asian countries. Singapore was the top performer in all three subjects in the PISA tests. Student learning outcome performances clearly state the expected knowledge, skills, attitudes, competencies, and habits of mind that students are expected to acquire at an institution of higher education. The science teachers, according to field notes about the physical laboratory environment: The laboratory has basic glassware neatly organized in trays and commonly used chemicals; acids, alkalis, iodine, indicators etc. in sets of ten stored on the shelf. All the work displayed on the walls is from upper secondary science classes.

To decide and adapt the personal form of the SLEI for creating the PLEI because of the purposes of this research study are to investigate in students' perceptions of their physics laboratory classroom environments. In this research study, using the PLEI-instrument research from Santiboon and Fisher (2005), which the PLEI has five scales (each with seven items) and the five response alternatives are Almost Never, Seldom, Sometimes, Often and Very Often to the 35-item *Physics Laboratory Environment Inventory* (PLEI) was used in this research study. The PLEI has five scales and each scale contains with seven items. This instrument is appropriate for the upper secondary education which contains 35 items and five scales which are *Student Cohesiveness* (SC), *Open-Endedness* (OE), *Integration* (IN), *Rule Clarity* (RC), and *Material Environment* (ME) and the five response alternatives are *Almost Never*, *Seldom*, *Sometimes*, *Often* and *Very Often* that it was used to assess students' perceptions. Adapted thinking of Watson Glaser Critical Thinking Appraisal (WGCTA) practice pack offers unique content, providing preparation for your critical thinking test. The pack contains a complete selection of Watson Glaser-style questions, including practice drills for each section of the test, all of which are accompanied by solving strategies and tips. Get hundreds of original questions with our Watson Glaser practice pack for your best chance at success to the 24-item *Critical Thinking Skill Assessment* (CTSA) in four scales, namely; Process of Activities and Skills (PAS), Concept of Conceptual Thinking (CCT), Critical Thinking Process (CTP), Characteristics of Critical Thinking (ChCT) scales of this research instruments in this present study.

The aims of this research study were to assess students' perceptions of their learning participations in physics laboratory classes to their critical thinking skills towards physics, and analyze the associations between students' perceptions of their learning participations in physics laboratory classes and their affecting critical thinking skills for upper secondary students with a sample size consisted of 357 upper secondary students in 10 secondary educational schools under the Secondary Educational Service Area Office 29. The items approximated a 5- point Likert scale, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the PLEI forms and the CTSA as specified. Factorial validity and adequacy of fit for the dimensionality of the PLEI and the CTSA were assessed through principal component analyses. The multiple correlations were significant of students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory classes according to enhance critical thinking skills toward science for the PLEI with students' critical thinking skills to associate were analyzed.

The Factor Loading, Intercorrelation circumplex Nature scales, internal consistency (Cronbach alpha) reliability, respectively. On the whole, it appears that the items had factor loadings greater than 0.30 with their a priori scales, and hence, the results lend support to the factorial validity of the PLEI and CTSA scales. As expected, the results show that the correlation between a scale and the next scale in generally is high, and become lower for scales further away from that scale. This is illustrated using each scale in Table 1-6. In general, the circumplex natures of the PLEI and the CTSA have been confirmed. In this study, it was also considered important to investigate associations between students' perceptions students' perceptions of their learning participations in physics laboratory classes with their affecting critical thinking skills. The simple correlation values ( $r$ ) which show significant correlations ( $p < 0.001$ ) between students' responses was assessed with the PLEI all of five scales. These

associations are positive for on all five scales. The conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the PLEI and facilitating critical thinking skills towards their physics classes when the effect of relationships between the scales are controlled. The multiple correlations ( $R_s$ ) are significant for assessing students' perceptions of their learning participations in physics laboratory classes to their affecting critical thinking skills for Process of Activities and Skills, Concept of Conceptual Thinking, Critical Thinking Process, Characteristics of Critical Thinking scales, respectively and showed that when the scales are considered together there is a significant in all scales of the PLEI association with the CTSA. The  $R^2$  values indicate that 41%, 36%, 35%, 33%, and 39% of their critical thinking skills outcomes for the PLEI scales to the Process of Activities and Skills, Concept of Conceptual Thinking, Critical Thinking Process, Characteristics of Critical Thinking scales of the CTSA, respectively. Suggestion that this research study was assessed students' perceptions of their learning participations in physics laboratory classes to their affecting critical thinking skills for upper secondary students under Secondary Educational Service Area Office 29, significantly.

Overall on students' critical thinking totalized skills, the  $R^2$  value indicates that 39% or 139 students of 357 students of the valiance in students' critical thinking skills were invented relatively evidence of accounting students' responses to their physics class was attributable to their perceptions of their physics laboratory classroom environments. The results of this research study have been found those students' learning participations in physics laboratory classes to their affecting critical thinking skills for upper secondary educational level in education system of Thailand are less than evidence of 50%, what have happened?. Although It has taken a period of 10 years since the 1999 Education Act before the executives of the ministry's education agencies agreed to the proposal to reduce the role of rote learning and to adopt analytical thinking as a fundamental teaching protocol. This has been a long time coming. Just how are we supposed to do this?, Teacher training, the situation of students not failing and automatically moving up to the next class, Being able to think critically/analytically and solve problems on a piece of paper is only half the battle (Graham, 2010) <sup>[20]</sup>. Education Minister Dapong Rattanasuwan admitted that there are problems in all aspects of Thai education, particularly issues concerning English proficiency and critical thinking. Speaking during a weekly program called "Thailand Moves Forward," Dapong revealed results of a recently-conducted study that revealed that academic performances of Thai students in math, science, English and Thai languages are below standard (The Nations, 2016) <sup>[21]</sup>. Who ought to seek of this situation?

## ACKNOWLEDGEMENT

I would first like to thank my thesis of the Master of Science Education/ Faculty of Education; Advisor Prof. Dr. Toansakul Santiboon Faculty of Education, and Dr. Nukoon Kootthalang of Faculty of Science, Rajabhat Mahasarakham University. I also thank to the 357 secondary students in 10 for upper secondary schools under Secondary Educational Service Area Office 29. The door to Prof. Santiboon was always open whenever I ran into a trouble spot or had a question about my research or writing. He consistently allowed this paper to be my own work, but steered me in the right the direction whenever he thought I needed it.

## REFERENCES

- UNICEF. (2016). *Overview of Thailand education*. Retrieved from [https://www.unicef.org/thailand/education\\_303.html](https://www.unicef.org/thailand/education_303.html)
- Ministry of Education. (2016). *Education System of Thailand*. Retrieved from <http://www.moe.go.th/moe/th/minister/index.php>
- UNESCO Institute for Statistics. (2015). *Ordinary National Educational Test*. Retrieved from <http://nada.uis.unesco.org/nada/en/index.php/catalogue/172>
- Mala, D. (2015). PISA test rankings put Thai students near bottom of Asia. Bangkok Post. Retrieved from <https://www.bangkokpost.com/learning/advanced/1154532/pisa-test-rankings-put-thai-students-near-bottom-of-asia>
- Jareonsettasin, T. (2016). Asia and the Pacific-national commission's database. Retrieved from [http://www.unesco.org/ncp/index-typo.php?lc=E&region=3&module=national\\_commissions-typo&web=&showPresidentsSecretariesGeneralNac=1](http://www.unesco.org/ncp/index-typo.php?lc=E&region=3&module=national_commissions-typo&web=&showPresidentsSecretariesGeneralNac=1)
- Tasty Thailand. (2016). The education system in Thailand: A terrible failure. Retrieved from <http://tastythailand.com/the-education-system-in-thailand-a-terrible-failure/>

- Firestone, 2015 Firestone, M. (2015). Learning environment in the classroom: Definition, impact & importance. Retrieved from: [tudy.com/academy/lesson/learning-environment-in-the-classroom-definition-impact-importance.html](http://tudy.com/academy/lesson/learning-environment-in-the-classroom-definition-impact-importance.html)
- Fraser, B. J. (1998a). Science learning environments: Assessment, effects and determinants. In B. J. Fraser and K. G. Tobin (Eds.), *The International Handbook of Science Education* (pp. 527–564). Dordrecht, The Netherlands: Kluwer.
- Goh and Khine's (2002) Goh, S. C., and Khine, M. S. (Eds.) (2002). *Studies in educational learning environments: An international perspective*. Singapore: World Scientific.
- Santiboon, T. & Fisher, D. (2005). *Learning environments and teacher-student interactions in physics classes in Thailand*. Proceedings of the Fourth International Conference on Physics, Mathematics and Technology Education Sustainable Communities and Sustainable Environments: Envisioning a Role for Physics, Mathematics and Technology Education, Victoria, Vancouver, Canada.
- Santiboon, T. (2012). Assessing science students' perceptions in learning activities achievements in physics laboratory classrooms in Udon Thani Rajabhat University. *2012 International Conference on Education and Management Innovation IPEDR Vol.30* (2012) © (2012) IACSIT Press, Singapore.
- Fraser, B. J., Fisher, D. L., and McRobbie, C. J. (1996). Development, validation and use of personal and class forms of a new classroom environment instrument. Paper presented at the annual meeting of the American Educational Research Association, New York.
- Fraser, B., McRobbie, C. J. and Giddings, G. J. (1993). Development and cross-national validation of a laboratory classroom instrument for senior high school students. *Science Education*, 77, pp. 1-24.
- Fisher, D. L. Henderson, D. and Fraser, B. L. (1997). Laboratory environment and student outcomes in senior high school biology classes. *American Biology Teacher*, 1997. 59, pp. 214-219.
- Quek, C. L., Wong, A. F. L. and Fraser, B. J. (2002). Teacher-student interaction and gifted students' attitudes toward chemistry in laboratory classrooms in Singapore. *Journal of Classroom Interaction*, 40 (1) : pp. 18-28.
- Giddings, G.J. and Waldrup, B. A. (1996). *Comparison of science laboratory classrooms in Asia, Australia, South Pacific and USA: An international study*. Paper presented at the annual meeting of the American Educational Research Association, New York, NY. 1996.
- Henderson, D., Fisher, D. L. & Fraser, B. J. (1995). *Gender differences in biology students' perceptions of actual and preferred learning environments*. Paper presented at the annual meeting of the National Association for Research in Science Teaching, San Francisco.
- Koul, P. and Fisher, D. (2005). *Science classroom learning environments in India*. Paper presented at the International Educational Research Conference of the Australian Association for Research in Education (AARE), Brisbane, Australia. 2005.
- Glaser, W. (1992). *Watson Glaser critical thinking appraisal*. Retrieved from <https://www.assessmentday.co.uk/watson-glaser-critical-thinking.htm>
- Graham, S. (2010). *Critical thinking*. *Bangkok Post: Learning*. Retrieved on 12 January 2010 from [www.bangkokpost.com/learning/education-features/30887/critical-thinking](http://www.bangkokpost.com/learning/education-features/30887/critical-thinking)
- The Nations. (2016). *Education Minister says Thai students lack critical thinking and English language skills*. Thai VISA Team. Retrieved from <https://www.thaivisa.com/forum/topic/940983-education-minister-says-thai-students-lack-critical-thinking-and-english-language-skills/>

# DETERMING FACTORS OF SCIENCE CLASSROOM LEARNING ENVIRONMENT INVENTORY THROUGH CREATIVE THINKING ABILITIES AND SATISFACTION OF SECONDARY STUDENT UNDER SECONDARY EDUCATIONAL SERVICE AREA OFFICE 26

Suphachai Boonserm<sup>a</sup>, Somsa-nguan Passago<sup>b</sup>, and Pornnarong Siripiyasing<sup>c</sup>

<sup>a</sup>*Department of Master of Science Education, Faculty of Education, Rajabhat Maha Sarakham University,  
Maha Sarakham, Thailand 44000*

*Corresponding author. Tel.: +66 8 4796 7118; Fax: +66 43 713 206, E-mail: argokku@hotmail.com*

<sup>b</sup>*Department of Biology, Faculty of Science and Technology, Rajabhat Maha Sarakham University,  
Maha Sarakham, Thailand 44000*

*Corresponding author. Tel.: +66 8 9277 3645 Fax: +66 43 722 257, E-mail: somsanguan\_c@yahoo.com*

<sup>c</sup>*Department of Biology, Faculty of Science and Technology; Rajabhat Maha Sarakham University  
Maha Sarakham, Thailand 44000*

*\* Corresponding author. Tel.: +66 6 1935 3935; fax: +66 43 722 257, E-mail: pornnarong\_s@gmail.com*

## ABSTRACT

To assess students' perceptions of their science classroom learning environment inventories to their satisfactions and their creative thinking abilities toward science of secondary schooling classes under Secondary Educational Service Area Office 26, which a sample size consisted of 420 upper secondary students from 14 schools under Secondary Educational Service Area Office 26, Maha Sarakham Province. Associations between students' perceptions of their science classroom learning environment inventories and their satisfaction and their creative thinking abilities in science secondary schooling classes were determined of affecting factors. Using the 30-item *My Class Inventory* (MCI), the 24-item *Creative Thinking test* (CTT) questionnaire, and the 20-item *Satisfaction Assessment Inventory* (SAI) Test were assessed students' perceptions of their science classroom learning environment inventories to their satisfactions toward their creative thinking abilities. These instruments are valid and reliable. Statistically significant was compared between school sizes with t-test, and associated with simple and multiple correlations, multiple regressive validity, and determination efficient values were predicted.. In terms of the form of the MCI, SAI, and the CTT, it has found that the Large and Medium school sizes, Large and Small school sizes; Medium and Small school sizes-group randomized are negative values excepts that show positive values Large-Medium sizes on the SAI and CTT, and show statistically significant ( $p < 0.001$ ), differently. These associations are positive for the scales of The  $R^2$  values indicate that less than 50% of these samples of their Creativethinking ability outcomes in understand the meaning, research design, data analysis, data synthetic, assessment and evaluation, and totalized scales of the CTT, respectively. Suggestions that, the results of this study are confirmed studies conducted in Australia, Brunei, Korea, Singapore, and other countries supported the reliability of the instrument, and consistently showed the associations between the environment, students' creative thinking abilities and learning outcomes are correlated, predicatively.

**KEYWORDS:** Determining factors, science classroom learning environment inventory, My Class Inventory (MCI), Creative Thinking Ability Test (CTT), satisfaction Assessment Inventory SAI) questionnaire, and secondary students,



## INTRODUCTIONS

Determination is a positive emotional feeling that involves persevering towards a difficult goal in spite of obstacles (Kirby, Morrow, & Yih, 2014) <sup>[1]</sup>. Determination occurs prior to goal attainment and serves to motivate behavior that will help achieve one's goal. Empirical research suggests that people consider determination to be an emotion; in other words, determination is not just a cognitive state, but rather an affective state<sup>[2]</sup>. In the psychology literature, researchers have studied determination under other terms, including challenge and anticipatory enthusiasm; this may explain one reason for the relative lack of research on determination compared to other positive emotions (Clore, Ortony, & Foss, 2014) <sup>[2]</sup>. Factor; a quantity by which a stated quantity is multiple or divided so as to indicate an increase or decrease in assessment is definition. Determining factor or causal element or factor is an important determinant of one of 'one' on 'life'. This research study indicated that to adaptation and coordination skills in constantly changing environments rely on a cohesive, dynamic and flexible approach that enables individuals and teams to quickly adjust to the new terms and demands involving their tasks. This innovative project intends to explain how these teams coordinate their activities in order to adapt and to excel on the long run. The leader's communication skills play a central role because they are directly linked to the way interpret situations and assigned tasks, as well as the way they respond to specific problems, weighing on the development of organizational practices (ISCTE, 2017) <sup>[3]</sup>.

Classroom learning environment inventory in the 21<sup>st</sup> century flipped learning, student blogging; these are becoming perceived staples of 21st-century learning. With such ambitious practices taking the spotlight for how people regard modern classrooms, it's not surprising that a murmur of impracticality or skepticism is still a frequent response when they're first introduced. Instead of requiring students to learn, work, and think in one place all day, consider how teachers' space might become more flexible (Wade, 2016) <sup>[4]</sup>. Modern realization of best practice in education no longer supports the idea of the teacher as an authoritarian figure standing in the front of the room scrawling on a chalkboard. As educators, our role can be reshaped so that we work beside students providing support and encouragement for their personal journey (Goerts, 2015) <sup>[5]</sup>. The instructional environment is the setting for all teaching. Teachers should be planed their instruction to make sure their students are able to comprehend by using different teaching practices, such as lecture, hands-on activities, cooperative learning groups and plenty of small group and individual practice (Firestone, 2015) <sup>[6]</sup>. The term "21st-century skills" is generally used to refer to certain core competencies such as collaboration; digital literacy, Creativethinking, and problem-solving that advocates believe schools need to teach to help students thrive in today's world (Rich, 2010) <sup>[7]</sup>.

Classroom learning environment inventory obviously concerns the dynamics of classrooms or smaller learning environments, including how children feel and experience the characteristics of this milieu. Judgments as to the nature of the classroom climate are based on a student perceptual consensus about the educational, psychological, social, and physical aspects of the environment (Santiboon, 2013) <sup>[8]</sup>. Because numerous measures of school and classroom climates have been developed over the past few decades, the My Class Inventory (MCI-SF) was narrowed to only those self-report surveys (Sink and Spencer, 2015) <sup>[9]</sup>. Although various instruments fit several of the criteria, only the My Class Inventory and its corresponding abbreviated version (MCISF) appear to meet each of them (Sink and Spencer, 2015) <sup>[9]</sup>. Scores on the MCI were analyzed by class to provide a measure (mean score) on each scale of each classroom of the classroom learning environment as perceived by the pupils to provide a measure of these pupils' perceptions of their classroom environments (Gedamu, 2017) <sup>[10]</sup>. At the bottom of the MCI are five abbreviations corresponding to the subscales (S = Satisfaction, F = Friction, Cm = Competitiveness, D = Difficulty, and Ch = Cohesiveness). To determine the Satisfaction subscale score, simply add the scores for the first statement in each block, using the same process for determining scores on all five subscales. At this point, teacher has the scores for each student. The final level of sophistication is to administer the MCI twice: once with students indicating how the classroom actually is, and then filling in a second sheet (Fraser & Fisher, 1986) <sup>[11]</sup>. Selected the MCI version of Santiboon (2013) <sup>[8]</sup> was used in this research study.

Historical of creative thinking, Guilford (1950) <sup>[13]</sup> was an early proponent of the idea that intelligence is not a unitary concept. Based on his interest in individual differences, he explored the multidimensional aspects of the human mind, describing the structure of the human intellect based on a number of different abilities. His work emphasized that scores on intelligence tests cannot be taken as a unidimensional ranking that some researchers have argued indicate the superiority of some people, or groups of people, over others. In particular, Guilford showed that the most creative people may score lower on a standard IQ test due to their approach to the problems, which generates a larger number of possible solutions, some of which are original. Guilford's work, thus, allows for greater appreciation of the diversity of human thinking and abilities, without attributing different value to different people (Guilford, 1980) <sup>[14]</sup>. In this research study, an adapted version of Guilford's creative thinking



skill test of his work in students' intelligence and creativity to the 24-item Guilford Divergent thinking Questionnaire (GDTQ) (Chanthala, Santiboon, and Ponkham, 2017) <sup>[15]</sup> to the 24-item *Creative Thinking Ability* (CAT) Questionnaire in 4 scales in science classes of fluency, flexibility, originality, and elaboration ability scales were used.

Student mobility has increased significantly over the past decade, supported by internationalization policies within Europe and in some other countries. International students are an important part of the internationalization process of university. Attracting international students can lead to a better learning environment also for domestic students. The crosscultural interaction can lead to diffusion of knowledge among the cultures and thus be a motivation tool for both international and domestic students of their satisfactions in the classroom environment inventory (Stoltenberg, 2011) <sup>[16]</sup> (. This study examines the students' satisfaction in secondary education; the study focuses on the factors like teachers' expertise, courses offered, learning environment and classroom facilities. Students' response measured through an adapted questionnaire on a 5-point likert scale in five scales of Learning Activity Process, Classroom Learning Environment, Instructional Media, and Benefit scales were assessed students perceptions with the *Satisfaction Assessment Inventory* (SAI) Test

However, when Thai schools ask students to focus on memorizing textbooks and give a free pass to students who write reports by copying text from the internet, Thai education seriously needs a remodeling. They also lack Creative and creative thinking skills and discipline. Their awareness of national history has also declined that courses provided at the tertiary level do not cater to the demands of the business sector. The ministry has begun solving the problem by reducing class hours and promoting classroom learning environment as well as vocational skills in schools. Education Minister Dapong Rattanasuwan admitted that there are problems in all aspects of Thai education, particularly issues concerning English proficiency and Creative and creative thinking are improved (Rattanasuwan, 2016).

As above, the based on Given the paucity of strong empirical research conducted with Thai secondary schooling students at the grade levels from Grade 10<sup>th</sup> to Grade 12<sup>th</sup> whereas differentiated size schools in four sizes; extra size (accounting students is more than 2501 students) from 121 to 499 students in a school) Large size (accounting students ranges from 1501 to 2500 students in a school), medium size (accounting students ranges from 501 to 1500 students in a school) and small size (accounting students less than 500 in school). The secondary schools under Secondary Educational Service Area Office 26 were assessed for demonstrating the reliability and validity with the My Class Inventory (MCI) instrument, before it could be recommended to school administration as a viable measure of school climate within the the *Satisfaction Assessment Inventory* (SAI) and the Creative Thinking Test (CTT), the instruments need to be thoroughly analyzed psychometrically.

## RESEACCH OBJECTIVES

1. To assess students' perceptions of their science classroom learning environment inventories of secondary schooling classes under Secondary Educational Service Area Office 26.
2. To assess students' perceptions of their satisfactions on science classroom learning environment inventories of secondary schooling classes under Secondary Educational Service Area Office 26.
3. To assess students' perceptions of their creative thinking abilities in science classroom learning environment inventories of secondary schooling classes under Secondary Educational Service Area Office 26.
4. To associate between students' perceptions of their science classroom learning environment inventories and their satisfaction of secondary schooling classes under Secondary Educational Service Area Office 26.
5. To associate between students' perceptions of their science classroom learning environment inventories and their secondary schooling classes under Secondary Educational Service Area Office 26.
6. To assess the determining factors of science classroom learning environment inventory to their satisfactions in science secondary schooling classes.
7. To assess the determining factors of science classroom learning environment inventory to their creative Thinking abilities in science secondary schooling classes.

## METHODOLOGY AND MATERIALS.

### Research Instruments

#### 1. The 30-item My Class Inventory (MCI)

In short, the construct and the factorial validity of the MCI-SF are equivocal with American school-age samples. To our knowledge, results from confirmatory factor analyses on the MCI or its short form have yet to be

published in a juried publication. In this research study, using the 30-item MCI of Santiboon version (2013) [8] were asked respondents about their perceptions of five different dimensions of their school (actual) and their dream school (preferred) environmental climates: Satisfaction (items 1, 2, 3, 4, 5, 6), Friction (items 7,8,9,10,11,12), Competitiveness (items 13, 14, 15, 16, 17,18), Difficulty (items 19, 20, 21, 22, 24, 24), and Cohesiveness (items 25, 26, 27, 28, 29, 30). The underlying scale meanings might be best described as follows: Cohesiveness--the degree to which students understand, collaborate, and are friendly with one another; Friction--the extent of tension and conflict among students; Difficulty--the level of difficulty students have with the classroom work; Satisfaction--the extent to which students feel satisfied with or like their class; and Competition--the perceived amount of classroom competition.

### 2. The 20-item Satisfaction Assessment Inventory (SAI) Test

Using the 20-item *Satisfaction Assessment Inventory* (SAI) in four scales that contains of Learning Activity Process LAP), Classroom Learning Environment (CLE), Instructional Media (ME), and Benefit (BEN) scales. The students selected from five scoring options ranging from 1 (strongly disagreement) to 5 (strongly agreement).). The items relate to student control over the design and implementation of practical work, and the choice they had or would like to have had in investigating what they wanted to investigate.

### 3. The 24- Item Creative Thinking Ability (CTT) Questionnaire

Using the original version of the original of the Guilford's intelligence work; the *Guilford Divergent Thinking Questionnaire* was adapted to assess students' perceptions of their creative thinking abilities with the 24-item *Guilford Creative Thinking Questionnaire* (GCTQ) to the Creative Thinking Test (CTT) Questionnaire in 4 scales, namely *Fluency Thinking* (the ability to produce great number of ideas or problem solutions in a short period of time) ; *Flexibility Thinking* (the ability to simultaneously propose a variety of approaches to a specific problem) ; *Originality Thinking* (the ability to produce new, original ideas) ; *Elaboration Thinking* (the ability to systematize and organize the details of an idea in a head and carry it out) were built. Each scale consists of 6 items and the five response alternatives are: *Almost Never*, *Seldom*, *Sometimes*, *Often* and *Very Often*.

### Sample

Research administration, which a sample size consisted of 420 secondary schooling students in 4 large size schools consisted of 120 students, 5 medium size schools consisted of 150 students and, 5 small size schools consisted of 150 students, it contained of 14 schooling totalities under Secondary Educational Service Area Office 26, Maha Sarakham Province, Thailand.

### Data Analysis

Assuming that the scaling of the items approximated as Strongly Disagreement to Strongly Agreement for the MCI and CTT, and Never to Always for the SAI, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the MCI, SAI and the CTT as specified. The multiple correlations, multiple regression, and determination efficient predictive analysis were significant of students' perceptions of their science classroom learning environment inventories in the 21<sup>st</sup> century through learning environment inventories for enhancing and improving science learning achievements in science classes in Under Secondary Service Area Office 26 to associate were analyzed.

## RESULTS

### Validity of the Research Instruments

Few fields of educational research have such a rich diversity of valid, economical and widely-applicable assessment instruments as does the field of learning environments. This research study describes three major questionnaires for assessing student perceptions of classroom psychosocial environment, namely My Class Inventory (MCI), to compeer students' perceptions of their satisfaction in their science classes with the SAI, and to assess of their responses to their Creativethinking abilities with the CTT. To reviews the application of these instruments in lines of past research (focusing on associations between outcomes and environment, evaluating educational innovation, differences between student perceptions, use of learning environment perceptions in guiding improvements in classrooms, links between different educational environments,, and incorporating educational environment ideas into science school were associated.

Table 1 Mean, Average mean, Standard deviation, Variance,  $\alpha$ -Reliability, Discrimination Validity, F-test for the MCI of Totalized School Size

Scale	Mean	Average mean	Standard deviation	Variance	Cronbach $\alpha$ -Reliability	Discrimination Validity	F-test
Satisfaction	22.511	3.752	4.023	16.184	0.807	0.822	4.080***
Friction	22.552	3.759	4.044	16.353	0.792	0.826	13.645***
Competitiveness	22.906	3.818	4.055	16.443	0.805	0.826	7.438***
Difficulty	23.474	3.912	4.287	18.379	0.848	0.812	3.413**
Cohesiveness	22.614	3.769	4.390	19.273	0.843	0.813	3.334**

$N=420$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

The results given in Table 1 shows that on average item means for each of the five MCI scales, that they contain five items, so that the minimum and maximum score possible on each of these scales is 5 and 25, that mean scores ranged from 22.511 to 23.474, average mean scores ranged from 3.752 to 3.912, in most case, the standard deviation ranged from 4.023 to 4.390, the discriminant validity coefficients (the mean correlation of a scale with the other scales) ranged from 0.812 to 0.826, respectively. Because of this difference in the number of items in the five scales, the average item mean for each scale was calculated so that there is a fair basis for comparison between different scales. These means were used as a basis for constructing the simplified plots of significant differences between forms of the MCI. For the remaining five scales, Satisfaction, Friction, Competitiveness, Difficulty, and Cohesiveness scales. There were significant differences between students' perceptions of their science school climate classes, indicated to moderate internal consistency Cronbach alpha reliability ranged from 0.792 to 0.848, respectively.

Table 2 Mean, Average mean, Standard deviation, Variance,  $\alpha$ -Reliability, Discrimination Validity, F-test for the SAI of Totalized School Size

Scale	Mean	Average mean	Standard deviation	Variance	Cronbach $\alpha$ -Reliability	Discrimination Validity	F-test
Learning Activity Process	19.255	3.851	3.050	9.302	0.752	0.785	6.880***
Classroom Learning Environment	18.945	3.789	3.261	10.634	0.756	0.784	12.393***
Leaning Media Benefit	18.912	3.782	3.504	12.281	0.810	0.766	8.735***
	19.323	3.865	3.3865	11.465	0.789	0.773	2.796*

$N=420$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

To measure student's satisfactions towards science studies, Table 2 presented twenty-item *Satisfaction Assessment Inventory* (SAI). Using international consistency reliability the SAI in four scales had a value ranged from 0.752 to 0.784 which was considered satisfactory for further use in this study.

Table 3 Mean, Average mean, Standard deviation, Variance,  $\alpha$ -Reliability, Discrimination Validity, F-test for the CTT

Scale	Mean	Average mean	Standard deviation	Variance	Cronbach $\alpha$ -Reliability	Discrimination Validity	F-test
Originality	16.423	2.737	3.589	12.884	0.611	0.622	23.980***
Flexibility	16.750	2.792	3.203	10.264	0.638	0.613	8.908***
Fluency	15.407	2.568	2.634	6.939	0.605	0.624	7.195***
Elaboration	16.031	2.672	2.901	8.417	0.624	0.618	15.580***

$N=420$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

The results given in Table 1, 2 and 3 show that on average item means for each of the five MCI, SAI, and CTT scales. In table 1, the MCI contained five items, so that the minimum and maximum score possible on each

of these scales is 5 and 25, and average mean scores ranged from 1 to 5, respectively. Because of this difference in the number of items, the average item mean for each scale was calculated so that there is a fair basis for comparison between different scales. These means were used as a basis for constructing the simplified plots of significant differences between forms of the MCI. For the remaining five scales, Satisfaction, Friction, Competitiveness, Difficulty, and Cohesiveness scales. In Table 2, the SAI contained four items, so that the minimum and maximum score possible on each of these scales is 5 and 20, and average mean scores ranged from 1 to 5, respectively. In Table 3, the CTT contained four items, so that the minimum and maximum score possible on each of these scales is 5 and 20, and average mean scores ranged from 1 to 5, respectively. There were significant differences between students' perceptions of their school climates, indicated to moderate internal consistency, respectively.

The internal consistency reliability of the version MCI used in this study was determined by calculating Cronbach alpha coefficient for the 25 items of the MCI using both different school environmental climates' perceptions scores in Table 1, which ranged from 0.792 to 0.848, ranged from 0.752 to 0.810 for the SAI, and ranged from 0.605 to 0.638 for the CTT when using the students' school climate totalized scores and from when using the students' perceptions of their science classroom environments in 11 schools' climate scores for the MCI, SAI, and CTT scales, respectively, which are amenable to easy hand scoring. When each instruments were administered to a large sample of science classes, results supported each scale's internal consistency reliability, discriminant validity, and ability to differentiate between the perceptions of students in different classrooms.

### Comparisons between Students Perceptions of their Classroom Environment Inventory of their Size Schools Differences for the MCI, SAI and CTT

A descriptive statistic analysis was used to follow as the research objectives, which dimension (s) of classroom environment that students perceived to have taken place most often in their differences of their sizes of their schooling large, medium, and small sizes' science classroom learning environments for the MCI, SAI and CTT. Table 4 shows the means and standard deviations of perceived classroom environment scales. Using *t*-test analysis assesses whether the means of two groups are *statistically* different from each other. This analysis is appropriate whenever want to compare the means of two groups, and especially appropriate as the analysis for the two schooling sizes, such as; Large and Medium school sizes, Large and Small school sizes; Medium and Small school sizes-group randomized. This study comparing how three different groups of informants use intersentential referencing is outlined. *Eta*<sup>2</sup> can be defined as the proportion of variance associated with or accounted for by each of the main effects, interactions, and error in an ANOVA study.

Table 4 *Comparisons between Students Perceptions of their Classroom Environment Inventory of their Size Schools Differences for the MCI, SAI and CTT*

Scale	Schooling Sizes	Accounting Sample	Account School	Means' scores	Standard Deviation	Paired Size schools	Sample	t-test	ANOVA Results (eta <sup>2</sup> )
MCI	Large size	120	4	3.728	0.721	Large- sizes	Medium	-0.815	0.422
	Medium size	150	5	3.793	0.520			-1.481	0.364
	size	150	5	3.861	0.576	Large- Medium- sizes	Small sizes	-	0.364
	Small size						Small	3.095***	
SAI	Large size	120	4	3.786	0.522	Large- sizes	Medium	0.623	0.376
	Medium size	150	5	3.741	0.592			-0.862	0.231
	size	150	5	3.963	0.572	Large- Medium- sizes	Small sizes	-	0.397*
	Small size						Small	4.080***	
CTT	Large size	120	4	2.730	0.30	Large- sizes	Medium	0.500	0.477
	Medium size	150	5	2.727	0.313			3.195***	0.318
	size	150	5	2.667	0.330	Large- Medium- sizes	Small sizes	0.751	0.351**
	Small size						Small		

*N*=420, \**p*<.05, \*\**p*<.01, \*\*\**p*<.001

In Table 4 shows the t-values indicated that positive if the first mean is larger than the second and negative if it is smaller. In terms of the form of the MCI, SAI, and the CTT, it has found that the Large and Medium school sizes, Large and Small school sizes; Medium and Small school sizes-group randomized are negative values excepts that show positive values Large-Medium sizes on the SAI and CTT, and show statistically significant ( $p < .05$ ), differently.

#### Associations between Students' Perceptions of their Science Classroom Environment Inventory (MCI) toward their Satisfaction Assessment Inventory (SAI) Questionnaire

The simple correlation values ( $r$ ) are reported in Table 5, 6, 7, 8 and 9 which show significant correlations ( $p < .05$ ) between students' Creative thinking abilities outcomes and their science teacher interpersonal behaviours all of eight scales. The second type of analysis consisted of the more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the MSI and their Creative thinking abilities towards their science schooling climates when the effect of relationships between the scales is controlled. The multiple correlation  $R$  is significant for My School Climate Form of the MCI and shows that when the scales are considered together there is a significant ( $p < .05$ ) in *Learning Activity Process Scale* (Table 5), *Classroom Learning Environment* scale (Table 6), *Learning Media Scale* (Table 7), and *Benefit* scale (Table 8). There are the significant ( $p < .05$ ) associations with the creative thinking abilities respectively. In Table 5 the determination efficiency predictive value ( $R^2$ ) indicates that 6% of the variance in students' creative thinking abilities to their science classes was attributable to their perceptions of their creative thinking abilities in *Learning Activity Process* scale.

Table 5 Associations between Students' Perceptions of their Science Classes Environment Inventory (MCI) toward their SAI in Learning Activity Process Scale

Scale	Simple correlation ( $r$ )	Multiple Regression validity ( $\beta$ )
Satisfaction	0.234***	0.137
Friction	0.215***	0.032
Competitiveness	0.219***	0.069
Difficulty	0.206***	0.058
Cohesiveness	0.192***	-0.018
Multiple Correlation ( $R$ )	0.025***	
Determination Efficient Predictive Value ( $R^2$ )	0.063***	

$N=420$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 6 Associations between Students' Perceptions of their Science Classes Environment Inventory (MCI) toward their SAI in Classroom Learning Environment Scale

Scale	Simple correlation ( $r$ )	Multiple Regression validity ( $\beta$ )
Satisfaction	0.212***	0.120
Friction	0.175***	-0.082
Competitiveness	0.200***	0.220
Difficulty	0.243***	0.196
Cohesiveness	0.198***	0.016
Multiple Correlation ( $R$ )	0.258***	
Determination Efficient Predictive Value ( $R^2$ )	0.066***	

$N=420$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$



Table 7 Associations between Students' Perceptions of their Science Classes Environment Inventory (MCI) toward their SAI in Learning Media Scale

Scale	Simple correlation (r)	Multiple Regression validity ( $\beta$ )
Satisfaction	0.225***	0.147*
Friction	0.182***	-0.078
Competitiveness	0.200***	0.008
Difficulty	0.256***	0.233
Cohesiveness	0.190***	-0.028
Multiple Correlation (R)	0.273***	
Determination Efficient Predictive Value ( $R^2$ ) 0.075***		

$N=420$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 8 Associations between Students' Perceptions of their Science Classes Environment Inventory (MCI) toward their SAI in Benefit Scale

Scale	Simple correlation (r)	Multiple Regression validity ( $\beta$ )
Satisfaction	0.270***	0.121*
Friction	0.246***	-0.046
Competitiveness	0.280***	0.106
Difficulty	0.296***	0.185
Cohesiveness	0.250***	-0.015
Multiple Correlation (R)	0.319***	
Determination Efficient Predictive Value ( $R^2$ ) 0.120***		

$N=420$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

In Table 6, 7, and 8, the determination efficiency predictive value ( $R^2$ ) indicates that 7%, 8% and 12% of the variances in students' creative thinking abilities to their science classes were attributable to their perceptions of their creative thinking abilities in *Learning Activity Process*, *Classroom Learning Environment*, *Learning Media* and *Benefit* scales, respectively.

#### Associations between Students' Perceptions of their Science Classroom Environment Inventory (MCI) toward their Creative Thinking Ability Test (CTT) Questionnaire

Focusing on the MCI and the CTT, the same statistical procedures also involved the investigation of associations between students' perceptions of their science classroom environment inventory (MCI) and their creative thinking abilities toward science. The simple correlation values (r) are reported in Table 9, 10, 11, and 12 which show non-significant correlations ( $p>.05$ ) on all scales between perceptions of their science classroom environment inventory (MCI) and their creative thinking abilities. The conservative regression coefficient, that measures the associations between perceptions on each scale of the MCI and their creative thinking abilities towards science when the effects of relationships between the scales are controlled. The multiple correlations (R) are non-significant associations with the CTT. The  $R^2$  values indicate that 5%, 12%, 29%, and 14% of the variance in students' creative thinking abilities to their science classes were attributable to their perceptions of their creative thinking abilities in *Fluency Thinking* (the ability to produce great number of ideas or problem solutions in a short period of time) ; *Flexibility Thinking* (the ability to simultaneously propose a variety of approaches to a specific problem) ; *Originality Thinking* (the ability to produce new, original ideas) ; *Elaboration Thinking* (the ability to systematize and organize the details of an idea in a head and carry it out), respectively (see in Table 9, 10, 11, and 12).



Table 9 Associations between Students' Perceptions of their Science Classes Environment Inventory (MCI) toward their CTT in Originality Scale

Scale	Simple correlation (r)	Multiple Regression validity ( $\beta$ )
Satisfaction	-0.001	-0.012
Friction	-0.012	-0.076
Competitiveness	0.005	-0.031
Difficulty	0.035	0.076
Cohesiveness	0.030	0.061
Multiple Correlation (R)	0.073	
Determination Efficient Predictive Value ( $R^2$ )	0.005	

$N=420$ ,  $*p<.05$ ,  $**p<.01$ ,  $***p<.001$

Table 10 Associations between Students' Perceptions of their Science Classes Environment Inventory (MCI) toward their CTT in Flexibility Scale

Scale	Simple correlation (r)	Multiple Regression validity ( $\beta$ )
Satisfaction	0.005	-0.010
Friction	-0.014	-0.118
Competitiveness	0.013	-0.435
Difficulty	0.056	1.378
Cohesiveness	0.049	1.054
Multiple Correlation (R)	0.109	
Determination Efficient Predictive Value ( $R^2$ )	0.012	

$N=420$ ,  $*p<.05$ ,  $**p<.01$ ,  $***p<.001$

Table 11 Associations between Students' Perceptions of their Science Classes Environment Inventory (MCI) toward their CTT in Fluency Scale

Scale	Simple correlation (r)	Multiple Regression validity ( $\beta$ )
Satisfaction	-0.037	-0.188
Friction	0.069	0.196
Competitiveness	0.030	0.020
Difficulty	0.060	0.114
Cohesiveness	-0.008	-0.121
Multiple Correlation (R)	0.170	
Determination Efficient Predictive Value ( $R^2$ )	0.029	

$N=420$ ,  $*p<.05$ ,  $**p<.01$ ,  $***p<.001$

Table 12 Associations between Students' Perceptions of their Science Classes Environment Inventory (MCI) toward their CTT in Elaboration Scale

Scale	Simple correlation (r)	Multiple Regression validity ( $\beta$ )
Satisfaction	-0.019	0.015
Friction	-0.052	-0.114
Competitiveness	-0.038	-0.108
Difficulty	-0.004	0.030
Cohesiveness	0.028	0.162
Multiple Correlation (R)	0.119	
Determination Efficient Predictive Value ( $R^2$ )	0.014	

$N=420$ ,  $*p<.05$ ,  $**p<.01$ ,  $***p<.001$

An investigation of the association between students' perceptions of science classroom learning environment inventory with their satisfactions and their creative thinking abilities were carried out. Non scale of five MCI scales, namely; Satisfaction, Friction, Competitiveness, Difficulty, and Cohesiveness scales were not

found to have a consistent positive and negative relationship with the satisfactions and the creative thinking abilities.

## CONCLUSIONS AND DISCUSSIONS

This research study was to assess students' perceptions of their science classroom learning environment inventories of secondary schooling classes, their satisfactions, and their creative thinking abilities in science classroom learning environment inventories. Associations between students' perceptions of their science classroom learning environment inventories and their satisfaction to their creative thinking abilities toward science were assessed of secondary schooling classes under Secondary Educational Service Area Office 26. The construct and the factorial validity of the MCI-SF are equivocal with American school-age samples. To our knowledge, results from confirmatory factor analyses on the MCI or its short form have yet to be published in a juried publication, using the 30-item MCI of Santiboon version (2013), the 20-item *Satisfaction Assessment Inventory* (SAI) in four scales that contains of Learning Activity Process (LAP), Classroom Learning Environment (CLE), Instructional Media (ME), and Benefit (BEN) scales, adapted to assess students' perceptions of their creative thinking abilities with the 24-item *Guilford Creative Thinking Questionnaire* (GCTQ) to the Creative Thinking Ability (CTT) Questionnaire in 4 scales, namely *Fluency Thinking*; *Flexibility Thinking*; *Originality Thinking* (the ability to produce new, original ideas) ; *Elaboration Thinking* were built. Each scale consists of 6 items and the five response alternatives are: *Almost Never*, *Seldom*, *Sometimes*, *Often* and *Very Often*. Research administration, which a sample size consisted of 420 secondary schooling students in 4 large size schools consisted of 120 students, 5 medium size schools consisted of 150 students and, 5 small size schools consisted of 150 students, it contained of 14 schooling totalities under Secondary Educational Service Area Office 26, Maha Sarakham Province. Internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the MCI, SAI and the CTT as specified. The multiple correlations, multiple regression, and determination efficient predictive analysis were significant of students' perceptions of their science classroom learning environment inventories.

The results supported each scale's internal consistency reliability, discriminant validity, and ability to differentiate between the perceptions of students in different classrooms of the version MCI, SAI, and CTT used were determined by calculating Cronbach alpha coefficient. the t-values indicated that positive if the first mean is larger than the second and negative if it is smaller. In terms of the form of the MCI, SAI, and the CTT, it has found that the Large and Medium school sizes, Large and Small school sizes; Medium and Small school sizes-group randomized are negative values excepts that show positive values Large-Medium sizes on the SAI and CTT, and show statistically significant ( $p < .05$ ), differently. Associations between students' perceptions of their science classroom environment inventory (MCI) toward their satisfaction assessment inventory (SAI) questionnaire were assessed. The determination efficiency predictive value ( $R^2$ ) indicates that 7%, 8% and 12% of the variances in students' creative thinking abilities to their science classes were attributable to their perceptions of their creative thinking abilities in *Learning Activity Process*, *Classroom Learning Environment*, *Learning Media* and *Benefit* scales. Associations between students' perceptions of their science classroom environment inventory (MCI) toward their creative thinking ability test (CTT) questionnaire were assessed. The  $R^2$  values indicate that 5%, 12%, 29%, and 14% of the variance in students' creative thinking abilities to their science classes were attributable to their perceptions of their creative thinking abilities in *Fluency Thinking*; *Flexibility Thinking*; *Originality Thinking* and *Elaboration Thinking* scales. An investigation of the association between students' perceptions of science classroom learning environment inventory with their satisfactions and their creative thinking abilities were carried out. Non scale of five MCI scales, namely; *Satisfaction*, *Friction*, *Competitiveness*, *Difficulty*, and *Cohesiveness* scales were not found to have a consistent positive and negative relationship with the satisfactions and the creative thinking abilities, respectively.

## ACKNOWLEDGEMENT

I would first like to thank my thesis of the Master of Science Education/ Faculty of Education; Advisor Prof. Dr. Somsa-nguan Passag, and Prof. Dr. Pornnarong Siripiyasing of Faculty of Science, Faculty of Education, Rajabhat Mahasarakham University. I also thank to the 420-secondary students in 14 schools under Service Area Office 26, Maha Sarakham Province. The door to Prof. Santiboon was always open whenever I ran into a trouble spot or had a question about my research or writing. He consistently allowed this paper to be my own work, but steered me in the right the direction whenever he thought I needed it.

## REFERENCES

- [1] Kirby, L.D., Morrow, J., & Yih, J. (2014). *The challenge of challenge: Pursuing determination as an emotion*. Handbook of Positive Emotions. New York: Guilford Publications, Inc.
- [2] Clore, G. L., Ortony, A., & Foss, M. A. (2014). The psychological foundations of the affective lexicon. *Journal of Personality and Social Psychology*, 53 (4), pp.751-766.
- [3] ISCTE-Instituto Universitario De Lisboa. (2017). Leadership as a determining factor when effectiveness is the goal. Retrieved on 15 February 2017 from <https://www.iscte-iul.pt/news/1220/leadership-determining-factor-when-effectiveness-is-the-goal>
- [4] Wade, M. (2016). Visualizing 21<sup>st</sup>-century classroom design. *George Locus Educational Foundation*. Retrieved on 29 March 2016 from <https://www.edutopia.org/blog/visualizing-21st-century-classroom-design-mary-wade>
- [5] Goerts, P. (2015). 10 signs of a 21<sup>st</sup> century classroom. *George Locus Educational Foundation*. Retrieved on 16 April 2015 from <https://www.edutopia.org/discussion/10-signs-21st-century-classroom>
- [6] Firestone, M. (2015). What is a learning environment in classrooms? Retrieved on 14 June 2015 from <http://study.com/academy/lesson/learning-environment-in-the-classroom-definition-impact-importance.html>
- [7] Rich, E. (2010). How do you define 21<sup>st</sup>-century learning. Retrieved on 11 October 2010 from <https://www.edweek.org/tsb/articles/2010/10/12/01panel.h04.html>
- [8] Santiboon, T. (2013). School environments inventory in primary education in Thailand. *Merit Research Journal of Education and Review* (ISSN: 2350-2282) Vol. 1 (10) pp. 250-258, November, 2013
- [9] Sink, C. A., and Spencer, L. R. (2015). My class inventory-short form as an accountability tool for elementary school counselors to measure classroom climate. *American School Counselor Association*, Vol 2 (5) : pp. 245-256.
- [10] Gedamu, A. D. (2017). Association between students' perceived EFL classroom environment and their achievement in English language: Ethiopian Secondary Schools in context. *International Journal of Languages' Education and Teaching Volume 5*, Issue 3, September 2017: pp. 1-11
- [11] Fraser, B. J., & Fisher, D. L. (1986). Using short forms of classroom climate instruments to assess and improve classroom psychosocial environment. *Journal of Research in Science Teaching*, 23, pp.387-413.
- [12] Santiboon, T. & Fisher D. L. (2005). *Learning environments and teacher-student interactions in physics classes in Thailand*. Proceedings of the Fourth International Conference on Physics, Mathematics and Technology Education Sustainable Communities and Sustainable Environments: Envisioning a Role for Physics, Mathematics and Technology Education, Victoria, Vancouver, Canada.
- [13] Guilford, J. P. (1950). *Creativity*. *American Psychologist*, 5, pp.444-454.
- [14] Guilford, J.P. 1980. Some changes in the structure of intellect model. *Educational and Psychological Measurement* 48: 1-4.
- [15] Chanthala, C., Santiboon, T., & Ponkham, K. (2017). Instructional designing the STEM education model for fostering creative thinking abilities in physics laboratory environment classes. *International Journal of Education and Practice*. 2017, Volume 5, Issue 11; pp. 259 – 272.
- [16] Stoltenberg, G. (2011). Investigating the Concept of Student Satisfaction. The Case of International Students at the UiO. Retrieved from <https://www.duo.uio.no/bitstream/handle/10852/30621/MYxTHESIS.pdf>
- [17] Rattanasuwan, D. (2016). Education Minister says Thai students lack Creative thinking of their learning skills. Retrieved from <https://coconuts.co/bangkok/news/education-minister-says-thai-students-lack-critical-thinking-and-english-language-skills/>

**MODEL OF DUAL EDUCATION MANAGEMENT SYSTEM THROUGH COMMUNITY PARTICIPATION**

SathakaTanchai, TipapornSujaree and SuwattanapongRomsri

*PhD. Candidate, Doctor of Philosophy Program in Educational Management for Local Development,  
RajabhatMahaSarakhm University.**Assistant Professor of RajabhatMahaSarakhm University.**Special Lecturer of RajabhatMahaSarakhm University.***ABSTRACT**

This research objective was to synthesize theoretical model of twilight learning management system by focusing on community participation for schools under the Secondary Educational Service Area Office 27. The study is the beginning part of the three-phase study -- 1) the study of present condition and needs of twilight learning management system by focusing on community participation for schools under the Secondary Educational Service Area Office 27, 2) model creation, and 3) model implementation and evaluation. This first step of model drafting for the Phase 1 study mentioned above employs literature review and documentary analysis by inductive method. The research results give theoretical model process cycle with the factors -- 1) policy and planning formulation; 2) curriculum formulation for general and vocational skills; 3) learning activities comprising teaching management, vocational training, skill development; 4) measurement and evaluation; and 5) forwarding graduated students. All processes must have community participation in every step.

**KEYWORDS:** learning management, twilight learning management system, community participation, model development

## INTRODUCTION

Thailand's Constitution of 2007 stipulates that Thai people have the rights to participate in government official decision process that may affect the rights and freedom (Chapter 60). Under this Constitution, the government must "encourage people participation in policy formation, political decision, social and political development planning, and monitoring government implementation in every level (Chapter 76). This is in line with Worapradit (2010) stating public participation come from the internal needs to engage according to social norm. The authentic community participation must follow social norm, value, tradition, individual's attitude for voluntary work. The community members are different in individual, economic characteristics, and access to information.

Therefore, community's participation refers to the provision of all stakeholders with participation in one part of dual education management focusing management process and sub-activities for the achievement of the projects. The major aim of public participation is to manage and develop based on the local needs and problems. Scholars can mainly help strengthening community, enhancing roles and responsibilities of people for community development and self-development.

Model refers to a copy of a real phenomenon that clarifies and simplifies the complex relationships of phenomenon. Model creates paradigm of the phenomenon based on the principle, theories and goals for systematical description. Therefore, model is not a description of all objects and phenomena clearly. The major aim of model designer is to describe and simplify specific phenomena by using physical model such as a model of the national library. Model is designed by knowledge transfer, and connecting the structural relations of all components or factors in a model.

However, types of models are composed of a simple one and the complex one or physical Model and qualitative model for describing phenomenon with languages or symbols. Therefore, the author will present the relations of components or variable for describing the relations and steps of dual education management.

Brown and Moberg (1980) has synthesized models by using system approach and contingency approach. He states that the components of model consists of 1) environment, 2) technology, 3) structure, 4) management process and 5) decision making. The recent studies show that models have a flexible forms or types based on the specific phenomenon and interest.

Keeves (1988) states that the practical model should consist of four factors: 1) structural relationship not associative relationship, 2) prediction of the expected outcomes and visual assessment and empirical data, 3) indicator for reason-based study and prediction, and instrument for creating paradigm and significant relations between variables.

After the principles have been used to design a model, a model designer should write practical guidelines for using seven components of a model, tools and handbooks. The model should be developed and assessed by experts concerned with, and the assessment results should be added in the appendix part of the report for practical purposes of the users. Therefore, the article focuses on synthesizing models of dual education management through community's participation. The authors will summarize and present theories, concepts and principles in this study.

### Research Question

What is the theoretical model of twilight learning management system by focusing on community participation for schools under the Secondary Educational Service Area Office 27?

### Research Objective

To synthesize the theoretical model of twilight learning management system by focusing on community participation for schools under the Secondary Educational Service Area Office 27.

### Unit of study

Since this study is the documentary research to find theoretical model of twilight learning management system by focusing on community participation for schools under the Secondary Educational Service Area Office 27, the unit of study is the related literature on proposing the mode. The variables studied were model development, learning management, community participation, twilight or dual education management, and credit transfer of vocational education.

## RESEARCH METHOD

As stated above this study focused on proposing the theoretical model of twilight learning management system by focusing on community participation for schools under the Secondary Educational Service Area Office 27 with literature review and inductive analysis. This section presents the related variables for creating the model. They are 1) learning management, 2) community participation, 3) dual education management, 4) credit transfer of vocational education, and 5) model development. The brief discussion of these variables is the following.

### Learning Management

Knowledge is absolutely created from the appropriate and interactive learning activities which are organized for learners based on the learning outcomes and objectives. The major goal of learning outcomes is to provide meaningful and interactive learning experiences to improve knowledge and skills of learners. Therefore, teachers should know personal background of learners, scope of contents and abilities of teachers in teaching for learning management and achievement of learning outcomes. The basic concepts of learning management are summarized as follows.

#### 1. Definition of learning management, consisting of two words: “learning and management”

An administrative process for achieving learning objectives by using effectively and efficiently educational resources for the instructional purposes. Klein (1991) defines that Learning is the relatively permanent change in a person's knowledge or behavior due to experience. It is defined as the transformative process of taking in information that—when internalized and mixed with what we have experienced—changes what we know and builds on what we do. In conclusion, learning management is a transformative process for organizing learning activities by using resources to improve learner behaviors and instructional purposes.

#### 2. Theories of Learning

Khaemmanee (2007) has studied and summarized theories of learning in the 20<sup>th</sup> century as follows.

Behaviorism is a learning theory that only focuses on objectively observable behaviors and discounts any independent activities of the mind. Behavior theorists define learning as nothing more than the acquisition of new behavior based on environmental conditions. Behaviorism is a worldview that assumes a learner is essentially passive, responding to environmental stimuli. The learner starts off as a clean slate and behavior is shaped through positive reinforcement or negative reinforcement. Thisana Khaemmanee (2007) states that Behaviorism theory of Thorndike's Classical Connectionism focuses on 1) law of readiness, 2) law of exercise 3) law of use and disuse and 4) law of effect.

The principles of the learning theory is applied to organize learning activities for learner improvement and problem solutions from stimulus-response associations made by the learner.

#### 3. Components of Learning Management

The author studies and concludes the concepts of learning management that learning management is a systematic process for the operation consisting of planning, managing learning activities, and evaluation. And classroom should include a teacher, students, learning activities and teaching- learning context.

### Community Participation

#### 1. Components of participation

Principles of public participation are to provide people and all stakeholders to participate in the government affairs. The community's participation consists of five levels: 1) giving information, 2) holding consultation, 3) involvement, 4) collaboration and 5) empower.

In conclusion, the public participation is created by many different levels and strategies based on needs of people and expenses for the participation.

#### 2. Participation

Delbeq and Andrew (1971) claims that participation refers to data collection, data analysis, setting priority, operation and evaluation for development. Process of public participation is composed of five models: 1) data collection of the projects, 2) analysis and conclusion of the problems, 3) setting priority of the problems, 4) solving problems and 5) evaluation of the projects for development.

Arnstein states that the quality of public participation should include authority of participants in controlling projects for the achievement of the projects. He proposes that participation consists of three levels: 1) pseudo participation or passive participation, 2) partial participation and 3) genuine participation.

In conclusion, level of participation should be consistent with process of steps of the participation, which indicates the interaction of people and the ability of people in movement for development.



### 3.Aspects and Steps of Participation

Fornaroff (1980) states that steps of the participation of people in community activities consists of:

- 1.Planning and making decisions on setting goals, method, resources and evaluation.
- 2.Operation
- 3.Project utility
- 4.Participation in benefits

Cohen and Uphoff (1981) claims that public participation refers to four dimensions of people in communities.

- 1.Participation in making decisions
- 2.Participation in operation and development
- 3.Participation in public benefits
- 4.Participation in evaluation

In conclusion, public participation creates public policies and services based on using effectively local resources and needs of people in communities.

## Dual Education Management

### 1.Rationale

Policy of Ministry of Education on vocational education focuses on producing vocational students by designing dual vocational training curriculums of vocational education and upper secondary education for labor market. Additionally, the training curriculums will be provided for people in communities especially working persons and secondary school students. The students who finish the dual vocation curriculum, will obtain knowledge of ordinary courses and vocational courses. This dual education, due to its application to people who work in the day, sometimes called twilight education.

### 2.Objectives of Dual Education Management

- 2.1 To provide vocational training courses to both people and secondary students based on their needs and interest.
- 2.2 To increase the target group, secondary students for vocational training curriculums.
- 2.3 To offer alternative vocational training courses for secondary students

### 5.4 Credit Transfer of Vocational Education

Credit transfer of core basic educational curriculum of 2007, upper secondary education for vocational certificate of 2013 focusing on fundamental courses, life skill courses and elective courses will be done as follows.

1. Analysis of learning standards, indicators and contents of core basic educational course of 2007 and comparing learning objectives, competencies, and course description of life skill courses with the certificate course of 2013

2. Credit transfer based on the national regulation for educational management and evaluation of the certificate course, 2013 Ministry of Education by assessing the objectives and contents which are close to the certificate course at least 60% and the equal credit.

## Model Development

A practical model must consist of core components: structural relationship, predictable results, the extension of results and application for model development. Model development should be based on the analysis and synthesis of theories for establishing the relations and suggestions of model components. Therefore, a model is assessed by experts and developed for the practical purposes. Ratchadaporn Wehachart (2005) proposes a model for improving education quality management of schools under Office of the Basic Education Commission. The model consists of five phases as follows:

Step 1: Study and survey on the concepts and principles of quality management of organizations by interviewing school administrators and teachers who were selected for pilot projects and learning development for education quality including documentary study of research and current conditions from self-assessment of the quality.

Step 2: Design of a model for quality management by synthesizing the interviewed data of step 1 and assessment of the model by the experts

Step 3: Development of the model based on the data of step 2 for quality management through Delphi technique of the experts and analysis of the model for quality management through three rounds of Delphi technique

Step 4: Assessment of the appropriateness for a model of quality management for school administrators, teachers and education committee

Step 5: implementation, conclusion and report on the model for quality management of organizations

### Assessment of Models

A major goal of model design is to assess a model with empirical data and by various methods for qualitative evidences and quantitative evidences in identifying the qualities of the model. UtumpornJamorn (1998) states that two qualities of the model are assessed by experts through statistical procedure: 1) analyzing the relationship of factors and variables, and 2) estimating the parameter value of the relationships. Eisner (1976) asserts that the values are assessed by experts and estimated across time, samples, and sites.

1. The assessment method is a responsive model not a goal-based model focusing on problems and needs of stakeholders through deeply analyzing the issues of problems and assessing the appropriateness and efficiency of the model by experts.

2. A model for specialization is usually designed from art criticism and assessed by the specialists. Consequently, the concept is applied for higher education in Thailand.

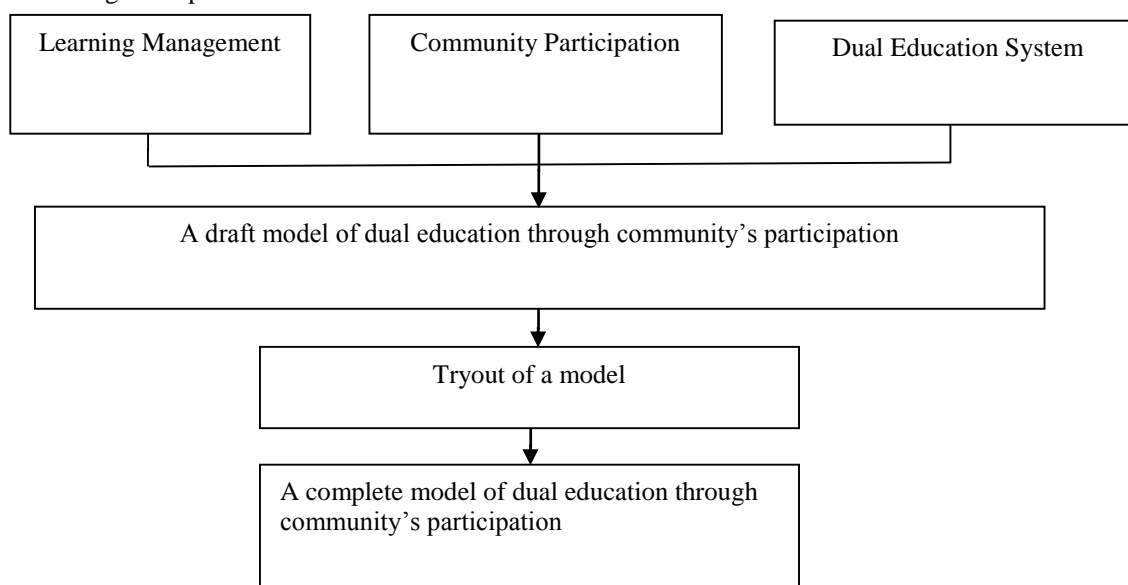
3. A model mainly focuses on assessing a model by experts or specialists based on the standard criteria and their experience.

4. A flexible model focuses on an operating process for identifying problems, data collection, data management and data presentation of the experts or specialists with high credit of work experiences.

In conclusion, four methods of model assessment are 1) standard-based assessment, 2) specialist-based assessment, 4) stakeholder-based assessment, and 4) tryout-based assessment.

## RESEARCH RESULTS

With literature review and study of variables in topic 5 above, the authors have synthesized the concepts and theories and designed a model for dual (twilight) education through community's participation as the following conceptual framework.



Picture 1 Drafted Model of Dual Education Management System through Community Participation

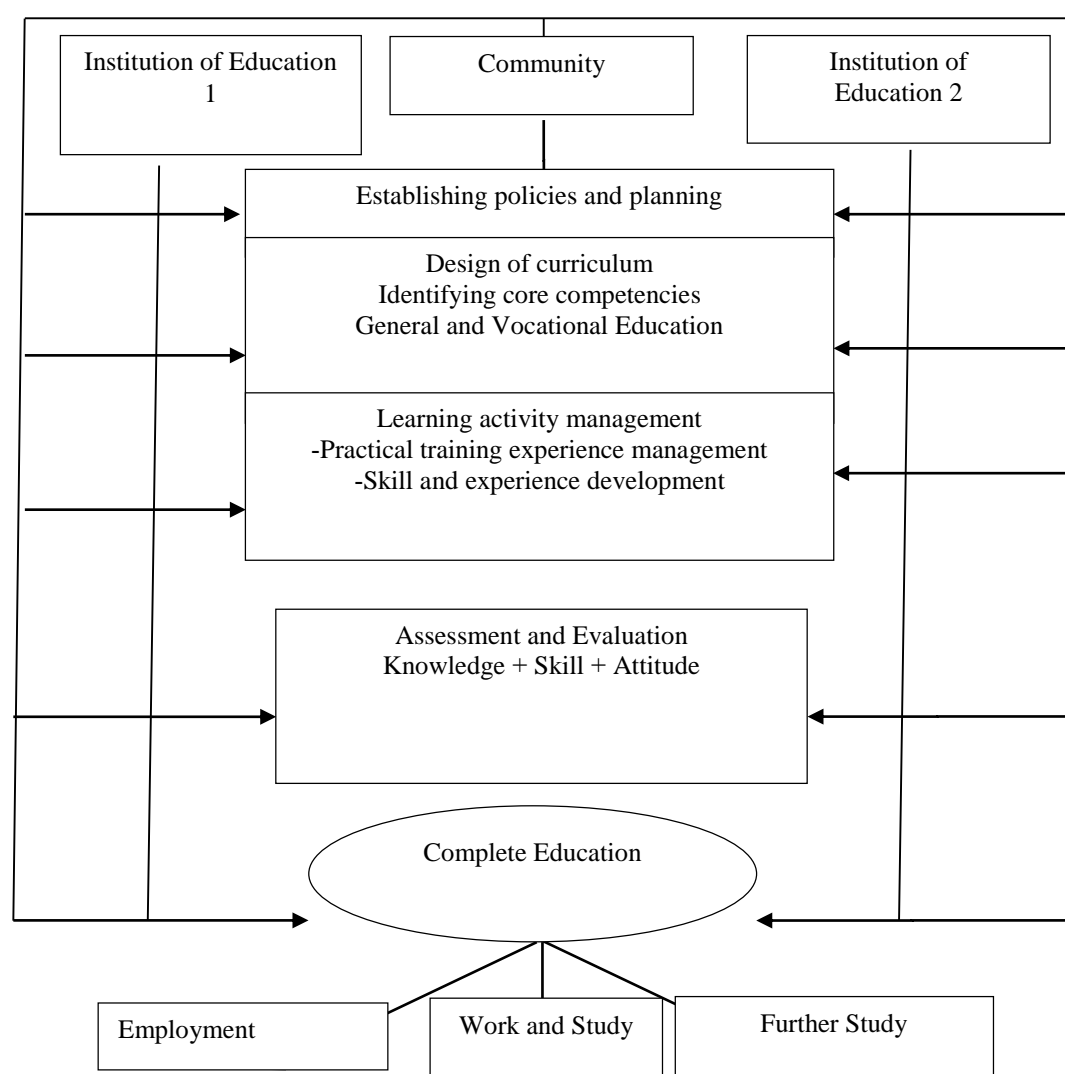
The model above combines the explicit knowledge of learning management and dual education through community's participation.

The model indicates the relationship between components and variables including the steps or activities. The model of dual education management through community's participation consists of:

1. Management process of:
  - 1.1 Establishing policies and planning
  - 1.2 Curriculum design

- 1.3 Learning activity management
- 1.4 Assessment and evaluation
- 1.5 Complete education
2. Activities of the management process consist of analysis of present conditions, opportunities and economic, social, political and cultural limitation. Then the model is designed for dual education management through community's participation.
3. The relations of agency include:
  - 3.1 Institution of general education
  - 3.2 Institution of vocational education
  - 3.3 Community
4. The system of mechanism of learning management mainly insists of Memorandum of Understanding (MOU), regulations and operational method.

Therefore, the model of dual education management through community participation is designed as the following picture.



**Diagram: A Model of Dual Education Management through Community's Participation**  
 Picture 2 Synthesized Model of Dual Education Management System through Community Participation  
**CONCLUSION**

Interactive learning activities are necessary for improving knowledge and behaviors of students. Additionally, the teachers are expected to understand precisely the dual education management. However, Ministry of Education has established the policy in producing more vocational students by collaborating with secondary school and community for providing people or students with education and jobs. Additionally, community-based education serves the national policy and public policy through efficient local resource management. The model of dual education management through community's participation was designed from the literature review of the explicit knowledge for the research.

## REFERENCES

- Khaemnee, Thisana. (2007). *Science of Teaching: Body of Knowledge for Efficient Learning Management* (5<sup>th</sup> Edition). Bangkok: Chulaongkorn Publication Limited.
- Wehachart, Rungratchda (2005). *A Model for Quality Management of Basic Education Schools*. Thesis for Doctor of Education, Burabha University.
- Worapradit, Suthee (2009), *Public Participation*. [Online]. [http://trat.nfe.go.th/trat/topic5\\_old.php?page=5](http://trat.nfe.go.th/trat/topic5_old.php?page=5), [10/January/2010].
- Jamornmal, Utoomporn (1998). *What is a model?*. Cademic Journal, January, 22-25.
- Cohen, J.M. and Uphoff, N.J. (1997) *Rural development participation : Concept and Measures For Project Design implementation and Evaluation*. London : Rural Development Committee Center For International Studies Cornell University.
- Delbecq, A.L. and H.V. Andrew. (1971). "A Group Process Model for Problem Identification and Program Planning". *Applied Behavioral Sciences*, 7 (10) : 466-492.
- Eisner, E. (1976). Education Connoisseurship and Criticism: Their Form and Function in Education Evaluation. *Journal of Aesthetic Education*
- Fornaroff, A. 1980. *Community Involvement in Health System for Primary Health Care*. Geneva: World Health Organization
- Hergenhahn, B.R. & Olsen, M. H. (1993). *An Introduction to Theories of Learning* 14<sup>th</sup> ed Englewood Cliffs, New Jersey: Prentice Hall, Inc
- Keeves, P.J. 1988. *Educational research, methodology and measurement: An international handbook*. Oxford : Pergamon Press
- Klein, S.B. (1991). *Learning*. New York : McGraw-Hill

**STUDENTS' PERCEPTIONS OF THEIR CLASSROOM LEARNING ENVIRONMENT  
INVENTORIES IN THE 21<sup>ST</sup> CENTURY IN PHYSICS LABORATORY CLASSES ACCORDING TO  
ENHANCE CRATIVE THINKING ABILITIES TOWARD SCIENCE IN UPPER SECONDARY  
EDUCATION UNDER OFFICE OF KHON KHEAN PROVINCAIL PRIVATE EDUCATION  
COMMISSION**

Watcharawit Chaiseang<sup>a</sup>, Toansakul Santiboon<sup>b</sup>, and Komon Ponkham<sup>c</sup>

<sup>a</sup>*Department of Master of Science Education, Faculty of Education, Rajabhat Maha Sarakham University,  
Maha Sarakham, Thailand 44000*

*Corresponding author. Tel.: +66 9 3138 3966; Fax: +66 43 713 206*

*E-mail address: [yochai310332@gmail.com](mailto:yochai310332@gmail.com)*

<sup>b</sup>*Department of Master of Science Education, Faculty of Education, Rajabhat Maha Sarakham University,  
Maha Sarakham, Thailand 44000*

*Corresponding author. Tel.: +66 8 6636 8528 Fax: +66 43 722 257*

*E-mail address: [toansakul35@yahoo.com.au](mailto:toansakul35@yahoo.com.au)*

<sup>c</sup>*Department of Physics, Faculty of Science and Technology; Rajabhat Maha Sarakham University  
Maha Sarakham, Thailand 44000*

*\* Corresponding author. Tel.: +66 9619 5397; fax: +66 43 722 257*

*E-mail address: [kamonponkham@yahoo.com](mailto:kamonponkham@yahoo.com)*

### ABSTRACT

To assess students' perception with the 35-item *Physics Laboratory Environment Inventory* (PLEI) of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory classes. Enhancement of students' learning performances was assessed with the 10-item *Creative Thinking Ability Questionnaire* (CTA). Associations between students' perceptions of their physics laboratory environment classes and their creative thinking abilities toward science were assessed to a sample size of 245 upper secondary students in 8 private educational schools in Khon Kaen province. The PLEI show a just option for on all of five scales; students cohesiveness which is reflected in the results, the open-endedness scale as it measured student preference for the science investigation they carried out, integration scale is seen of the relationship between theory and practical integration in their classes. The PLEI scales are reliability and discriminant validity. The internal consistency Cronbach alpha coefficient reliability the CTA scale had a value of 0.75. The simple correlation values ( $r$ ) is significant correlations ( $p < 0.05$ ) between students' creative thinking outcomes and physics laboratory classroom inventory all of five scales. The conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the PLEI and CTA when the effects of relationships between the scales were controlled. The multiple correlations ( $R$ ) was 0.63 and the predictive efficiency ( $R^2$ ) value indicated that 40% of the variances in students' creative thinking abilities to their physics classes were attributable to their post learning achievement in their physics laboratory classroom environments. It provides a measure based on the proportion of total variation of students' learning outcomes explained by students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory classes according to enhance creative thinking abilities in upper secondary schools under Office of Khon Kaen Provincial Private Education Commission, significantly.

**KEYWORDS:** Students' perceptions, classroom learning environment inventories, physics laboratory classes creative thinking abilities, upper secondary education, and Office of Khon Kaen Provincial Private Education Commission

## INTRODUCTION

The Ministry of Education is a Thai governmental body responsible for the oversight of education in Thailand. It was established by King Rama V (Chulalongkorn) in 1892 as the Ministry of Education which controlled religion, education, healthcare, and museums. In 1941, the ministry changed its Thai name to the present one. However, education in Thailand is provided mainly by the Thai government through the Ministry of Education from pre-school to senior high school. A free basic education of twelve years is guaranteed by the constitution, and a minimum of nine years' school attendance is mandatory. In 2009 the Ministry of Education announced the extension of a free, mandatory education to fifteen years. The school structure is divided into four key stages: The upper secondary level of schooling consists of at the 10<sup>th</sup> – 12<sup>th</sup> grade level for age groups 16–18 and is divided into academic stream. There are academic upper secondary schools and comprehensive schools offering academic tracks. Students who choose the academic stream usually intend to enter a university. Public or private schools are administered by the government (UNICEF, 2016) <sup>[1]</sup> The private sector comprises schools run for profit and fee-paying non-profit schools which are often run by charitable organizations, especially by Catholic diocesan and religious orders that operate over 300 large secondary schools throughout the country. The years from 2001 to 2006 showed some improvements in education, such as computers in the schools and an increase in the number of qualified native-speaker teachers for foreign languages. Experiments with restructuring the administrative regions for education or partly decentralizing the responsibility of education to the provinces were conducted (UNICEF, 2016) <sup>[1]</sup>. In the parents' opinions, the greater the competition, the higher the amount of donations the parents believe they have to offer in exchange for their children's chances to get a good education at a quality school, so that they choose the private schools to going on education, exactly (Saengpassa, 2012) <sup>[2]</sup>

The policies of the Office Private Education Commission, Ministry of Educations are to promote the quality of education in private education, to be able to meet the needs of the educational service, and to develop a system to manage, promote, supervise and supervise private education effectively. The strategies compose of development of curriculum learning and teaching measurement and evaluation, to reform of the resource system for private education, strengthen the educational management of private schools, promotion of participation in the organization and support of private education, promoting non-formal education to create a learning society of private education, development in the southern border provinces, and development of private education promotion management system. The target goals obtain of the learner has been developed to the full potential. Have desirable attributes, have life skills, have the knowledge, have the necessary skills in the 21<sup>st</sup> century, all learners receive the opportunity and equality of access to quality education. Private schools provide quality education standards, to manage the subsidy effectively, to have sufficient educational resources for quality education. The private schools administer and administer quality and standard education with responsibility to the learners; people have confidence, to provide educational services to private schools. Private schools participate in both formal and informal education, the government and civil society have confidence and support for private education. Private schools outside the educational management system are of standard quality is known of society, the public received short-term education that it can be used for career or transfer to study in the system, the educational management in the southern border provinces is of standard quality and suitable for the area, The system of administration, promotion and supervision of private education is modern, dynamic and timely are changed, an parents and learners are informed about the quality and efficiency of school management. In this recently, the accounting of private schools throughout of Thailand of 13,133 schools, and students consist of 3,825,312 students. Focusing on upper secondary education under Office of Khon Kaen Provincial Private Education Commission, there are 9 schools and 2,746 students (Office of Private Education Commission, 2017) <sup>[3]</sup>.

This study intended to extend this notion in order to obtain more comprehensive picture of physics laboratories for the physics curriculum course of the upper secondary education level of private schools in Khon Kaen Provincial Private Education Commission (KKPEC), particular at the science students, by focusing on students' perceptions about their own laboratories. The KKPEC that is offered in the same management acknowledgement that follow as the basic core curriculum of Minister of Education are provided. Its' physics laboratory is designed carefully based on physics disciplines themselves and results of the studies to promise quality graduates with the frequency and quality of physics laboratory activities, students have changed to experience, expected to get more improvement, and supposed to get many more chances with better facilities (Office of Khon Kaen Provincial Private Education Commission, 2016) <sup>[4]</sup>.

Many research studies show that learning environments not only have the positive correlation with the students' outcomes, motivation, and attitudes. Furthermore, there are some research studies on learning environments which focus on student outcomes, students' and teachers' perceptions, and evaluation of the



strategies (Fraser, Fisher, & McRobbie, 1996) <sup>[5]</sup>. Since the laboratory classroom learning instruments were applied and adapted version from the Science Laboratory Environment Inventory (SLEI) that it was developed by Fraser and his colleagues (1993) <sup>[6]</sup> with an awareness of the importance of laboratory lessons, aspects of laboratory classroom environments have been widely investigated in various settings. Using the SLEI, and adapted the Test Of Science-Related Attitudes (TOSRA) were associated with students' cognitive and affective outcomes were found in Australia (Fisher, Henderson & Fraser, 1997) <sup>[7]</sup>, Singapore (Quek, Wong & Fraser (2002) <sup>[8]</sup>. The SLEI has been used in various contexts, including countries across most high schools throughout the USA, Australia, Asian and South Pacific (Giddings & Waldrup, 1996) <sup>[9]</sup>, Tasmania and Australia (Harrison, Fisher & Fraser, 1995) <sup>[10]</sup>, India (Koul & Fisher, 2005) <sup>[11]</sup>, and Thailand (Santiboon & Fisher, 2005) <sup>[12]</sup>, (Santiboon, 2012) <sup>[13]</sup>.

Santiboon and Fisher (2005) <sup>[12]</sup> decided to adapt the personal form of the SLEI to create the PLEI because of the purposes of this research study are to investigate in students' perceptions of their physics laboratory classroom environments. In this research study, using the PLEI-instrument research from Santiboon and Fisher (2005) <sup>[12]</sup>, which the PLEI has five scales (each with seven items) and the five response alternatives are Almost Never, Seldom, Sometimes, Often and Very Often to the 35-item *Physics Laboratory Environment Inventory* (PLEI) was used in this research study. The PLEI has five scales and each scale contains with seven items. This instrument is appropriate for the upper secondary education which contains 35 items and five scales which are *Student Cohesiveness* (SC), *Open-Endedness* (OE), *Integration* (IN), *Rule Clarity* (RC), and *Material Environment* (ME) and the five response alternatives are *Almost Never*, *Seldom*, *Sometimes*, *Often* and *Very Often*.

Historical of creative thinking, Guilford (1950) <sup>[14]</sup> was an early proponent of the idea that intelligence is not a unitary concept. Based on his interest in individual differences, he explored the multidimensional aspects of the human mind, describing the structure of the human intellect based on a number of different abilities. His work emphasized that scores on intelligence tests cannot be taken as a unidimensional ranking that some researchers have argued indicate the superiority of some people, or groups of people, over others. In particular, Guilford showed that the most creative people may score lower on a standard IQ test due to their approach to the problems, which generates a larger number of possible solutions, some of which are original. Guilford's work, thus, allows for greater appreciation of the diversity of human thinking and abilities, without attributing different value to different people (Guilford, 1980) <sup>[15]</sup>. In this research study, an adapted version of Guilford's creative thinking skill test of his work in students' intelligence and creativity to the 24-item Guilford Divergent thinking Questionnaire (GDTQ) in 4 scales in physics laboratory classes of fluency, flexibility, originality, and elaboration ability scales were used (Chanthala, Santiboon, & Ponkham, 2017) <sup>[16]</sup>. Adapted version of the GDTQ to the *10-item Creative Thinking Ability (CTA)* questionnaire to assess students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory according to enhance creative thinking abilities toward science in upper secondary education under Office of Khon Kaen Provincial Private Education Commission (Kuana, Kuana, & Santiboon, 2017) <sup>[17]</sup> were selected for this research study to use with the aim of investigating any possible relationships with students' perceptions about their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory according to enhance creative thinking abilities toward science in upper secondary education under Office of Khon Kaen Provincial Private Education Commission school climates in the basic education of school's environmental climates.

## METHODOLOGY AND MATERIALS

To assess students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory classes according to enhance creative thinking abilities toward science in upper secondary education under Office of Khon Kaen Provincial Private Education Commission. The research procedures are followed as:

### Research Aims

1. To assess students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory classes in upper secondary educational schools under Office of Khon Kaen Provincial Private Education Commission.
2. To assess students' perceptions for enhancing their creative thinking abilities according to physics laboratory classes in upper secondary education under Office of Khon Kaen Provincial Private Education Commission.

3. To analyze of associations between students' perceptions of their classroom learning environment inventories and their creative thinking abilities in the 21<sup>st</sup> century in physics laboratory classes in upper secondary educational schools under Office of Khon Kaen Provincial Private Education Commission.

### Research Instruments

#### *The Physics Laboratory Environment Inventory (PLEI)*

To create the PLEI because of the purposes of this research study are to investigate in students' perceptions of their physics laboratory classroom environments. In this research study, using the PLEI-instrument research from Santiboon and Fisher (2005) <sup>[12]</sup>, which the PLEI has five scales (each with seven items) and the five response alternatives are Almost Never, Seldom, Sometimes, Often and Very Often to the 35-item *Physics Laboratory Environment Inventory* (PLEI) was used. The PLEI has five scales and each scale contains with seven items. This instrument is appropriate for the upper secondary education which is *Student Cohesiveness* (SC), *Open-Endedness* (OE), *Integration* (IN), *Rule Clarity* (RC), and *Material Environment* (ME) and the five response alternatives are *Almost Never*, *Seldom*, *Sometimes*, *Often* and *Very Often*.

#### *The Creative Thinking Ability (CTA) Questionnaire*

In this research study, an adapted version of Guilford's creative thinking skill test of his work in students' intelligence and creativity to the 24-item Guilford Divergent thinking Questionnaire (GDTQ) in 4 scales in physics laboratory classes of fluency, flexibility, originality, and elaboration ability scales were used (Chanthala, Santiboon, & Ponkham, 2017) <sup>[16]</sup>. Adapted version of the GDTQ to the *10-item Creative Thinkink Ability (CTA)* questionnaire to assess students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory according to enhance creative thinking abilities toward science in upper secondary education under Office of Khon Kaen Provincial Private Education Commission (Kuana, Kuana, & Santiboon, 2017) <sup>[17]</sup> were selected.

### Sample

Administrations to the sample size consisted of 245 upper secondary students in 8 private schools in secondary educational level under the Office of Khon Kaen Provincial Private Education Commission were used to assess students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory classes according to enhance creative thinking abilities toward science.

### Data Analysis

Assuming that the scaling of the items approximated a 5- point Likert scale, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the PLEI forms and the CTA as specified. Factorial validity and adequacy of fit for the dimensionality of the PLEI and the CTA were assessed through principal component analyses. The multiple correlations were significant of students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory classes according to enhance creative thinking abilities toward science for the PLEI with students' creative thinking abilities to associate were analyzed.

## RESULTS

To assess students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory classes according to enhance creative thinking abilities toward science in upper secondary education under Office of Khon Kaen Provincial Private Education Commission were computed for each of the derived factors of the PLEI forms and the CTA as specified. Factorial validity and adequacy of fit for the dimensionality of the PLEI and the CTA were assessed through principal component analyses. The multiple correlations were significant of students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory classes according to enhance creative thinking abilities toward science for the PLEI with students' creative thinking abilities to associate were analyzed.

**Students' Perceptions of their Classroom Learning Environment Inventories in the 21<sup>st</sup> Century in Physics Laboratory Classes in Upper Secondary Educational Schools under Office of Khon Kaen Provincial Private Education Commission.**

The results given in Table 1, 2, and 3 show that on average item means for each of the five PLEI scales, that they contain seven items, so that the minimum and maximum score possible on each of these scales is 7 and 35, respectively. Because of this difference in the number of items in the five scales, the average item mean for each scale was calculated so that there is a fair basis for comparison between different scales. These means were used as a basis for constructing the simplified plots of significant differences between forms of the PLEI. For the remaining five scales, *Student Cohesiveness* (SC), *Open-Endedness* (OE), *Integration* (IN), *Rule Clarity* (RC), and *Material Environment* (ME) scales, indicated to moderate; Factor Loading, Intercorrelation Circumplex Nature scales, internal consistency (Cronbach alpha) reliability, respectively.

#### **Factor Loading Analysis for the PLEI**

The PLEI form was subjected to separated principal components factor analyses (with varimax rotation) involving student's score. The factor structure that emerged replicated, to a large extent. Table 1 lists the items which were found to have factor loading greater than 0.30 (which is the minimum value conventionally accepted as meaningful in factor analysis).

Table 1 *Factor Loading Analysis for the PLEI*

Item	SC	Item No.	OE	Item No.	IN	Item No.	RC	Item No.	ME
6	0.77	9	0.63	19	0.63	22	0.69	31	0.70
5	0.69	11	0.63	17	0.63	23	0.69	33	0.70
7	0.61	14	0.54	18	0.57	28	0.60	29	0.66
2	0.54	10	0.52	15	0.52	27	0.57	32	0.61
3	0.50	8	0.52	20	0.49	26	0.52	34	0.60
1	0.47	12	0.51	16	0.47	25	0.49	35	0.56
4	0.46	13	0.48	21	0.42	24	0.47	30	0.54
% of Variance	30.23		25.21		33.06		33.58		39.54
Eigenvalue	2.22		2.76		2.31		2.35		2.77

\* Loading smaller than 0.30 omitted. N=245

On the whole, it appears that the items had factor loadings greater than 0.30 with their a priori scales, and hence, the results lend support to the factorial validity of the PLEI scales.

#### *Intercorrelation Circumplex Nature Scales for the PLEI*

To investigate the circumplex nature of the PLEI, correlations between the scales were calculated. The results are presents in Table 2.

Table 2 *Scale Intercorrelations for the PLEI Form*

Scale	SC	OE	IN	RC	ME
Student Cohesiveness (SC)		0.39***	0.55***	0.67***	0.40***
Open-Endedness (OE)			0.46***	0.39***	0.34***
Integration (IN)				0.61***	0.43***
Rule Clarity (RC)					0.54***
Material Environment (ME)					

N=245, \* $p < .05$ , \*\* $p < .05$ , \*\*\* $p < .05$

As expected, the results show that the correlation between a scale and the next scale in generally is high, and become lower for scales further away from that scale. This is illustrated using each scale in Table 2. In general, the circumplex nature of the PLEI has been confirmed.

#### *Internal Consistency (Cronbach Alpha Coefficient) Reliability*

Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales (Discrimination validity) were obtained the sample in this present study as indices of scale reliability and discriminant validity for the PLEI which adding of the mean score, average mean score, standard deviation, variance, and F-test, the summary of these values obtained separately for the PLEI is reported in Table 3.

Table 3 Scale Internal Consistency (Cronbach Alpha Coefficient) Reliability, Discriminant Validity (Mean Correlation of a Scale with Other Scales), Mean Score, Average Mean Score, Standard Deviation, Variance, and F-test for the PLEI

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach Alpha Reliability	Discriminant Validity	F-test
Student Cohesiveness (SC)	27.02	3.86	3.69	13.60	0.60	0.69	12.56***
Open-Endedness (OE)	25.19	3.60	3.46	11.97	0.70	0.66	9.27***
Integration (IN)	25.89	3.70	4.12	16.98	0.65	0.68	8.19***
Rule Clarity (RC)	24.28	3.47	4.23	17.92	0.66	0.67	26.72***
Material Environment (ME)	20.69	2.96	5.17	26.76	0.74	0.65	6.97***

N=245, \* $p < .05$ , \*\* $p < .05$ , \*\*\* $p < .05$

As reported in Table 3, the mean score ranged from 20.69 ( $\bar{X} = 2.96$ , S.D. = 5.17, Variance = 26.76, and F – test = 6.97) (Material Environment) to 27.02 ( $\bar{X} = 3.86$ , S.D. = 3.69, Variance = 26.76, and F – test = 12.56) (Student Cohesiveness), the reliability coefficients for the different PLEI ranged from 0.60 to 0.74. The Discriminant Validity (Mean correlation of a scale with other scales) of physics laboratory classroom environment ranged from 0.65 to 0.69 when using the individual student as the unit of analysis. On the whole, these results are acceptable which was considered satisfactory for further use in this study.

#### Students' Perceptions for Enhancing their Creative Thinking Abilities according to Physics Laboratory Classes in Upper Secondary Education under Office Of Khon Kaen Provincial Private Education Commission.

To measure students' creative thinking abilities towards physics laboratory studied, the present study adapted version of Guilford's creative thinking skill test of his work in students' intelligence and creativity to the 24-item Guilford Divergent thinking Questionnaire (GDTQ) in 4 scales in physics laboratory classes of fluency, flexibility, originality, and elaboration ability scales were used (Chanthala, Santiboon, & Ponkham, 2017). Finally, adapted version of the GDTQ to the 10-item Creative Thinkink Ability (CTA) questionnaire was used. Using internal consistency (Cronbach alpha coefficient) reliability the CTA scale, the result is reported in Table 4.

Table 4 Scale Internal Consistency (Cronbach Alpha Coefficient) Reliability, Mean Score, Average Mean Score, Standard Deviation, Variance, and F-test for the CTA

Item	Mean	Average Mean	Standard Deviation	Variance	Cronbach Alpha Reliability	F-test	Sig.
Item 1	35.39	3.54	0.88				
Item 2	30.74	3.07	0.92				
Item 3	34.65	3.47	0.92				
Item 4	35.27	3.53	0.78				
Item 5	35.27	3.53	0.99				
Item 6	33.88	3.39	0.97				
Item 7	35.18	3.52	0.91				
Item 8	33.79	3.38	0.91				
Item 9	33.47	3.35	0.97				
Item 10	34.94	3.49	1.05				
Total	34.26	3.43	4.17	17.38	0.75	6.38	.000

N=245, \* $p < .05$ , \*\* $p < .05$ , \*\*\* $p < .05$

In Table 4, using internal consistency (Cronbach alpha coefficient) reliability the CTA scale had a value of 0.75 which considered satisfactory for further use in this study.

### Associations between Students' Perceptions of their Physics Laboratory Classroom Learning Environment and their Creative Thinking Abilities toward Science

Focusing on the PLEI, the statistical procedures also involved the investigation of associations between students' perceptions of their physics laboratory classroom learning environment and their creative thinking abilities toward science. The simple correlation values ( $r$ ) are reported in Table 5 which show significant correlations ( $p < 0.05$ ) between students' creative thinking outcomes and physics laboratory classroom inventory all of five scales. These associations are positive for the scales of *Student Cohesiveness* (SC), *Open-Endedness* (OE), *Integration* (IN), *Rule Clarity* (RC), and *Material Environment* (ME); there was a more favourable the CTA towards their PLEI environment inventory. The second type of analysis consisted of the more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the PLEI and their creative thinking abilities towards their CTA when the effect of relationships between the scales is controlled.

Table 5 Associations between Students' Perceptions of their Physics Laboratory Classroom Learning Environment and their Creative Thinking Abilities toward Science

Scale	Simple Correlation Validity ( $r$ )	Standardized Regression Weight Validity ( $\beta$ )
Student Cohesiveness (SC)	0.23***	0.14*
Open-Endedness (OE)	0.23***	0.13*
Integration (IN)	0.17**	0.17*
Rule Clarity (RC)	0.23***	0.16*
Material Environment (ME)	-0.17**	-0.17*
Multiple Correlation ( $R$ )		0.6322***
Determination Efficient Predictive Value ( $R^2$ )		0.3997***

$N=245$ , \* $p < .05$ , \*\* $p < .05$ , \*\*\* $p < .05$

The multiple correlation  $R$  is significant for the PLEI Form and shows that when the scales are considered together there is a significant ( $p < 0.05$ ) association with the CTA. The beta weights ( $\beta$ ) shows that in PLEI inventory is positive for the four of five scales; Student Cohesiveness, Open-Endedness, Integration, and Rule Clarity scales and negative for the scale of Material Environment. That is, in physics laboratory classes where the students perceived in student cohesiveness, open-endedness, integration, and rule clarity. The multiple correlations ( $R$ ) was 0.63 and the predictive efficiency ( $R^2$ ) value indicated that 40% of the variances in students' creative thinking abilities to their physics classes were attributable to their post learning achievement in their physics laboratory classroom environments. The coefficient of determination, denoted  $R^2$  and pronounced "R squared", is a number that indicates the proportion of the variance in the dependent variable (CTA) that is predictable from the independent variable (PLEI). It provides a measure based on the proportion of total variation of students' learning outcomes explained by students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory classes according to enhance creative thinking abilities toward science in upper secondary education under Office of Khon Kaen Provincial Private Education Commission, significantly.

## CONCLUSIONS AND DISCUSSIONS

The Ministry of Education announced the extension of a free, mandatory education to fifteen years. The school structure is divided into four key stages: The upper secondary level of schooling consists of at the 10<sup>th</sup> – 12<sup>th</sup> grade level for age groups 16–18 and is divided into academic stream. There are academic upper secondary schools and comprehensive schools offering academic tracks. Students who choose the academic stream usually intend to enter a university. Public or private schools are administered by the government. Private schools participate in both formal and informal education, the government and civil society have confidence and support for private education. In this recently, the accounting of private schools throughout of Thailand of 13,133 schools, and students consist of 3,825,312 students. Focusing on upper secondary education under Office of Khon Kaen Provincial Private Education Commission, there are 9 schools and 2,746 students. This study intended to extend this notion in order to obtain more comprehensive picture of physics laboratories for the physics curriculum course



of the upper secondary education level of private schools in Khon Kaen Provincial Private Education Commission, particular at the science students, by focusing on students' perceptions about their own physics laboratories.

Since the laboratory classroom learning instruments were applied and adapted version from the Science Laboratory Environment Inventory (SLEI) that it was developed by Fraser and his colleagues (1993) <sup>[6]</sup> with an awareness of the importance of laboratory lessons, aspects of laboratory classroom environments have been widely investigated in various settings. Using the PLEI-instrument research from Santiboon and Fisher (2005) <sup>[12]</sup>, which the PLEI has five scales (each with seven items) and the five response alternatives are Almost Never, Seldom, Sometimes, Often and Very Often to the 35-item *Physics Laboratory Environment Inventory* (PLEI) was used in this research study. The PLEI has five scales and each scale contains with seven items. This instrument is appropriate for the upper secondary education which contains 35 items and five scales which are *Student Cohesiveness* (SC), *Open-Endedness* (OE), *Integration* (IN), *Rule Clarity* (RC), and *Material Environment* (ME) and the five response alternatives are *Almost Never*, *Seldom*, *Sometimes*, *Often* and *Very Often*. An adapted version of Guilford's creative thinking skill test of his work in students' intelligence and creativity to the 24-item Guilford Divergent thinking Questionnaire (GDTQ) in 4 scales in physics laboratory classes of fluency, flexibility, originality, and elaboration ability scales were used (Chanthala, Santiboon, & Ponkham, 2017) <sup>[16]</sup>. Adapted version of the GDTQ to the *10-item Creative Thinking Ability* (CTA) questionnaire to assess students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory according to enhance creative thinking abilities toward science in upper secondary education under Office of Khon Kaen Provincial Private Education Commission (Kuana, Kuana, & Santiboon, 2017) <sup>[17]</sup>.

The purposes of this research study were to assess students' perceptions of their classroom learning environment inventories for enhancing their creative thinking abilities, and to analyze of associations between students' perceptions of their classroom learning environment inventories and their creative thinking abilities in the 21<sup>st</sup> century in physics laboratory classes in upper secondary educational schools. Administrations to the sample size consisted of 245 upper secondary students in 8 private schools in secondary educational level under the Office of Khon Kaen Provincial Private Education Commission. Assuming that the scaling of the items approximated a 5- point Likert scale, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the PLEI forms and the CTA as specified. Factorial validity and adequacy of fit for the dimensionality of the PLEI and the CTA were assessed through principal component analyses. The multiple correlations were significant of students' perceptions in physics laboratory classes according for enhancing creative thinking abilities toward science for the PLEI with the CTA to associate were analyzed.

On the whole, it appears that the items had factor loadings greater than 0.30 with their a priori scales, and hence, the results lend support to the factorial validity of the PLEI scales. The correlation between a scale and the next scale in generally is high. This is illustrated using each scale; the circumplex nature of the PLEI has been confirmed. Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales (Discrimination validity) were obtained the sample in this present study as indices of scale reliability and discriminant validity for the PLEI. The internal consistency (Cronbach alpha coefficient) reliability the CTA scale had a value of 0.75. The simple correlation values ( $r$ ) are reported which show significant correlations ( $p < 0.05$ ) between students' creative thinking outcomes and physics laboratory classroom inventory all of five scales. There was a more favourable the CTA towards their PLEI environment inventory. The second type of analysis consisted of the more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the PLEI and their creative thinking abilities towards their CTA when the effect of relationships between the scales is controlled.

The multiple correlations ( $R$ ) was 0.63 and the predictive efficiency ( $R^2$ ) value indicated that 40% of the variances in students' creative thinking abilities to their physics classes were attributable to their post learning achievement in their physics laboratory classroom environments. The coefficient of determination, denoted  $R^2$  and pronounced "R squared", is a number that indicates the proportion of the variance in the dependent variable (CTA) that is predictable from the independent variable (PLEI). It provides a measure based on the proportion of total variation of students' learning outcomes explained by students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory classes according to enhance creative thinking abilities toward science in upper secondary education under Office of Khon Kaen Provincial Private Education Commission, significantly.

As described in the results section, the upper secondary private schools under Office of Khon Kaen Provincial Private Education Commission, students show similar answering patterns to those from other countries as reported in previous studies when they are asked to reply to the PLEI questionnaire. Overall, upper secondary private schools' students show relatively favourable perceptions of their laboratory lessons, with the lowest score



occurring for the Material Environment scale. It seems that laboratory lessons or practical activities related to physics lessons are operated rather as supplementary to theory classes rather than being independently important in their own right. The lower score on Material Environment scale has been also reported in several previous studies. Internationally, it is most likely that physics teachers or lecturers are not convinced about the practical value of laboratory activities. This can be also applied to the upper secondary private schools situation, where an examination driven curriculum is normally prescribed and delivered. In other words, Thai physics lectures or teachers usually do not place much value to laboratory activities, because laboratory lessons guarantee satisfactory student achievement. Overall, this study replicated previous studies using the PLEI, with the findings being consistent with the situation in upper secondary private schools under Office of Provincial Private Education Commission in Thailand. It is also noteworthy that this study showed distinctive and more positive learning environment perceptions among students from their classroom learning environment inventories in the 21<sup>st</sup> century in physics laboratory classes according to enhance creative thinking abilities toward science in upper secondary education under Office of Khon Kaen Provincial Private Education Commission.

### ACKNOWLEDGEMENT

I would first like to thank my thesis of the Master of Science Education/ Faculty of Education; Advisor Prof. Dr. Toansakul Santiboon Faculty of Education, and Dr. Kamon Ponkham of Faculty of Science, Rajabhat Mahasarakham University. I also thank to the 245-secondary students in 8 private schools under Office of Khon Kaen Provincial Private Education Commission, Khon Kaen Province. The door to Prof. Santiboon was always open whenever I ran into a trouble spot or had a question about my research or writing. He consistently allowed this paper to be my own work, but steered me in the right the direction whenever he thought I needed it.

### REFERENCES

- [1] UNICEF. (2016). *Overview of Thailand education*. Retrieved from [https://www.unicef.org/thailand/education\\_303.html](https://www.unicef.org/thailand/education_303.html)
- [2] Saengpassa, C. (2012). The rampant custom of “tea money” persists, and where has it got us. *The Nation*. Retrieved 2 July 2015 from <http://www.nationmultimedia.com/opinion/The-rampant-custom-of-tea-money-persists-and-where-30182928.html>
- [3] Office of Private Education Commission. (2017). The policy of the Office of Private Education Commission of Thailand. Retrieved from <http://www.opec.go.th/weboppec/content.php?page=content&group=plan>
- [4] Office of Khon Kaen Provincial Private Education Commission. (2016). *The roles of Khon Kaen provincial private education*. Retrieved from <http://db.kkzone1.go.th/g/sorchor/>
- [5] Fraser, B. J., Fisher, D. L., and McRobbie, C. J. (1996). Development, validation and use of personal and class forms of a new classroom environment instrument. Paper presented at the annual meeting of the American Educational Research Association, New York.
- [6] Fraser, B., McRobbie, C. J. and Giddings, G. J. (1993). Development and cross-national validation of a laboratory classroom instrument for senior high school students. *Science Education*, 77, pp. 1-24.
- [7] Fisher, D. L. Henderson, D. and Fraser, B. L. (1997). Laboratory environment and student outcomes in senior high school biology classes. *American Biology Teacher*, 1997. 59, pp. 214-219.
- [8] Quek, C. L., Wong, A. F. L. and Fraser, B. J. (2002). Teacher-student interaction and gifted students' attitudes toward chemistry in laboratory classrooms in Singapore. *Journal of Classroom Interaction*, 40 (1) : pp. 18-28.
- [9] Giddings, G.J. and Waldrup, B. A. (1996). *Comparison of science laboratory classrooms in Asia, Australia, South Pacific and USA: An international study*. Paper presented at the annual meeting of the American Educational Research Association, New York, NY. 1996.
- [10] Henderson, D., Fisher, D. L. & Fraser, B. J. (1995). *Gender differences in biology students' perceptions of actual and preferred learning environments*. Paper presented at the annual meeting of the National Association for Research in Science Teaching, San Francisco.
- [11] Koul, P. and Fisher, D. (2005). *Science classroom learning environments in India*. Paper presented at the International Educational Research Conference of the Australian Association for Research in Education (AARE), Brisbane, Australia. 2005.

- [12] Santiboon, T. & Fisher, D. (2005). *Learning environments and teacher-student interactions in physics classes in Thailand*. Proceedings of the Fourth International Conference on Physics, Mathematics and Technology Education Sustainable Communities and Sustainable Environments: Envisioning a Role for Physics, Mathematics and Technology Education, Victoria, Vancouver, Canada.
- [13] Santiboon, T. (2012). Assessing science students' perceptions in learning activities achievements in physics laboratory classrooms in Udon Thani Rajabhat University. *2012 International Conference on Education and Management Innovation IPEDR Vol.30* (2012) © (2012) IACSIT Press, Singapore.
- [14] Guilford, J. P. (1950). *Creativity*. American Psychologist, 5, 444–454.
- [15] Guilford, J.P. 1980. Some changes in the structure of intellect model. *Educational and Psychological Measurement* 48: pp. 1-4.
- [16] Chanthala, C., Santiboon, T., & Ponkham, K. (2017). Instructional designing the STEM education model for fostering creative thinking abilities in physics laboratory environment classes. *International Journal of Education and Practice*. 2017, Volume 5, Issue 11; pp. 259 – 272.
- [17] Kuana, K., Kuana, T., & Santiboon, T. (2017). An instructional design model with the cultivating research-based learning strategies for fostering teacher students' creative thinking abilities. *Educational Research and Reviews*. Vol. 12 (15), pp. 712-724.

# INSTRUCTING PHYSICS TEACHER INTERPERSONAL BEHAVIOUR ON SCIENCE PROCESS SKILLS THROUGH FACILITATING EXPERIMENTAL LABORATORY APPARAUS SKILLS FOR UPPER SECONDARY STUDENTS IN ROI-KEAN-SARN-SIN PROVINCIAL GROUP UNDER PROVINCIAL ADMINISTRATIVE ORGANIZATION

Suni Chansamarn<sup>a</sup>, Toansakul Santiboon<sup>b</sup>, and Nukun Koodthalhang<sup>c</sup>

<sup>a</sup>*Department of Master of Science Education, Faculty of Education, Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000*

*Corresponding author. Tel.: +66 8 7871 4719; Fax: +66 43 713 206*

*E-mail address: [ying.pakphom@gmail.com](mailto:ying.pakphom@gmail.com)*

<sup>b</sup>*Department of Master of Science Education, Faculty of Education, Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000*

*Corresponding author. Tel.: +66 6 6636 8528; Fax: +66 43 713 206*

*E-mail address: [toansakul35@yahoo.com.au](mailto:toansakul35@yahoo.com.au)*

<sup>c</sup>*Department of Physics, Faculty of Science and Technology; Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000*

*\* Corresponding author. Tel.: +66 8 9570 3971; Fax +66 43 722 980*

*E-mail address: [ponkham@yahoo.com](mailto:ponkham@yahoo.com)*

## ABSTRACT

The aims of this research study that focus on schooling sizes from educational institute in Roi-Kean-Sarn-Sin Group under Provincial Administration Organization were 1) to assess instructing physics teacher interpersonal behaviors on science process skills, 2) to assess using physics laboratory instruments of upper secondary students in their schooling sizes from educational institute in Roi-Kean-Sarn-Sin Group under Provincial Administration Organization, and 3) to analyze associations between students' perceptions of their physics teacher interpersonal behaviors on science process skills and their using physics laboratory instruments toward physics in their schooling sizes from educational institute in Roi-Kean-Sarn-Sin Group under Provincial Administration Organization. Administrations to a sample size consisted of 370 students in 10 schools in four schooling sizes with the Krejcie and Morgan Table. Using the 24-item *Questionnaire on Physics Teacher Interaction* (QPTI) and the 15-item *Test of Integrated Process skill* (TIPS) with a 5-point scale are validity and reliability with Cronbach alpha reliability were analyzed. Statistically significant with mean scores were associated between students' perceptions of their physics teacher interpersonal behaviors on science process skills and their using physics laboratory instruments toward physics in their schooling sizes with Pearson Correlations and Multiple Regression analysis were predicted. Physics teacher interpersonal behaviors on science process skills in schooling sizes from educational institute were differentiated with an extra, large, medium and small schooling sizes, significantly. Students' responses of their physics laboratory instruments of upper secondary schools in their schooling sizes also were found significantly, differently. The determination efficient predictive values ( $R^2$ ) indicate that 40% of the variance in students' using physics laboratory instruments to their physics laboratory classes were attributable to their perceptions of their physics teacher interpersonal behaviors on science process skills toward physics in their different schooling sizes from educational institutes in Roi-Kean-Sarn-Sin Provincial Group under Provincial Administration Organization is correlated, interestingly.

**KEYWORDS:** Instruction, physics teacher interpersonal behaviors, science process skills, conductive experimental physics laboratory apparatus skills physics laboratory instrument skills, upper secondary students, Roi-Kean-Sarn-Sin Group, and Provincial Administration Organization

## INTRODUCTION

Thailand is a unitary state in Southeast Asia. Under this Act, the services are divided into three levels: central, provincial and local (State Administration Act, 1991) <sup>[1]</sup>. In term of the provincial government consists of provinces. As of 2016, there were 76 provinces. Each province is led by a governor and is divided into District (State Administration Act, 1991) <sup>[2]</sup>. As of 2010, there were 878 districts throughout the country. In each province, there is one capital district. For example, the capital district of Khon Kaen Province is Khon Kaen District. Each district is led by a district chief. <sup>[8]</sup> Until 2007, some provinces might include minor districts. A minor district was established in large areas where the small number of residents did not warrant the formation of a district. Each minor district was led by a district clerk (Royal Institute of Thailand, 2007) <sup>[3]</sup>. Governors, district chiefs, and district clerks are appointed by the central government. A city municipality is established in an area where there are at least 50,000 citizens, a town municipality, in an area where there are at least 10,000 citizens, and a sub-district municipality, in any other area. The government of each municipality is divided into two branches: the executive branch led by a mayor and the legislative branch led by a municipal council. The mayors and the municipal councilors are directly elected by the local citizens. As for an administrative organization, the government is also divided into two branches. The administrative organization chiefs and councilors are directly elected by the local citizens (State Administration Act. (1991) <sup>[4]</sup>.

Provincial Administrative Organization (PAO) 's system had firstly risen in 1933 by the act of the organized municipality. The status of each city council, in that moment, was the organization which acted as people's representatives and gave committees advices. It still not being a corporate organization or departed from region administrative organization yet. Afterwards, revolutionary council law (issue 218) was declared in 29 September 1972, which related to organize the Administrative Organization of the State; city council was changed its role into Provincial Administrative Organization (PAO) which would fully had more responsible. After the act of PAO in 1997 was approved by the parliament, it was announced in The Royal Government Gazette Issue 114 Part 62 Dated 31 October 2008 which started enforcing on 1 November 1997. This act mentioned about the administration of PAO which is the unit of a local administration rather than provincial administration. Provincial Administrative Organization (PAO) (2016) <sup>[5]</sup> has a responsible to administrate public service as support educational system, and Promote and create activities to other local administrative organizations to work together and launch project for local organizations to work out by themselves.

Schools under the Provincial Administration Organization's guideline in effective academic administration of schools under provincial administrative consisted of 4 main factors and 10 sub-factors, such as; Input consisted of academic leadership of administrator, Process consisted of consisted of curriculum development, learning process administration and development, learning assessment and evaluation, ICT development for learning and teaching process, supervision, and quality assurance and standard, Output consisted effectiveness of academic administrative, and Feedback of this guideline there are two elements were employed included reporting, recommending, and editing. The second method is the original admission system managed by the National Institute of Education Testing Service (NIETS) (2017) <sup>[6]</sup>.

Upper secondary educational schools in Roi-Kean-Sarn-Sin Provincial Group under Provincial Administration Organization, it means at upper secondary educational schools in Roi-Et, Khon Kaen, Maha Sarakham, and Kalasin provinces where as in the Central Northeast Region of Thailand under the Provincial Administration Organization, students who wish to continue academic education move on to elective courses. Of these, the science and mathematics/English programs are most popular – other choices include foreign languages and social science. In this way, they are already preparing for tertiary education that may follow as students study eight core subjects each semester: Thai language, mathematics, science, social science, health and physical education, arts and music, technology, and foreign languages. However, overall, the quality of school administrators and teachers was excellent; the quality of the student is not satisfactory. The results of the evaluation by the Office of Standards and Quality Assessment of Education (MOET) during the academic year 2012-2016; from primary to secondary school can pass the benchmark, almost every aspect, but when looking deep into the details, quality of learners in key areas was remained moderate to low (Manager Newspaper Online, 2017) <sup>[7]</sup>.

Researchers in classroom learning environments have indicated the importance of teacher–student relationships in achieving student outcomes. Healthy teacher–student relationships are a prerequisite for engaging students in learning activities. Using this perspective, studies show that the way students perceive their teacher interpersonally (teacher interpersonal behaviour) relates to students' academic achievement. Investigating teacher–student relationships in competence-based vocational education is important since the competence-based

concept in education is currently receiving more and more attention from educational researchers and practitioners worldwide are instructed (Fisher, Waldrup, Dorman, & den Brok, 2007) [8]. This research study focused on the instructing physics teacher interpersonal behaviors on science process skills for upper secondary students in Roi-Kean-Sarn-Sin Provincial Group under Provincial Administration Organization.

One of the most important and pervasive goals of schooling is to teach students to think. All school subjects should share in accomplishing this overall goal. Science contributes its unique skills, with its emphasis on hypothesizing, manipulating the physical world and reasoning from data. The scientific method, scientific thinking and critical thinking have been terms used at various times to describe these science skills. Today the term "science process skills" is commonly used. Popularized by the curriculum project, Science - A Process Approach (SAPA), these skills are defined as a set of broadly transferable abilities, appropriate to many science disciplines and reflective of the behavior of scientists. SAPA grouped process skills into two types-basic and integrated. The basic (simpler) process skills provide a foundation for learning the integrated (more complex) skills (Padilla, 1990). These *Basic Science Process Skills* are listed as; Observing - using the senses to gather information about an object or event; Inferring - making an "educated guess" about an object or event based on previously gathered data or information, Measuring - using both standard and nonstandard measures and estimates to describe the dimensions of an object or event, Communicating - using words or graphic symbols to describe an action, object or event, Classifying - grouping or ordering objects or events into categories based on properties or criteria, and Predicting - stating the outcome of a future event based on a pattern of evidence. The *Integrated Science Process Skills* are listed as: Controlling variables - being able to identify variables that can affect an experimental outcome, keeping most constant while manipulating only the independent variable, Defining operationally - stating how to measure a variable in an experiment, Formulating hypotheses - stating the expected outcome of an experiment, Interpreting data - organizing data and drawing conclusions from it, Experimenting - being able to conduct an experiment, including asking an appropriate question, stating a hypothesis, identifying and controlling variables, operationally defining those variables, designing a "fair" experiment, conducting the experiment, and interpreting the results of the experiment, and Formulating models - creating a mental or physical model of a process or event. This research study was instructed and designed the questionnaire to assess students' perceptions of their physics teacher interpersonal behaviors on science process skills through facilitating experimental laboratory apparatus skills for upper secondary students were assessed with the 24-item *Questionnaire on Physics Teacher Interaction* (QPTI).

To help students to understand scientific knowledge and to develop students' ability of the scientific approach to enquiry was assessed. The science process skills, along with the knowledge those skills produce are the instructional objectives of Thai science education. This research study describes the development and validation of a *Test of Integrated Process skill* (TIPS) ; the student's using physics laboratory instruments, namely; Vernier Caliper, Micrometer, and Multimeter Skills were assessed that has been developed specific to the science content defined in the school science curriculum. The test is used to measure acquisition in the processes of science. The test assesses performance on a set of integrated science processes associated with planning investigations. They include formulating hypotheses, operationally defining variable, identifying and controlling variables as well as interpreting data. Science process skills are not subject specific. However, these skills operate in conjunction with specific knowledge. Test items were developed so as to be suitable for use with specific knowledge and contain conceptual materials on science as well as requiring the application of component integrated process skills. The Test of Integrated Science Process (TISP) consisted of 15 multiple choice items. Evidence of content validity, construct validity, and reliability are presented. This test with sound psychometric properties will be useful in evaluating the progress in the learning of integrated science process skills in upper secondary students in Roi-Kean-Sarn-Sin Provincial Group under Provincial Administration Organization.

## METHODOLOGY

### Research Objectives

1. To assess the instructional physics teacher interpersonal behaviors on science process skills through facilitating experimental laboratory apparatus skills for upper secondary students in different school sizes.
2. To assess students' using skills on physics laboratory instruments through facilitating experimental laboratory apparatus skills for upper secondary students in different school sizes.
3. To analyze of associations between students' perceptions of their instructional physics teacher interpersonal behaviors and their experimental laboratory apparatus skills for upper secondary students in different school sizes.



## Research Instruments

### *The Questionnaire on Physics Teacher Interaction (QPTI)*

The 24-item *Questionnaire on Physics Teacher Interaction* (QPTI) has five responses (Strongly Agree, Agree, Moderately Agree, Disagree, and Strongly Disagree) on two scales, namely; Basic Science Process Skill, and Integrate Science Process Skill scales. Each scale contains of 12 items.

### *The Test of Integrated Process Skill (TIPS) Questionnaire*

The 15-item *Test of Integrated Process Skill* (TIPS) *Questionnaire* has five responses (Strongly Agree, Agree, Moderately Agree, Disagree, and Strongly Disagree) on three scales, namely; Using Vernier Caliper Skill, Using Micrometer Skill, and Using Multimeter Skill scales. Each scale contains of 5 items.

## Sample

Administrations to the sample size which consisted of 370 upper secondary students in Roi-Kean-Sarn-Sin Provincial Group under Provincial Administration Organization. The sub-samples were separated in four different schooling sizes, such as; 111-students in an Extra School size, 67-students in two Large School size, 111-students in four Medium School size, and 81-students in two Small School size, totalizes as 370 students in 10 upper secondary schools in Roi-Kean-Sarn-Sin Provincial Group.

## Data Analysis

Assuming that the scaling of the items approximated a 5- point Likert scale, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the QPTI forms and the TIPS as specified. Factorial validity and adequacy of fit for the dimensionality of the QPTI and the TIPS were assessed through principal component analyses. The multiple correlations were significant of students' perceptions of their instructing physics teacher interpersonal behaviors on science process skills through facilitating experimental laboratory apparatus skills for upper secondary students in Roi-Kean-Sarn-Sin Provincial Group under Provincial Administration Organization to associate were analyzed.

## RESULTS

### Validity and Students' Perceptions of the QPTI

The results given in Table 1, 2, 3, 4 and 5 show that on average item means for each of the five QPTI forms' scales, that they contain seven items, so that the minimum and maximum score possible on each of these scales is 7 and 35, respectively. Because of this difference in the number of items in the five scales, the average item mean for each scale was calculated so that there is a fair basis for comparison between different scales. These means were used as a basis for constructing the simplified plots of significant differences between forms of the QPTI. For the remaining two scales, Basic Science Process Skill, and Integrate Science Process Skill scales. Each scale contains of 12 items, using the internal consistency (Cronbach alpha) reliability were assessed students' perceptions of their differences in an Extra School size, Large School size, Medium School size, Small School size, and totalizes as 370 students in 10 upper secondary schools in Roi-Kean-Sarn-Sin Provincial Group, respectively.

Table 1 *Scale Mean Score, Average Mean Score, Standard Deviation, Variance, Internal Consistency (Cronbach Alpha Coefficient) Reliability, and F-test in Small Schooling Size for the QPTI*

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach $\alpha$ -Reliability	F-test
Basic Science Process Skill	46.51	3.88	6.86	47.00	0.88	6.04***
Integrate Science Process Skill	47.15	3.93	7.07	49.98	0.88	3.03**
Science Process Skill	93.65	3.90	12.87	165.68	0.93	4.17***

$N=81$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$ ,

In keeping at Table 1 shows the results of the *Small Schooling Size for the QPTI* scales form were statistically significant, the mean score ranged from 46.51 ( $\bar{X} = 3.88$ , S. D. = 6.86, Variance = 47.00, and F –



test = 6.04) in Basic Science Process Skill scale to 47.15 ( $\bar{X}$  = 3.98, S. D. = 7.07, Variance = 49.98, and F – test = 3.03) in Integrate Science Process Skill scale. The reliability coefficients had of 0.88 when using the individual student as the unit of analysis. On the whole, these results are acceptable which was considered satisfactory for further use in this study for the QPTI Form.

Table 2 Scale Mean Score, Average Mean Score, Standard Deviation, Variance, Internal Consistency (Cronbach Alpha Coefficient) Reliability, and F-test in Medium Schooling Size for the QPTI

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach $\alpha$ -Reliability	F-test
Basic Science Process Skill	44.82	3.74	5.29	27.95	0.64	12.62***
Integrate Science Process Skill	44.54	3.71	6.45	41.61	0.76	3.71***
Science Process Skill	89.36	3.72	10.72	114.96	0.82	7.53***

$N=111$ , \* $p<.05$ , \* $p<.01$ , \* $p<.001$ ,

Table 2 reports the results of the *Medium Schooling Size for the QPTI* scales form were statistically significant, the mean score ranged from 44.82 ( $\bar{X}$  = 3.74, S. D. = 5.29, Variance = 27.95, and F – test = 12.62) in Basic Science Process Skill scale to 44.54 ( $\bar{X}$  = 3.71, S. D. = 6.45, Variance = 41.61, and F – test = 3.71) in Integrate Science Process Skill scale. The reliability coefficients ranged from 0.64 to 0.76 when using the individual student as the unit of analysis.

Table 3 Scale Mean Score, Average Mean Score, Standard Deviation, Variance, Internal Consistency (Cronbach Alpha Coefficient) Reliability, and F-test in Large Schooling Size for the QPTI

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach $\alpha$ -Reliability	F-test
Basic Science Process Skill	43.07	3.59	3.73	13.89	0.62	3.38***
Integrate Science Process Skill	41.75	3.48	3.55	12.65	0.73	5.29**
Science Process Skill	84.82	3.53	5.23	25.30	0.73	4.43***

$N=67$ , \* $p<.05$ , \* $p<.01$ , \* $p<.001$ ,

Table 3 reveals the results of the *Large Schooling Size for the QPTI* scales form were statistically significant, the mean score ranged from 43.07 ( $\bar{X}$  = 3.59, S. D. = 3.73, Variance = 13.89, and F – test = 3.38) in Basic Science Process Skill scale to 41.75 ( $\bar{X}$  = 3.48, S. D. = 3.55, Variance = 12.65, and F – test = 5.29) in Integrate Science Process Skill scale. The reliability coefficients ranged from 0.62 to 0.73 when using the individual student as the unit of analysis.

Table 4 Scale Mean Score, Average Mean Score, Standard Deviation, Variance, Internal Consistency (Cronbach Alpha Coefficient) Reliability, and F-test in Extra Schooling Size for the QPTI

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach $\alpha$ -Reliability	F-test
Basic Science Process Skill	42.93	3.58	5.64	31.86	0.70	5.54**
Integrate Science Process Skill	41.79	3.48	6.10	37.22	0.71	1.34
Science Process Skill	84.77	3.53	10.74	115.45	0.82	3.47***

$N=111$ , \* $p<.05$ , \* $p<.01$ , \* $p<.001$ ,

Table 4 shows the results of the *Extra Schooling Size for the QPTI* scales form were statistically significant, the mean score ranged from 42.93 ( $\bar{X}$  = 3.58, S. D. = 5.64, Variance = 31.86, and F – test = 5.54) in Basic Science Process Skill scale to 41.79 ( $\bar{X}$  = 3.48, S. D. = 6.10, Variance = 37.22, and F – test = 1.34) in Integrate Science

Process Skill scale. The reliability coefficients ranged from 0.64 to 0.76 when using the individual student as the unit of analysis.

Table 5 Scale Mean Score, Average Mean Score, Standard Deviation, Variance, Internal Consistency (Cronbach Alpha Coefficient) Reliability, and F-test in Totalized Schooling Size for the QPTI

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach $\alpha$ -Reliability	F-test
Basic Science Process Skill	44.41	3.70	5.95	35.43	0.72	14.40***
Integrate Science Process Skill	44.26	3.69	11.26	126.70	0.92	6.30***
Science Process Skill	88.67	3.70	15.57	242.38	0.91	8.63***

$N=370$ , \* $p<.05$ , \* $p<.01$ , \* $p<.001$ ,

In the same analysis, Table 5 reports the results of the *Totalized Schooling Size for the QPTI* scales form were statistically significant, the mean score ranged from 44.41 ( $\bar{X} = 3.70$ , S. D. = 5.95, Variance = 35.43, and F – test = 14.40) in Basic Science Process Skill scale to 44.26 ( $\bar{X} = 3.69$ , S. D. = 11.26, Variance = 126.70, and F – test = 6.30) in Integrate Science Process Skill scale. The reliability coefficients ranged from 0.64 to 0.76 when using the individual student as the unit of analysis.

On the whole, these results are acceptable which was considered satisfactory for further use in this study for the QPTI Form.

#### Validity and Students' Perceptions of the TIPS

To measure students' instructing physics teacher interpersonal behaviors on science process skills through facilitating experimental laboratory apparatus skills for upper secondary students in Roi-Kean-Sarn-Sin Provincial Group under Provincial Administration Organization, the present study adapted version of Guilford's creative thinking skill test of his work in students' intelligence and creativity to the The 15-item *Test of Integrated Process Skill (TIPS) Questionnaire* has five responses (Strongly Agree, Agree, Moderately Agree, Disagree, and Strongly Disagree) on three scales, namely; Using Vernier Caliper Skill, Using Micrometer Skill, and Using Multimeter Skill scales. Each scale contains of 5 items was used. Using internal consistency (Cronbach alpha coefficient) reliability the TIPS scale, the result is reported in Table 6-10.

Table 6 Scale Mean Score, Average Mean Score, Standard Deviation, Variance, Internal Consistency (Cronbach Alpha Coefficient) Reliability, and F-test in Small Schooling Size for the TIPS

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach $\alpha$ -Reliability	F-test
Using Vernier Caliper Skill	14.95	2.99	4.83	23.37	0.93	2.14
Using Micrometer Skill	15.32	3.06	4.74	22.45	0.89	2.13
Using Multimeter Skill	16.07	3.22	5.16	26.64	0.91	5.84***
Using Physics Instrument Skill	44.35	3.09	13.61	185.18	0.96	3.87***

$N=81$ , \* $p<.05$ , \* $p<.01$ , \* $p<.001$ ,

In keeping at Table 6 shows the results of the *Small Schooling Size for the TIPS* scales form were statistically significant, the mean score ranged from 14.95 ( $\bar{X} = 2.99$ , S. D. = 4.83, Variance = 23.37, and F – test = 2.14) in Using Vernier Skill scale to 16.07 ( $\bar{X} = 3.22$ , S. D. = 5.16, Variance = 26.64, and F – test = 5.84) in Integrate Science Process Skill scale. The reliability coefficients had of 0.88 when using the individual student as the unit of analysis.

Table 7 Scale Mean Score, Average Mean Score, Standard Deviation, Variance, Internal Consistency (Cronbach Alpha Coefficient) Reliability, and F-test in Medium Schooling Size for the TIPS

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach $\alpha$ -Reliability	F-test
Using Vernier Caliper Skill	17.28	3.46	2.32	5.37	0.64	8.38***
Using Micrometer Skill	17.18	3.44	2.57	6.59	0.64	1.48
Using Multimeter Skill	14.28	2.86	3.89	15.15	0.71	9.55***
Using Physics Instrument Skill	48.74	3.25	6.24	38.98	0.76	15.39***

$N=111$ , \* $p<.05$ , \* $p<.01$ , \* $p<.001$ ,

Table 7 reports the results of the *Medium Schooling Size for the TIPS* scales form were statistically significant, the mean score ranged from 14.28 ( $\bar{X} = 2.86$ , S. D. = 3.89, Variance = 15.55, and F – test = 9.55) in Using Multimeter Skill scale to 17.28 ( $\bar{X} = 3.46$ , S. D. = 2.32, Variance = 5.37, and F – test = 8.38) in Integrate Science Process Skill scale. The reliability coefficients ranged from 0.64 to 0.76 when using the individual student as the unit of analysis.

Table 8 Scale Mean Score, Average Mean Score, Standard Deviation, Variance, Internal Consistency (Cronbach Alpha Coefficient) Reliability, and F-test in Large Schooling Size for the TIPS

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach $\alpha$ -Reliability	F-test
Using Vernier Caliper Skill	16.43	3.29	2.48	6.16	0.63	6.55***
Using Micrometer Skill	16.46	3.29	2.33	5.43	0.59	4.33**
Using Multimeter Skill	16.16	2.83	2.92	8.50	0.63	2.87*
Using Physics Instrument Skill	47.06	3.14	4.04	16.33	0.70	6.59***

$N=67$ , \* $p<.05$ , \* $p<.01$ , \* $p<.001$ ,

Table 8 reveals the results of the *Large Schooling Size for the TIPS* scales form were statistically significant, the mean score ranged from 16.16 ( $\bar{X} = 2.83$ , S. D. = 2.92, Variance = 8.50, and F – test = 2.87) in Using Multimeter Skill scale to 16.46 ( $\bar{X} = 3.29$ , S. D. = 2.48, Variance = 6.16, and F – test = 6.55) in Using Vernier Caliper Skill scale. The reliability coefficients ranged from 0.59 to 0.63 when using the individual student as the unit of analysis.

Table 9 Scale Mean Score, Average Mean Score, Standard Deviation, Variance, Internal Consistency (Cronbach Alpha Coefficient) Reliability, and F-test in Extra Schooling Size for the TIPS

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach $\alpha$ -Reliability	F-test
Using Vernier Caliper Skill	16.62	3.32	4.27	18.22	0.85	2.12
Using Micrometer Skill	16.14	3.23	3.55	12.59	0.79	3.22*
Using Multimeter Skill	15.86	3.17	4.31	18.63	0.86	2.14
Using Physics Instrument Skill	48.61	3.24	11.00	121.09	0.93	2.74**

$N=111$ , \* $p<.05$ , \* $p<.01$ , \* $p<.001$ ,

Table 9 shows the results of the *Extra Schooling Size for the TIPS* scales form were statistically significant, the mean score ranged from 15.86 ( $\bar{X} = 3.17$ , S. D. = 4.31, Variance = 18.63, and F – test = 2.14) in Using Multimeter Skill scale to 16.62 ( $\bar{X} = 3.32$ , S. D. = 4.27, Variance = 18.22, and F – test = 2.12) in Using Vernier Caliper Skill scale. The reliability coefficients ranged from 0.79 to 0.86 when using the individual student as the unit of analysis.

Table 10 Scale Mean Score, Average Mean Score, Standard Deviation, Variance, Internal Consistency (Cronbach Alpha Coefficient) Reliability, and F-test in Totalized Schooling Size for the TIPS

Scale	Mean	Average Mean	Standard Deviation	Variance	Cronbach $\alpha$ -Reliability	F-test
Using Vernier Caliper Skill	16.42	3.28	3.72	13.87	0.77	9.99***
Using Micrometer Skill	16.39	3.28	3.67	13.49	0.73	2.38*
Using Multimeter Skill	15.26	3.05	4.98	24.77	0.84	4.86**
Using Physics Instrument Skill	48.07	3.20	10.38	105.58	0.88	9.43***

$N=370$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$ ,

In the same analysis, Table 10 reports the results of the *Totalized Schooling Size for the TIPS* scales form were statistically significant, the mean score ranged from 15.26 ( $\bar{X} = 3.05$ , S. D. = 4.98, Variance = 24.77, and F – test = 4.86) in Using Multimeter Skill scale to 16.42 ( $\bar{X} = 3.28$ , S. D. = 3.72, Variance = 24.77, and F – test = 9.99) in Using Vernier Caliper Skill scale. The reliability coefficients ranged from 0.64 to 0.76 when using the individual student as the unit of analysis.

On the whole, these results are acceptable which was considered satisfactory for further use in this study for the *TIPS* Form.

### Comparisons between Students' Perceptions of their Differences Schooling Sizes to their Instructing Physics Teacher Interpersonal Behaviors on Science Process Skills

The students' perceptions of their differences schooling sizes of their instructing physics teacher interpersonal behaviors on science process skills through facilitating experimental laboratory apparatus skills for upper secondary students in Roi-Kean-Sarn-Sin Provincial Group under Provincial Administration Organization.

Table 11 Comparisons between Students' Perceptions of their Differences Schooling Sizes to their Instructing Physics Teacher Interpersonal Behaviors on Science Process Skills

Data Analysis	Extra-Large School Size		Extra-Medium School Size		Extra-Small School Size		Large-Medium School Size		Large-Small School Size		Medium-Small School Size	
	Extr a	Larg e	Extr a	Mediu m	Extr a	Smal l	Larg e	Mediu m	Larg e	Smal l	Mediu m	Smal l
Mean	3.63	3.53	3.63	3.72	3.63	3.90	3.53	3.72	3.53	3.90	3.72	3.90
S.D.	10.74	5.23	10.74	10.72	10.74	12.87	5.23	10.72	5.23	12.87	10.72	12.87
<i>t</i> -test	1.45		-3.48**		-3.75***		-5.47***		-4.73***		-1.13	
<i>Eta</i> <sup>2</sup>	0.36		0.40		0.54		0.52		0.59		0.46	
Sig.	.152		.001***		.000***		.000***		.000***		.264	

\* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$ ,

Table 11 shows the average mean scores, standard deviation for two scales of the QPTI scales. As each scale has 12 items. The statistically significant of the differences between the Extra and Large Schooling Size, Extra and Medium Schooling Size, Extra and Small Schooling Size, Large and Medium Schooling Size, Large and Small Schooling Size, and Medium and Small Schooling Size, respectively.

In scale means ranged from 3.53 (Large Schooling Size) to 3.90 (Small Schooling Size), standard deviation ranged from 5.23 to 12.87. In Table 11 reveal that the differences between Extra and Medium Schooling Size ( $p<.001$ ), Extra and Small Schooling Size ( $p<.001$ ), Large and Medium Schooling Size ( $p<.001$ ), Large and Small Schooling Size ( $p<.001$ ), significantly which measuring with the *t*-test analysis in negative values, differently. In the other hand, students' responses of their Extra and Large Schooling Size, and Medium and Small Schooling Size are non significant, differently.

### Associations between Students' Perceptions of their Instructing Physics Teacher Interpersonal Behaviors on Science Process Skills and their Using Facilitating Experimental Laboratory Apparatus Skills

Focusing on the QPTI, the statistical procedures also involved the investigation of associations between students' perceptions of their physics laboratory classroom learning environment and their creative thinking abilities toward science. The simple correlation values ( $r$ ) are reported in Table 12 which show significant correlations ( $p < 0.05$ ) between students' instructing physics teacher interpersonal behaviors on science process skills classes. These associations are positive for the scales of Basic Science Process Skill and Integrate Science Process Skill scales; there was a more favourable the TIPS towards their QPTI environment inventory. The second type of analysis consisted of the more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the QPTI and their using facilitating experimental laboratory apparatus skills towards their TIPS when the effect of relationships between the scales is controlled.

Table 12 *Associations between Students' Perceptions of their Instructing Physics Teacher Interpersonal Behaviors on Science Process Skills and their Using Facilitating Experimental Laboratory Apparatus Skills*

Scale	Simple Correlation Validity ( $r$ )	Standardized Regression Weight Validity ( $\beta$ )
Basic Science Process Skill	0.34***	0.15*
Integrate Science Process Skill	0.39***	0.29***
Multiple Correlation ( $R$ )		0.634***
Determination Efficient Predictive Value ( $R^2$ )		0.403***

$N=370$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ ,

In this study, it was also considered important to investigate associations between students' perceptions of instructing physics teacher interpersonal behaviors on science process skills through facilitating experimental laboratory apparatus skills. The selection of an evaluation and assessment instrument suitable was required. Table 11 suggests that the scales of the QPTI and the TIPS are reliable for measuring critical thinking abilities in seminar on education class. Using simple correlation ( $r$ ), multiple correlations ( $R$ ), Multiple Regression Validity ( $\beta$ ), and Determination Efficient Predictive value ( $R^2$ ) were associated and predicted in Using Vernier Caliper Skill, Using Micrometer Skill, and Using Multimeter Skill scale of the TIPS Scales, respectively.

The simple correlation values ( $r$ ) are reported in Table 12 which show significant correlations ( $p < 0.001$ ) between students' responses of their associations between students' perceptions of their instructing physics teacher interpersonal behaviors on science process skills and their using facilitating experimental laboratory apparatus skills was assessed with the OPTI all of two scales. These associations are positive for the scales of Personal Relevance, Uncertainty, Shared Control, Critical Voice and Student Negotiation scales. The second type of analysis consisted of the more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the OPTI and facilitating creative thinking abilities towards their constructivist approach in augmented reality technology (AR) classes when the effect of relationships between the scales is controlled.

The multiple correlations ( $R$ s) are significant for students' perceptions of their instructing physics teacher interpersonal behaviors on science process skills and their using facilitating experimental laboratory apparatus skills and showed that when the scales are considered together there is a significant in some scales of the OPTI association with the TIPS. The  $R^2$  values indicate that 40% their using facilitating experimental laboratory apparatus skills of the TIPS. Suggestion that both students were assessed their instructing physics teacher interpersonal behaviors on science process skills through facilitating experimental laboratory apparatus skills for upper secondary students in Roi-Kean-Sarn-Sin Provincial Group under Provincial Administration Organization. Desirable future applications of the OPTI and the TIPS for research purposes and in improving teaching in secondary education in Thailand are considered.

### CONCLUSSIONS AND DISCUSSIONS

Provincial Administrative Organization (PAO) 's system had firstly risen in 1933 by the act of the organized municipality. The status of each city council, in that moment, was the organization which acted as people's representatives and gave committees advices. It still not being a corporate organization or departed from



region administrative organization yet. The PAO has a responsible to administrate public service as support educational system, and Promote and create activities to other local administrative organizations to work together and launch project for local organizations to work out by themselves. Upper secondary educational schools in Roi-Kean-Sarn-Sin Provincial Group under Provincial Administration Organization, it means at upper secondary educational schools in Roi-Et, Khon Kaen, Maha Sarakham, and Kalasin provinces where as in the Central Northeast Region of Thailand under the Provincial Administration Organization were administered.

Researchers in classroom learning environments have indicated the importance of teacher–student relationships in achieving student outcomes. Healthy teacher–student relationships are a prerequisite for engaging students in learning activities. Using this perspective, studies show that the way students perceive their teacher interpersonally. All school subjects should share in accomplishing this overall goal. Science contributes its unique skills, with its emphasis on hypothesizing, manipulating the physical world and reasoning from data. These *Basic Science Process Skills* are listed as; Observing, Inferring, Measuring, Classifying, and Predicting skills The *Integrated Science Process Skills* are Controlling, Defining operationally, Formulating hypotheses Interpreting data, Experimenting, and Formulating models. This research study was instructed and designed the questionnaire to assess students' perceptions of their physics teacher interpersonal behaviors on science process skills through facilitating experimental laboratory apparatus skills for upper secondary students were assessed with the 24-item *Questionnaire on Physics Teacher Interaction* (QPTI). Students were helped to understand scientific knowledge and to develop students' ability of the scientific approach to enquiry was assessed. The science process skills, along with the knowledge those skills produce are the instructional objectives of Thai science education. This research study describes the development and validation of a *Test of Integrated Process skill* (TIPS); the student's using physics laboratory instruments, namely; Vernier Caliper, Micrometer, and Multimeter Skills were assessed that has been developed specific to the science content defined in the school science curriculum.

Administrations to the sample size which consisted of 370 upper secondary students in Roi-Kean-Sarn-Sin Provincial Group under Provincial Administration Organization. The sub-samples were separated in four different schooling sizes, such as; 111-students in an Extra School size, 67-students in two Large School size, 111-students in four Medium School size, and 81-students in two Small School size, totalizes as 370 students in 10 upper secondary schools in Roi-Kean-Sarn-Sin Provincial Group. internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the QPTI forms and the TIPS as specified. Factorial validity and adequacy of fit for the dimensionality of the QPTI and the TIPS were assessed through principal component analyses. The multiple correlations were significant of students' perceptions of their instructing physics teacher interpersonal behaviors on science process skills through facilitating experimental laboratory apparatus skills were analyzed.

To investigate students' perceptions of their instructing physics teacher interpersonal behaviors on science process skills through facilitating experimental laboratory apparatus skills for upper secondary students in Roi-Kean-Sarn-Sin Provincial Group under Provincial Administration Organization. Associations between students' perceptions of their instructing physics teacher interpersonal behaviors on science process skills and their using facilitating experimental laboratory apparatus skills were assessed. The differences schooling sizes of their instructing physics teacher interpersonal behaviors on science process skills through facilitating experimental laboratory apparatus skills between the Extra and Large Schooling Size, Extra and Medium Schooling Size, Extra and Small Schooling Size, Large and Medium Schooling Size, Large and Small Schooling Size, and Medium and Small Schooling Size, were compared.

The results of the *Totalized Schooling Size for the QPTI* scales form were statistically significant, the mean score ranged from 44.41 ( $\bar{X} = 3.70$ , S.D. = 5.95, Variance = 35.43, and F – test = 14.40) in Basic Science Process Skill scale to 44.26 ( $\bar{X} = 3.69$ , S.D. = 11.26, Variance = 126.70, and F – test = 6.30) in Integrate Science Process Skill scale. The reliability coefficients ranged from 0.64 to 0.76 when using the individual student as the unit of analysis. the *Totalized Schooling Size for the TIPS* scales form were statistically significant, the mean score ranged from 15.26 ( $\bar{X} = 3.05$ , S.D. = 4.98, Variance = 24.77, and F – test = 4.86) in Using Multimeter Skill scale to 16.42 ( $\bar{X} = 3.28$ , S.D. = 3.72, Variance = 24.77, and F – test = 9.99) in Using Vernier Caliper Skill scale. The reliability coefficients ranged from 0.64 to 0.76 when using the individual student as the unit of analysis. On the whole, these results are acceptable which was considered satisfactory for further use in this study for the QPTI Form.

Comparisons between students' perceptions of their differences schooling sizes to their instructing physics teacher interpersonal behaviors on science process skills. In scale means ranged from 3.53 (Large Schooling Size) to 3.90 (Small Schooling Size), standard deviation ranged from 5.23 to 12.87. In Table 11 reveal that the differences between Extra and Medium Schooling Size ( $p < .001$ ), Extra and Small Schooling Size ( $p < .001$ ), Large



and Medium Schooling Size ( $p < .001$ ), Large and Small Schooling Size ( $p < .001$ ), significantly which measuring with the  $t$ -test analysis in negative values, differently. In the other hand, students' responses of their Extra and Large Schooling Size, and Medium and Small Schooling Size are non significant, differently.

Associations between students' perceptions of their instructing physics teacher interpersonal behaviors on science process skills and their using facilitating experimental laboratory apparatus skills. The multiple correlations ( $R_s$ ) are significant for students' perceptions of their instructing physics teacher interpersonal behaviors on science process skills and their using facilitating experimental laboratory apparatus skills and showed that when the scales are considered together there is a significant in some scales of the OPTI association with the TIPS. The  $R^2$  values indicate that 40% their using facilitating experimental laboratory apparatus skills of the TIPS. Suggestion that both students were assessed their instructing physics teacher interpersonal behaviors on science process skills through facilitating experimental laboratory apparatus skills for upper secondary students in Roi-Kean-Sarn-Sin Provincial Group under Provincial Administration Organization.

### ACKNOWLEDGEMENT

I would first like to thank my thesis of the Master of Science Education/ Faculty of Education; Advisor Prof. Dr. Toansakul Santiboon Faculty of Education, and Dr. Nukoon Kootthalang of Faculty of Science, Rajabhat Mahasarakham University. I also thank to the 245-secondary students in 8 private schools under Office of Khon Kaen Provincial Private Education Commission, Khon Kaen Province. The door to Prof. Santiboon was always open whenever I ran into a trouble spot or had a question about my research or writing. He consistently allowed this paper to be my own work, but steered me in the right the direction whenever he thought I needed it.

### REFERENCES

- [1] State Administration Act. (1991). *National Government Organization Act, BE 2534 (1991), section 3*. Retrieved from <http://www.krisdika.go.th/wps/wcm/connect/>
- [2] State Administration Act (1991). *National Government Organization Act, BE 2534 (1991), sections 51, 54 and 61*.
- [3] Royal Institute of Thailand. (2007). *Royal institute dictionary 1999*. Retrieved from <http://rirs3.royin.go.th/dictionary.asp>
- [4] State Administration Act. (1991). *Sub-district Councils and Sub-district Administrative Organizations Act, BE 2537 (1995), sections 44, 45, and 58, Provincial Administrative Organizations Act, BE 2540 (1997), sections 7, 9 and 35*.
- [5] Provincial Administrative Organization (PAO). (2016).
- [6] National Institute of Education Testing Service (NIETS). (2017).
- [7] Manager Newspaper Online. (2017). *The quality of the poor students in the Provincial Administrative Organization*. Retrieved from <http://www.manager.co.th/qol/viewnews.aspx?newsid=9530000117910>
- [8] Fisher, D., Waldrip, B., Dorman, J., & den Brok, P. (2007). *Interpersonal behaviour styles of science teachers in primary education*. Paper presented at the annual meeting of the American Educational Research Association, Chicago (2007, April)
- [9] **Padilla, M. J.** (1990). The science process skills. *National Association for Research in Science Teaching*. Retrieved on 1 March 1990 from <https://www.narst.org/publications/research/skill.cfm>

# INSTRUCTIONAL INVENTORY WITH THE AUGMENTED REALITY TECHNOLOGY (AR) FOR FACILITATING SATISFACTIONS AND CRITICAL THINKING ABILITIES OF UPPER SECONDARY STUDENTS IN THE 21<sup>ST</sup> CENTURY UNDER THE SECONDARY EDUCATIONAL SERVICE AREA OFFICE IN THE CENTRAL OF THE NORTHEAST REGION

Wachira Waisan<sup>a</sup>, Toansakul Santiboon<sup>b</sup>, and Pornnarong Siripiyasing<sup>c</sup>

<sup>a</sup>*Department of Master of Science Education, Faculty of Education, Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000*

*\*Corresponding author. Tel.: +66 9 2983 8831; Fax: +66 43 713 206  
E-mail address: [pornaka27@gmail.com](mailto:pornaka27@gmail.com)*

<sup>b</sup>*Department of Master of Science Education, Faculty of Education, Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000*

*\*Corresponding author. Tel.: +66 6 6636 8528; Fax: +66 43 713 206  
E-mail address: [toansakul35@yahoo.com.au](mailto:toansakul35@yahoo.com.au)*

<sup>c</sup>*Department of Biology, Faculty of Science and Technology; Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000*

*\*Corresponding author. Tel.: +66 8 9570 3971; Fax +66 43 722 980  
E-mail address: [Pornnarong\\_Siripiyasing@gmail.com](mailto:Pornnarong_Siripiyasing@gmail.com)*

## ABSTRACT

Instructional inventory with the augmented reality technology (AR) for facilitating satisfactions and critical thinking skills of upper secondary students in the 21st century under the Secondary Educational Service Area Office in the Central of the Northeast Region, Thailand from different paradigms were used in this interpretive study to explore the nature of classroom environments. A sample of 169 upper secondary students in AR classes in 4 schools completed the questionnaire on the 56-items *What is Happening In this Class* (WIHIC) and the 25-items *Glaser Critical Thinking Skill* (GCTS) Questionnaire, and the 20-item *Student Satisfaction Questionnaire* (SSQ). Data analyses supported the validity and reliability of the instruments when used in this context. Significant positive associations between the WIHIC scales and student critical thinking skills were found and supported the SSQ predictive validity of the WIHIC. The multiple regressions showed that on overall seven scales, which were positively and significantly related to students' critical thinking skills. Perceptions of the AR classroom learning environments were also investigated. This confirmation of the selection of an evaluation and assessment instruments' was required. The simple correlation values ( $r$ ), which show significant correlations ( $p < 0.05$ ) between students' critical thinking outcomes and their satisfaction all of seven scales. These associations are positive for the scales of Student Cohesiveness, Teacher Support, Involvement, Investigation, Task Orientation, Cooperation, and Equity scales; there were a more favourable critical thinking skills and their satisfaction towards their AR classroom environments. The  $R^2$  values indicate that 56% and 37% of their critical thinking ability outcomes and their satisfaction, respectively. Suggestions that, the results of this study are confirmed studies conducted in Australia, Brunei, Korea, Singapore, and other countries supported the reliability of the instrument, and consistently showed the associations between the environment, students' critical thinking skills and their satisfaction to their learning outcomes are correlated.

**KEYWORDS:** Instructional inventory, augmented reality technology (AR), facilitating satisfactions, critical thinking skills, upper secondary students, the 21st century, Secondary Educational Service Area Office, the Central of the Northeast Region

## INTRODUCTION

The first description of augmented reality (AR) as we know it today was in *Virtual Light*, the 1994 novel by William Gibson. In 2011, AR was blended with poetry by Nika from Sekai Camera in Tokyo, Japan. The prose of these AR poems comes from Paul Celan. *Die Neimandsrose*, expressing the aftermath of 2011 Tohoku earthquake and tsunami (Davies, 2012) <sup>[1]</sup>. Augmented reality (AR) is a live direct or indirect view of a physical, real-world environment whose elements are "augmented" by computer-generated or extracted real-world sensory input such as sound, video, graphics, hepatics or GPS data (Schuettel, 2017) <sup>[2]</sup>. It is related to a more general concept called computer-mediated reality, in which a view of reality is modified (possibly even diminished rather than augmented) by a computer. Augmented reality enhances one's current perception of reality, whereas in contrast, virtual reality replaces the real world with a simulated one (Steuer, J. (2016) <sup>[3]</sup>. Augmented reality is used in order to enhance the experienced environments or situations and to offer enriched experiences. Originally, the immersive augmented reality experiences were used in entertainment and game businesses, but now other business industries are also getting interested about AR's possibilities for example in knowledge sharing, educating, managing the information flood and organizing distant meetings. Augmented reality has a lot of potential in gathering and sharing tacit knowledge (Kaasinen, Aromaa & Rauhala, 2017) <sup>[4]</sup>. Augmentation techniques are typically performed in real time and in semantic context with environmental elements, such as overlaying supplemental information like scores over a live video feed of a sporting event.

In educational settings, AR has been used to complement a standard curriculum. Text, graphics, video, and audio were superimposed into a student's real time environment. Textbooks, flashcards and other educational reading material contained embedded "markers" or triggers that, when scanned by an AR device, produced supplementary information to the student rendered in a multimedia format (Stewart-Smith, 2012) <sup>[5]</sup>. Augmented reality technology enhanced remote collaboration, allowing students and instructors in different locales to interact by sharing a common virtual learning environment populated by virtual objects and learning materials. AR would also be a way for parents and teachers to achieve their goals for modern education, which are for example to provide a more individualized and flexible learning, making closer connections between what is taught at school and the real world and helping students to become more engaged in their own learning (Augment.com., 2017) <sup>[6]</sup>. As it always is with new technologies though, over here in Thailand we seem to be behind on the trend and have to wait for it to arrive here, right? Wrong! It might sometimes feel like it but that's quite likely only because there's not that much hype around as compared to what we see on YouTube or Face Book. That doesn't mean that we don't have VR / AR tech here as well. Heck teachers can even buy those headsets on [lazada](#) (Funk, 2017) <sup>[7]</sup>.

In Thailand, using learning and teaching materials based on Augmented Reality on the topic of Electromagnetism of Physics by creating the prototype of learning and teaching materials based on Augmented Reality on the topic of Electromagnetism with 3Dmax and Build AR on the topic of Electromagnetism of Physics for senior high school students and the prototype of learning and teaching materials based on Augmented Reality on the topic of Electromagnetism was assessed (Techakosit & Nilsook, 2015) <sup>[8]</sup>. In this search study, to investigate of ensuring students are engaged, motivated and challenged throughout their upper secondary school career is a key priority for teachers. See how virtual and augmented reality can unlock potential, giving students new ways to experience learning and even create their own media are assessed.

Over the past 30 years in conceptualizing, assessing and investigating the determinants and effects of social and psychological aspects of the learning environments of classrooms and schools. Consideration is given to teachers' use of classroom and school environment instruments in practical attempts to improve their own classrooms and schools. The current trends and future desirable directions in research on educational environments are identified and linked between educational environments (Fraser, 2012) <sup>[9]</sup>. The work on educational environments builds upon the earlier ideas of Lewin and Murray and their followers. Lewin's seminal work on field theory recognized that both the environment and its interaction with personal characteristics of the individual are potent determinants of human behavior (Santiboon, 2016) <sup>[10]</sup>.

In recent years, based on past studies; Fraser, Fisher, and McRobbie (1996) <sup>[11]</sup> developed a new learning environmental instrument named *What Is Happening In This Class?* (WIHIC) which incorporates scales that have been used and proven to be significant predictors of learning outcomes are validated. They also included additional scales which were designed to measure current concerns in the classrooms, such as equity issues. The study of the classroom learning environment is gaining momentum and making significant contributions to the improvement of teaching and learning. The purpose of this research study is to examine the background of the study of learning environment and to introduce a recently developed questionnaire called *What is Happening In this Class?*

(WIHIC) questionnaire. The questionnaire is designed to measure students' perception of their classroom environment in various AR contexts.

In essence, critical thinking requires human to use their ability to reason. It is about being an active learner rather than a passive recipient of information. In addition to the critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action (Patterson, 2014) <sup>[12]</sup>. Critical thinking is just **deliberately and systematically processing information** so that you can **make better decisions and generally understand things better** because critical thinking requires you to apply diverse intellectual tools to diverse information. The value of critical thinking doesn't stop with college, however. Once teacher get out into the real world, critical thinking matters even more (Roberts, 2013) <sup>[13]</sup>. In this research study, as resecher team hope instructor now see, learning to think critically will benefit instructor both in the classroom and beyond. We hope this post has given instructor has some ideas about how they can think more critically in our own life after we are going on work, completely. Because our learning to think critically is a lifelong journey, and there's always more to learn in this class. Then, we designed using the 25-items Critical Thinking Skill (CTS) (Santiboon, 2017) <sup>[14]</sup> was adapted and assessed secondary students in instructional inventory with the augmented reality technology (AR) for facilitating satisfactions and critical thinking skills of upper secondary students were assessed with 25-items Glaser Critical Thinking Skill Test (GCTS) in the 21st century in this research study.

Student mobility has increased significantly over the past decade, supported by internationalization policies within Europe and in some other countries. International students are an important part of the internationalization process of university. Attracting international students can lead to a better learning environment also for domestic students. The cross-cultural interaction can lead to diffusion of knowledge among the cultures and thus be a motivation tool for both international and domestic students of their satisfactions in the classroom environment inventory (Stoltenberg, 2011) <sup>[15]</sup> (. This study examines the students' satisfaction in secondary education; the study focuses on the factors like teachers' expertise, courses offered, learning environment and classroom facilities. Students' response measured through an adapted questionnaire on a 5-point likert scale in five scales of Learning Activity Process, Classroom Learning Environment, Instructional Media, and Benefit scales were assessed students perceptions with the 20-item *Student Satisfaction Questionnaire* (SSQ) was tested.

To devote to students' perceptions of psychosocial and science skill characteristics of classroom has been to make this exciting research tradition in AR more accessible to wider audiences. In its attempt to portray prior work, attention has been given to instruments for assessing classroom. Associations between outcomes and environment to use of environment dimensions as dependent variables, classroom environment instruments' differentiates between learning environments questionnaires which assess the whole-class environment, learning environment assessments should be used in addition to student learning satisfaction outcome measures to provide information about subtle but important aspects of classroom life for enhancing AR classes. Research team modified the strongest tradition in past classroom environment research has involved investigation of associations between students' cognitive and affective learning outcomes and their perceptions of psychosocial characteristics of their classrooms with the WIHIC, GCTS and SSQ questionnaires were associated.

## METHODOLOGY AND MATERIALS

### Research Aims

1. To assess students' questions "What is happen in this class?" of their instructional inventory with the augmented reality technology (AR) of upper secondary students in the 21st century under the Secondary Educational Service Area Office in the Central of the Northeast Region.
2. To assess students' perceptions of their satisfaction to their instructional inventory with the augmented reality technology (AR) of upper secondary students in the 21st century under the Secondary Educational Service Area Office in the Central of the Northeast Region.
3. To assess students' perceptions of their critical thinking skills in AR classes of upper secondary students in the 21st century under the Secondary Educational Service Area Office in the Central of the Northeast Region.
4. To analyze associations between students' perceptions of their science classroom learning environments and their satisfactions to their critical thinking skills with the augmented reality technology (AR) for of upper secondary students in the 21st century under the Secondary Educational Service Area Office in the Central of the Northeast Region.

### Research Instruments

Administration to complete the questionnaires obtained of

1. The *What is Happening In this Class* (WIHIC), the WIHIC consisted of 7 scales and 56 items in seven scales are Student Cohesiveness (SC), Teacher Support (TS), Involvement (IN), Investigation (IV), Task Orientation (TO), Cooperation (CO), and Equity (EQ).

2. The 25-items *Glaser Critical Thinking* (GCTS) Test. The GCTS consisted of 5 scales and 25 items. The five scales are Inference (IN), Recognition of Assumption (RA), Deduction (DE), Interpretation (IT), and Evaluation of Argument (EA) scales.

3. The 20-item *Student Satisfaction Questionnaire* (SSQ). The SSQ consisted in four scales that contains of Learning Activity Process (LAP), Classroom Learning Environment (CLE), Instructional Media (ME), and Benefit (BEN) scales. The students selected from five scoring options ranging from 1 (strongly disagreement) to 5 (strongly agreement).

### Sample Size

A sample of 169 upper secondary students in AR classes in 4 schools whereas the instructional inventory with the augmented reality technology (AR) for facilitating satisfactions and critical thinking skills in the 21st century under the Secondary Educational Service Area Office in the Central of the Northeast Region

### Data Analysis

Validity and reliability of two research instruments were analyzed with internal consistency (Cronbach alpha reliability, circumflex correlation scales. Associations between students' perceptions of their WIHIC, GCTS and SSQ, using simple and multiple correlations, regression validity, and determination efficient predictive value were analyzed.

## RESULTS

The study of the classroom learning environment attempts to identify what environmental factors are conducive for learning and the reasons why these factors have such influence. Research team also included additional scales which were designed to measure current concerns in the instructional inventory with the augmented reality technology (AR) classroom. The students are asked to provide their responses on a five-point Likert scale of Almost Never, Seldom, Sometimes, Often and Almost Always for their perceptions with the WIHIC, GCTS and SSQ questionnaires. Associations between perceptions of learning environment and critical thinking performances were reported when they used a modified version of WIHIC, GCTS and SSQ.

**To Assess Students' Questions "What Is Happen In This Class?" of their Instructional Inventory with the Augmented Reality Technology (AR) of Upper Secondary Students in the 21st Century under the Secondary Educational Service Area Office in the Central of the Northeast Region.**

Using the Factor Loading Analysis, the Intercorrelation Circumplex Nature Scales, and Internal Consistency (Cronbach) Alpha Reliability were analyzed the research instruments' confirmation.



Table 1 *Factor Loading Analysis for the WIHIC*

Item	SC	Ite m	TS	Ite m	IN	Ite m	IV	Ite m	TO	Ite m	CO	Ite m	EQ
6	0.80	12	0.79	23	0.82	29	0.87	37	0.84	43	0.81	56	0.86
5	0.80	14	0.79	22	0.79	27	0.84	35	0.81	45	0.80	49	0.83
3	0.78	16	0.78	20	0.77	28	0.82	39	0.81	44	0.79	52	0.82
2	0.77	10	0.77	18	0.75	26	0.81	38	0.79	48	0.79	54	0.82
4	0.76	13	0.77	21	0.74	25	0.80	36	0.76	47	0.78	53	0.80
1	0.73	11	0.77	17	0.73	31	0.76	40	0.74	42	0.78	55	0.79
8	0.68	15	0.73	24	0.73	30	0.76	33	0.64	46	0.77	56	0.78
7	0.68	9	0.56	19	0.67	32	0.66	34	0.62	41	0.72	50	0.77
%of Variance	56.6		55.8		56.2		62.7		56.5		59.6		65.5
Eigenvalu e	9		8		1		2		5		0		0
	4.54		4.47		4.50		5.02		4.52		4.77		5.24

\*Loading smaller than 0.30 omitted.  $N = 169$

### **Factor Loading Analysis for the WIHIC**

Keeping in Table 1, the WIHIC questionnaires were subjected to separated principal components factor analyses (with varimax rotation) involving student's score. The factor structure that emerged replicated, to a large extent. Table 1,2 and 3 list the items which were found to have factor loading greater than 0.30 (which is the minimum value conventionally accepted as meaningful in factor analysis).

### **The Circumplex Nature of the Research Instruments for the WIHIC**

To investigate the circumflex nature of the WIHIC that correlations between the scales were calculated. The results are presents in Table 2. In Table 2 reported in the internal consistency (Cronbach alpha coefficient) and the mean correlation of each item was obtained for the sample for the WIHIC showed the circumflex nature scales.

The WIHIC is the cricumplex model which means that correlations between a scale and the scale next to it generally are high, and becomes lower for scales further away from it. Correlations between the scales of the WIHIC, GCTS and SSQ were calculated in order to check these. The WIHIC is reported in Table 2 to differentiate between classrooms were also investigated.

Table 2 *Scale Intercorrelations for the WIHIC*

Scale	SC	TS	IV	IN	CO	TO	EQ
Student Cohesiveness		0.57***	0.61***	0.51***	0.61***	0.70***	0.46***
Teacher Support			0.49***	0.56***	0.49***	0.49***	0.58***
Involvement				0.66***	0.50***	0.57***	0.50***
Investigation					0.42***	0.54***	0.50***
Cooperation						0.79***	0.61***
Task Orientation							0.67***
Equity							

$N = 169$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

### **Internal Consistency (Cronbach) Alpha Reliability of the Research Instrument for the WIHIC**

Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales (Discrimination validity) were obtained the sample in this present study as indices of scale reliability and discriminant validity for the WIHIC. The summary of these values obtained separately for the WIHIC is reported in Table 3.



Table 3 Mean, Average Mean, Standard Deviation, Variance, Cronbach Alpha Reliability, Discrimination, and F-test for the WIHIC

Scale	Mean	Mean Average	Standard Deviation	Variance	Alpha Reliability	Discriminant Validity	F-test
SC	31.02	3.88	5.05	25.47	0.89	0.90	6.19***
TS	29.65	3.74	5.08	25.78	0.88	0.89	4.36***
IV	29.12	3.64	2.45	29.69	0.87	0.90	3.40***
IN	28.71	3.59	5.69	32.42	0.91	0.90	2.77**
CO	31.55	3.94	5.25	27.58	0.89	0.90	4.46***
TO	31.64	3.96	5.06	25.55	0.90	0.89	1.98*
EQ	31.28	3.91	5.95	35.45	0.93	0.89	1.36

$N = 169$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

The mean score evidence ranged from 28.71 to 31.64, average mean score ranged from 3.59 to 3.96, the standard deviation ranged from 5.05 to 5.69, variance value ranged from 25.47 to 35.45 and F-test value indicates that ranged from 1.36 to 6.19 for the WIHIC scales in Table 7. Using internal consistency, the Cronbach alpha reliability coefficients for the WIHIC had a value ranged from 0.87 to 0.93. The discriminant validity coefficients (the mean correlation of a scale with the other scales) of the Augmented Reality classes ranged from 0.89 to 0.90 which was considered satisfactory for further use in this study.

### To Assess Students' Perceptions of their Satisfaction to their Instructional Inventory with the Augmented Reality Technology (AR) of upper Secondary Students in the 21st Century under the Secondary Educational Service Area Office in the Central of the Northeast Region

Using the Factor Loading Analysis, the Intercorrelation Circumplex Nature Scales, and Internal Consistency (Cronbach) Alpha Reliability were analyzed the research instruments' confirmation.

#### Factor Loading Analysis for the GCTS

The GCTS questionnaires were subjected to separated principal components factor analyses (with varimax rotation) involving student's score. The factor structure that emerged replicated, to a large extent.

Table 4 Factor Loading Analysis for the GCTS

Item	IN	Item	RA	Item	DE	Item	IT	Item	EA
1	0.84	9	0.88	15	0.77	19	0.87	25	1.00
4	0.84	7	0.80	14	0.75	18	0.82	22	0.92
2	0.82	8	0.80	12	0.75	20	0.81	23	0.88
3	0.77	10	0.76	11	0.66	16	0.78	24	0.88
5	0.74	6	0.75	13	0.41	17	0.75	21	0.83
%of Variance	64.40		62.79		37.95		65.34		81.80
Eigenvalue	3.22		3.14		1.90		3.30		4.09

\*Loading smaller than 0.30 omitted.  $N = 169$

Keeping in Table 4 lists the items which were found to have factor loading greater than 0.30 (which is the minimum value conventionally accepted as meaningful in factor analysis).

#### The Circumplex Nature of the Research Instruments

To investigate the circumflex nature of the GCTS that correlation between the scales were calculated. The results are presents in Table 5. In Table 5 reported in the internal consistency (Cronbach alpha coefficient) and the mean correlation of each item was obtained for the sample for the GCTS and Table 4 and 5 showed the circumflex nature GCTS scales.

Table 5 Scale Intercorrelations for the GCTS

Scale	IN	RA	DE	IT	VA
Understand the Meaning (UM)		0.75***	0.61***	0.58***	0.58***
Research Design (RA)			0.74***	0.75***	0.68***
Data Analysis (DA)				0.78***	0.67***
Data Synthetic (DS)					0.77***
Assessment and Evaluation (AV)					

$N = 169$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

The GCTS is the cricumplex model which means that correlations between a scale and the scale next to it generally are high, and becomes lower for scales further away from it. Correlations between the scales of the GCTS were calculated in order to check these. The GCTS reported to differentiate between classrooms were also investigated.

#### Internal Consistency (Cronbach) Alpha Reliability of the Research Instrument for the GCTS

Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales (Discrimination validity) were obtained the sample in this present study as indices of scale reliability and discriminant validity for the GTCS. The summary of these values obtained separately for the GTCS is reported in Table 6.

Table 6 Mean, Average Mean, Standard Deviation, Variance, Cronbach Alpha Reliability, Discrimination, and F-test for the GTCS

Scale	Mean	Mean Average	Standard Deviation	Variance	Alpha Reliability	Discriminant Validity	F-test
IN	18.29	3.66	3.41	11.62	0.86	0.82	2.86*
RA	18.13	3.63	3.42	11.73	0.85	0.83	2.36*
DE	18.16	3.63	3.38	11.41	0.87	0.82	1.16
IT	18.34	3.67	3.31	10.95	0.85	0.83	5.90***
EA	18.63	3.77	3.08	9.51	0.72	0.86	0.87

$N = 169$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

In Table 6, the mean score evidence ranged from 18.13 to 18.63, average mean score ranged from 3.63 to 3.73, the standard deviation ranged from 3.08 to 3.42, variance value ranged from 9.51 to 11.73 and F-test value indicates that ranged from 0.87 to 5.90 for the GTCS scales in Table 8. Using internal consistency, the Cronbach alpha reliability coefficients for the WIHIC had a value ranged from 0.72 to 0.87. The discriminant validity coefficients (the mean correlation of a scale with the other scales) of the Augmented Reality classes ranged from 0.82 to 0.86 which was considered satisfactory for further use in this study.

#### To Assess Students' Perceptions of their Critical Thinking Skills in AR Classes of Upper Secondary Students in the 21st Century under the Secondary Educational Service Area Office in the Central of the Northeast Region

Using the Factor Loading Analysis, the Intercorrelation Ciucumplex Nature Scales, and Internal Consistency (Cronbach) Alpha Reliability were analyzed the research instruments' confirmation.

#### Factor Loading Analysis for the SSQ

The SSQ questionnaires were subjected to separated principal components factor analyses (with varimax rotation) involving student's score. The factor structure that emerged replicated, to a large extent.

Table 7 Factor Loading Analysis for the SSQ

Item	LAP	Item	CLI	Item	IME	Item	BEN
4	0.82	7	0.78	14	0.88	16	0.79
3	0.77	9	0.77	15	0.88	20	0.77
1	0.79	10	0.77	13	0.72	18	0.77
2	0.69	6	0.66	11	0.70	19	0.73
5	0.67	8	0.66	12	0.66	17	0.70
%of Variance	55.59		54.68		46.42		56.45
Eigenvalue	2.78		2.73		2.32		2.82

\*Loading smaller than 0.30 omitted.  $N = 169$ 

Table 7 lists the items which were found to have factor loading greater than 0.30 (which is the minimum value conventionally accepted as meaningful in factor analysis).

### The Circumplex Nature of the Research Instrument for the SSQ

To investigate the circumflex nature of the SSQ that correlations between the scales were calculated. The results are presents in Table 8. In Table 8 reported in the internal consistency (Cronbach alpha coefficient) and the mean correlation of each item was obtained for the sample for the SSQ and Table 8 showed the circumflex nature for the SSQ scales.

Table 8 Scale Intercorrelations for the SSQ

Scale	LAP	CLE	IME	BEN
Learning Activity Process (LAP)		0.75***	0.61***	0.58***
Classroom Learning Environment (CLE)			0.74***	0.74***
Instructional Media (IME)				0.75***
Benefit (BEN)				

 $N = 169$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ 

The SSQ is the cricumplex model which means that correlations between a scale and the scale next to it generally are high, and becomes lower for scales further away from it. Correlations between the scales of the WIHIC, GCTS and SSQ were calculated in order to check these. The SSQ reports in Table 8 to differentiate between classrooms were also investigated.

### Internal Consistency (Cronbach) Alpha Reliability of the Research Instrument for the SSQ

Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales (Discrimination validity) were obtained the sample in this present study as indices of scale reliability and discriminant validity for the SSQ. The summary of these values obtained separately for the SSQ is reported in Table 9.

Table 9 Mean, Average Mean, Standard Deviation, Variance, Cronbach Alpha Reliability, Discrimination, and F-test for the SSQ

Scale	Mean	Mean Average	Standard Deviation	Variance	Alpha Reliability	Discriminant Validity	F-test
LAP	19.64	3.93	2.78	7.71	0.73	0.81	5.16***
CLE	19.28	3.86	3.27	10.69	0.80	0.79	2.39*
IME	19.53	3.91	3.34	11.18	0.80	0.79	2.85*
BEN	19.72	3.94	3.41	11.65	0.84	0.77	1.55

 $N = 169$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ 

In Table 9, the mean score evidence ranged from 19.28 to 19.72, average mean score ranged from 3.86 to 3.94, the standard deviation ranged from 2.78 to 3.41, variance value ranged from 7.71 to 11.65 and F-test value indicates that ranged from 1.55 to 5.16 for the SSQ scales in Table 9. Using internal consistency, the Cronbach

alpha reliability coefficients for the SSQ had a value ranged from 0.73 to 0.84. The discriminant validity coefficients (the mean correlation of a scale with the other scales) of the Augmented Reality classes ranged from 0.77 to 0.81 which was considered satisfactory for further use in this study.

The results from Table 1 to Table 9 were reported of the forms of the WIHIC, the GCTS and the SSQ were subjected to separate principal component factor analyzes (with varimax rotation) involving the individual students' score. The factor structure that emerged replicated extent, and list the items which were found to have factor loadings greater than 0.30 (which is the minimum value conventionally accepted as meaningful in factor loading analysis). On the whole, it appears that the items had factor loadings greater than 0.30 with their a priori scales, and hence, the results lend support to the factorial validity of the WIHIC, GCTS and the SSQ, as expected, the results show that the correlation between a scale and the next scale in generally is high, and become lower for scales further away from that scale. This is illustrated using each scale. In general, the circumplex nature of the WIHIC, GCTS and the SSQ have been confirmed. Using internal consistency, the Cronbach alpha reliability coefficients for the WIHIC, GCTS, and SSQ are valid and reliable with the discriminant validity coefficients (the mean correlation of a scale with the other scales) of the Augmented Reality classes, which was considered satisfactory for further use in this study.

### **Associations between Students' Perceptions of their Instructional Inventory with the Augmented Reality Technology (AR) and their Facilitating Critical Thinking Skills**

Focusing on the WIHIC, the statistical procedures also involved the investigation of associations between students' perceptions of their augmented reality technology (AR) learning environment and their creative thinking skills toward science. The simple correlation values ( $r$ ) are reported in Table 10 which show significant correlations ( $p < 0.05$ ) between students' critical thinking skill outcomes and classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) classes. These associations are positive for the scales of Student Cohesiveness (SC), Teacher Support (TS), Involvement (IN), Investigation (IV), Task Orientation (TO), Cooperation (CO), and Equity (EQ) scales, there was a more favourable towards their WIHIC environment inventory. The second type of analysis consisted of the more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the WIHIC and their creative thinking skills towards their GCTS when the effect of relationships between the scales is controlled.

In this study, it was also considered important to investigate associations between students' perceptions students' perceptions of their instructional inventory with the augmented reality technology (AR) and their facilitating critical thinking skills in Augmented Reality Technology (AR) classes and their critical thinking with their critical thinking skills. The selection of an evaluation and assessment instrument suitable was required. Table 10 suggests that the scales of the WIHIC and the GCTS are reliable for measuring critical thinking skills in seminar on education class. Using simple correlation ( $r$ ), multiple correlations ( $R$ ), Multiple Regression Validity ( $\beta$ ), and Determination Efficient Predictive value ( $R^2$ ) were associated and predicted in Inference (IN), Recognition of Assumption (RA), Deduction (DE), Interpretation (IT), and Evaluation of Argument (EA) scales, respectively.

Table 10 *Associations between Students' Perceptions of their Instructional Inventory with the Augmented Reality Technology (AR) and their Facilitating Critical Thinking Skills (for the GCTS)*

Scale	Simple Correlation $r$	Standardized Regression Weight Validity ( $\beta$ )
Student Cohesiveness	0.47***	0.23*
Teacher Support	0.35***	0.13*
Involvement	0.30***	0.11*
Investigation	0.29***	0.23**
Cooperation	0.52***	0.30***
Task Orientation	0.49***	0.19**
Equity	0.38***	0.15*
Multiple Correlation $R$		0.7485***
Determination Efficient Predictive value ( $R^2$ )		0.5603***

$N = 169$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

The multiple correlations ( $R$ ) are significant for science classroom learning environment with students' perceptions of their instructional inventory with the augmented reality technology (AR) classes for the 25-items *Glaser Critical Thinking* (GCTS) Test. The GCTS consisted of 5 scales and 25 items are Inference (IN), Recognition of Assumption (RA), Deduction (DE), Interpretation (IT), and Evaluation of Argument (EA) scales and showed that when the scales are considered together there is a significant ( $p < 0.05$ ) association with the GCTS. The  $R^2$  value indicates that 56% of the variance in students' critical thinking skill outcomes of the GCTS to their instructional inventory with the augmented reality technology (AR) classes was attributable to their perceptions of their *What Is Happen In this Class* (WIHIC). In these AR classes, students perceived greater student cohesiveness, teacher support, involvement, investigation, task orientation, cooperation, and equity for facilitating critical thinking skills, relatively.

#### Associations between Students' Perceptions of their Instructional Inventory with the Augmented Reality Technology (AR) and their Facilitating Satisfaction

*What Is Happen In this Class* (WIHIC) questionnaire, the statistical procedures also involved the investigation of associations between students' perceptions of their physics laboratory classroom learning environment and their creative thinking skills toward science. The simple correlation values ( $r$ ) are reported in Table 11 which show significant correlations ( $p < 0.05$ ) between students' critical thinking skill outcomes and classroom learning environment inventory according to constructivist approach in augmented reality technology (AR) classes. These associations are positive for the scales of Student Cohesiveness (SC), Teacher Support (TS), Involvement (IN), Investigation (IV), Task Orientation (TO), Cooperation (CO), and Equity (EQ) scales, there was a more favourable the towards their WIHIC environment inventory. The second type of analysis consisted of the more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the WIHIC and their creative thinking skills towards their SSQ when the effect of relationships between the scales is controlled.

The multiple correlations ( $R$ ) are significant for science classroom learning environment with students' perceptions of their instructional inventory with the augmented reality technology (AR) classes for the 20-items *Student Satisfaction Questionnaire* (SSQ) in four scales obtained of Learning Activity Process (LAP), Classroom Learning Environment (CLE), Instructional Media (IME), and Benefit (BEN) scales and showed that when the scales are considered together there is a significant ( $p < 0.05$ ) association with the GCTS.

Table 11 *Associations between Students' Perceptions of their Instructional Inventory with the Augmented Reality Technology (AR) and their Facilitating Satisfaction (for the SSQ)*

Scale	Simple Correlation ( $r$ )	Standardized Regression Weight Validity ( $\beta$ )
Student Cohesiveness	0.22**	0.11*
Teacher Support	0.29***	0.18*
Involvement	0.24**	0.17*
Investigation	0.31***	0.20**
Cooperation	0.28**	0.16*
Task Orientation	0.26**	0.14*
Equity	0.30***	0.19**
Multiple Correlation ( $R$ )		0.6091*
Determination Efficient Predictive value ( $R^2$ )		0.3710*

$N = 169$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

The  $R^2$  value indicates that 37% of the variance in students' satisfaction performances of the SSQ to their instructional inventory with the augmented reality technology (AR) classes was attributable to their perceptions of their *What Is Happen In this Class* (WIHIC). In these AR classes, students perceived lower student cohesiveness, teacher support, involvement, investigation, task orientation, cooperation, and equity for facilitating critical thinking skills, relatively.



## CONCLUSIONS AND DISCUSSIONS

The Augmented Reality (AR) is a live direct or indirect view of a physical, real-world environment whose elements are "augmented" by computer-generated or extracted real-world sensory input such as sound, video, graphics, hepatics or GPS data. In education in Thailand, the AR has been used to complement a standard curriculum. Text, graphics, video, and audio were superimposed into a student's real time environment. In this search study, to investigate of ensuring students are engaged, motivated and challenged throughout their upper secondary school career is a key priority for teachers. See how virtual and augmented reality can unlock potential, giving students new ways to experience learning and even create their own media are assessed. Based on past studies; Fraser, Fisher, and McRobbie (1996) <sup>[11]</sup> developed a new learning environmental instrument named What Is Happening In This Class? (WIHIC) which incorporates scales that have been used and proven to be significant predictors of learning outcomes are validated. The critical thinking skills was adapted from Watson Glaser to assess students in instructional inventory with the augmented reality technology (AR) for to the 25-items *Glaser Critical Thinking Skill (GCTS)* Test in five scales. Students' response measured through an adapted questionnaire on a 5-point likert scale in five scales of Learning Activity Process, Classroom Learning Environment, Instructional Media, and Benefit scales were assessed students perceptions with the 20-item Student Satisfaction Questionnaire (SSQ) in the 21st century in this research study.

The purposes of this research study were to assess students' questions "What is happen in this class?" of their instructional inventory, to assess students' perceptions of their critical thinking skills and their satisfactions, and to associate between students' perceptions of their augmented reality technology (AR) classes and their critical thinking skills to their satisfactions of upper secondary students in the 21st century under the Secondary Educational Service Area Office in the Central of the Northeast Region which a sample size consisted of 169 upper secondary students in four schools whereas the instructional inventory with the augmented reality technology (AR). Validity and reliability of two research instruments were analyzed with internal consistency (Cronbach alpha reliability, circumflex correlation scales. Associations between students' perceptions of their WIHIC, GCTS and SSQ, using simple and multiple correlations, regression validity, and determination efficient predictive value were analyzed.

The WIHIC, GCTS and SSQ questionnaires were subjected to separated principal components factor analyses (with varimax rotation) involving student's score. On the whole, it appears that the items had factor loadings greater than 0.30 with their a priori scales, and hence, the results lend support to the factorial validity of the WIHIC, GCTS and the SSQ. The WIHIC, GCTS and SSQ are the cricumplex model which means that correlations between a scale and the scale next to it generally are high correlations. In general, the circumplex natures of the WIHIC, GCTS and the SSQ have been confirmed. Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales (Discrimination validity) were obtained the sample in this present study as indices of scale reliability and discriminant validity for the WIHIC, GCTS and SSQ.

In this study, it was also considered important to investigate associations between students' perceptions students' perceptions of their instructional inventory with the augmented reality technology (AR) and their facilitating critical thinking skills in Augmented Reality Technology (AR) classes with the WIHIC scales and their critical thinking with their critical thinking skills and students' satisfaction performances. The  $R^2$  values indicates that 56% and 37% of the variance in students' critical thinking skill outcomes of the GCTS and their satisfactions to their instructional inventory with the augmented reality technology (AR) classes was attributable to their perceptions of their *What Is Happen In this Class* (WIHIC). In these AR classes, students perceived greater student cohesiveness, teacher support, involvement, investigation, task orientation, cooperation, and equity for facilitating critical thinking skills, relatively. Suggestions that, the *What is Happening In this Class* (WIHIC), the WIHIC consisted of 7 scales and 56 items in seven scales are Student Cohesiveness (SC), Teacher Support (TS), Involvement (IN), Investigation (IV), Task Orientation (TO), Cooperation (CO), and Equity (EQ), the 25-items *Glaser Critical Thinking (GCTS)* Test. The GCTS consisted of 5 scales and 25 items. The five scales are Inference (IN), Recognition of Assumption (RA), Deduction (DE), Interpretation (IT), and Evaluation of Argument (EA) scales, and the 20-item *Student Satisfaction Questionnaire* (SSQ). The SSQ consisted in four scales that contains of Learning Activity Process (LAP), Classroom Learning Environment (CLE), Instructional Media (IME), and Benefit (BEN) scales. The students selected from five scoring options ranging from 1 (strongly disagreement) to 5 (strongly agreement) are provided for investigating the instructional inventory with the augmented reality technology (AR) for facilitating satisfactions and critical thinking skills of upper secondary students in the 21st century under the Secondary Educational Service Area Office in the Central of the Northeast Region, significantly.



## ACKNOWLEDGEMENT

I would first like to thank my thesis of the Master of Science Education, Faculty of Education; Advisor; Prof. Toansakul Santiboon, and Assist. Assist. Prof. Dr. Pornnarong Siripiyasing; Faculty of Science and Technology, Rajabhat Mahasarakham University are advised. I also thank to the 169 secondary students in 4 schools in secondary educational school level under the Secondary Educational Service Area Offices throughout of Northeast Region of Thailand were used to assess students' perceptions of their classroom learning environment inventories in the 21<sup>st</sup> century in augmented reality technology (AR) classes. The door to Prof. Santiboon was always open whenever I ran into a trouble spot or had a question about my research or writing. He consistently allowed this paper to be my own work, but steered me in the right the direction whenever he thought I needed it.

## REFERENCES

- [1] Davies, C. (2012). Quantigraphic camera promises HDR eyesight from father of AR. Retrieved on 12 September 2012 from <https://www.slashgear.com/quantigraphic-camera-promises-hdr-eyesight-from-father-of-ar-12246941/>
- [2] Schuettel, P. (2017). The concise fintech compendium. Fribourg: School of Management Fribourg/Switzerland.
- [3] Steuer, J. (2016). *Defining virtual reality: Dimensions determining telepresence archived*. Retrieved on 24 May 2016 from 24 May 2016 at the Wayback Machine. Department of Communication, Stanford University. 15 October 1993.
- [4] Kaasinen, E., Aromaa, S. & Rauhala, V. (2017). Augmented reality based knowledge sharing solutions for field service personnel. Retrieved from <https://ercim-news.ercim.eu/en103/special/augmented-reality-based-knowledge-sharing-solutions-for-field-service-personnel>
- [5] Stewart-Smith, H. (2012). Education with augmented reality: AR textbooks released in Japan. ZDnet, 4 April 2012.
- [6] Augment.com. (2017). *5 reasons to use augmented reality in education*. Retrieved from <http://www.augment.com/blog/5-reasons-use-augmented-reality-education/>
- [7] Funk, S. (2017). *VR/AR/MR in Thailand*. Retrieved from <http://my-thai.org/vr-in-thailand/>
- [8] Techakosit, S. & Nilsook, P. (2015). *Using Augmented Reality for Teaching Physics*. ResearchGate. Retrieved from [https://www.researchgate.net/publication/280576271\\_Using\\_Augmented\\_Reality\\_for\\_Teaching\\_Physics](https://www.researchgate.net/publication/280576271_Using_Augmented_Reality_for_Teaching_Physics)
- [9] Fraser, B. (2012). Classroom learning environments: retrospect, context and prospect. In *Second International Handbook of Science Education*: pp. 1191-1239
- [10] Santiboon, T. (2016). Senior educational students' perceptions of their master science trainee educational teachers' internships in teaching physics for improving and creating attitude skills on teaching and learning sustainable developments in Thailand. *Academia Journal of Educational Research* 4 (11) : pp. 175-186, November 2016.
- [11] Fraser, B. J., Fisher, D. L., & McRobbie, C. J. (1996). *Development, validation and use of personal and class forms of a nezu classroom environment instrument*. Paper presented at the annual meeting of the American Educational Research Association, New York, USA in April.
- [12] Patterson, R. (2014). 7 ways to improve your critical skills and abilities. Retrieved from <https://collegeinfo geek.com/improve-critical-thinking-skills/>
- [13] Roberts, A. (2013). *The source of several of the seven ways to think more critically*. Retrieved from <https://www.amazon.com/Thinking-Students-Guide-College-Education-ebook/>
- [14] Santiboon, T. (2017). An instructional design model based learning strategies for fostering students' critical thinking abilities. *Educational Research and Reviews*. Vol. 12 (15) : pp. 712 – 724.
- [15] Khine, M. S. (2012). Using the WHIC Questionnaire to Measure the Learning Environment. *Teaching and Learning*, 22 (2), Institute of Education (Singapore) : pp. 54-61.
- [16] Dorman, J. P., Aldridge, J. M., and Fraser, B. (2006). Using students' assessment of classroom environment to develop a typology of secondary school classrooms. *International Education Journal*, 2006, 7 (7) : pp. 906-915.
- [17] Majeed, A. & Aldridge, J. M. (2012). Learning environment and its association with student satisfaction among mathematics students in Brunei Darussalam. ResearchGate. Retrieved from

- [https://www.researchgate.net/publication/227291448\\_Learning\\_Environment\\_and\\_its\\_Association\\_with\\_Student\\_Satisfaction\\_Among\\_Mathematics\\_Students\\_in\\_Brunei\\_Darussalam](https://www.researchgate.net/publication/227291448_Learning_Environment_and_its_Association_with_Student_Satisfaction_Among_Mathematics_Students_in_Brunei_Darussalam)
- [18] Koul, R. B. (2005). Cultural background and students' perceptions of science classroom learning environment and teacher interpersonal behaviour in Jammu, India. *Learning Environment Research*. Volume 8, Issue 2: pp 195–211.
  - [19] Fraser, B. (2009). Science laboratory classroom environments in Korean high schools. *Learning Environments Research*, 12, pp. 67-84.
  - [20] Ching-Tse, D. L. (2013). Learning environments in English classrooms in Singapore: Determinants and effects. Doctor Thesis, Science and Mathematics Education Centre, Curtin University of Technology. Australia.
  - [21] Santiboon, T. (2006). Laboratory learning environments and teacher-student interactions in physics classes in Thailand. *ResearchGate*. Retrieved from [https://www.researchgate.net/publication/45844124\\_Laboratory\\_learning\\_environments\\_and\\_teacher-student\\_interactions\\_in\\_physics\\_classes\\_in\\_Thailand](https://www.researchgate.net/publication/45844124_Laboratory_learning_environments_and_teacher-student_interactions_in_physics_classes_in_Thailand)
  - [22] Aldridge, J. M. (2012). A cross-cultural study of classroom learning environments in Australia and Taiwan. *ResearchGate*. Retrieved from [https://www.researchgate.net/publication/226011741\\_A\\_Cross-cultural\\_Study\\_of\\_Classroom\\_Learning\\_Environments\\_in\\_Australia\\_and\\_Taiwan](https://www.researchgate.net/publication/226011741_A_Cross-cultural_Study_of_Classroom_Learning_Environments_in_Australia_and_Taiwan)
  - [23] Cheryan, S., Ziegler, S. A., Plaut, V. C., and Meltzoff, A. N. (2014). Designing classrooms to maximize student achievement. *Policy Insights from the Behavioral and Brain Sciences 2014*, Vol. 1 (1) : pp. 4–12.
  - [24] Wei, L. S. (2011). Relationship between students' perceptions of classroom environment and their motivation in learning English language. *International Journal of Humanities and Social Science Vol. 1* No. 21 [Special Issue - December 2011].
  - [25] Thao-Do, T. P., & Bac-Ly, D. B. (2016). Learning environment in Vietnamese physics teacher education programme through the lens of constructivism: a case study of a State University in Mekong Delta Region, Vietnam. *International Journal of Science and Mathematics Education*. January 2016, Volume 14 (1) : pp 55–79.
  - [26] Sutikno, W. Y. (2017). Science education in Indonesia: A classroom learning environment perspective. *ResearchGate*. Retrieved from [https://www.researchgate.net/publication/291409410\\_Science\\_education\\_in\\_indonesia\\_A\\_classroom\\_learning\\_environment\\_perspective](https://www.researchgate.net/publication/291409410_Science_education_in_indonesia_A_classroom_learning_environment_perspective)
  - [27] Gorra, V. C. & Bhati, S. S. (2016). Students' perception on use of technology in the classroom at higher education institutions in Philippines. *University of Wollongong Research Online*. Retrieved from <http://ro.uow.edu.au/cgi/viewcontent.cgi?article=1878&context=buspapers>

# A STUDY ON SCIENCE TEACHER INTERPERSONAL LEARNING ENVIRONMENT BEHAVIOURS AND CRITICAL THINKING ABILITIES OF UPPER SECONDARY STUDENTS UNDER SECONDARY EDUCATIONAL SERVICE AREA OFFICE 32

Orapan Laminon<sup>a</sup>, Tanawat Somtua<sup>b</sup>, and Wandee Rakrai<sup>c</sup>

<sup>a</sup>Department of Master of Science Education, Faculty of Education, Rajabhat Maha Sarakham University,  
Maha Sarakham, Thailand 44000

Corresponding author. Tel.: +66 9 8658 0878; Fax: +66 43 713 206

E-mail address: [jiew.wy@gmail.com](mailto:jiew.wy@gmail.com)

<sup>b</sup>Department of Master of Science, Faculty of Science and Technology, Rajabhat Maha Sarakham University,  
Maha Sarakham, Thailand 44000

Corresponding author. Tel.: +66 8 4844 7656; Fax: +66 43 713 206

E-mail address: [somtua.t@gmail.com](mailto:somtua.t@gmail.com)

<sup>c</sup>Department of Science, Faculty of Science and Technology, Rajabhat Maha Sarakham  
Maha Sarakham, Thailand 44000

\* Corresponding author. Tel.: +66 8 1716 5946; fax: +66 43 722 257

E-mail address: [wandee.rakrai@gmail.com](mailto:wandee.rakrai@gmail.com)

## ABSTRACT

The aims of this research study were 1) to associate between students' perceptions of their science teacher interpersonal behaviours to be affected of their students' critical thinking abilities, 2) to associated between teacher-student interpersonal behaviours to their classroom learning environment inventories, and 3) to associate between students' perceptions of their learning environment inventories and their affecting critical thinking of science learning achievements in science classes under Secondary Service Area Office 32 with a sample size consisted of 379 students at upper secondary education in 11 schools. Using the 48-item *Questionnaire on Teacher Interaction* (QTI) of eight scales and the 24-item *Critical Thinking Ability* (CTA) Questionnaire in four scales was assessed. Most of two research instruments are valid and reliable were tried out. Analyzing statistically significant correlations with mean scores were associated. Students' perceptions of their science teacher interpersonal behaviours and their critical thinking abilities with simple and multiple correlations, multiple regression validity are significant ( $p < 0.05$ ). It has found that: the  $R^2$  values indicate that 30%, 29%, 31%, 26% and 35% of their *Leadership*, *Helping/Friendly*, *Understanding*, *Student Responsibility/Freedom*, *Strategies*, *Morals and Relates*, *Emotional Quotient*, and *Non-Strict* learning achievement critical thinking outcomes for *Activity Process*, *Thinking Principal*, *Critical Thinking Process*, *Critical Thinking Property*, and *Totalized* of the CTA, respectively. Comparisons between students' responses of their QTI and CTA in different schooling sizes also were found and differences of Extra, Large, Medium, and Small were differentiated, significantly ( $p < .05$ ), which results of the variance in student's learning achievement critical thinking outcomes were attributable to their perceptions of their science teacher interpersonal behaviours in student's critical thinking outcomes were attributable to their perceptions. Suggestions that the effects of science teacher interpersonal behaviours through their improving critical thinking abilities show relatively favourable perceptions with their science teacher interpersonal behaviours under Secondary Educational Service Area Office 32, significantly.

**KEYWORDS:** Science schooling classes, teacher interpersonal behaviours, learning environment inventory, critical thinking ability, upper secondary students, and Secondary Service Area Office 32

## INTRODUCTION

Education in Thailand is provided mainly by the Thai government through the Ministry of Education from pre-school to senior high school. A free basic education of twelve years is guaranteed by the constitution, and a minimum of nine years' school attendance is mandatory. In 2009 the Ministry of Education announced the extension of a free, mandatory education to fifteen years (UNICEF, 2016) <sup>[1]</sup>. Formal education consists of at least twelve years of basic education, and higher education. Basic education is divided into six years of elementary education and six years of secondary education, the latter being further divided into three years of lower- and upper-secondary levels. Kindergarten levels of pre-elementary education, also part of the basic education level, span 2–3 years depending on the locale, and are variably provided. Non-formal education is also supported by the state. Independent schools contribute significantly to the general education infrastructure. Administration and control of public and private universities are carried out by the Office of Higher Education Commission, a department of the Ministry of Education.

Educational system in Thailand with respect to the international measurements standards' reflects their weakness in delivering quality learning curriculum. Thai students are struggling to cope with English language proficiency due to which it has been spotted on 57th place on the international platform test PISA in 2015. Even when dealing with natural sciences, Students failed in tackling with critical problems. They were ranked by 54th place across the world in terms of science and mathematics (PISA, 2015) <sup>[2]</sup>. It's no secret the Thai education system has many problems, In recent years Thai government schools have been the object of much criticism, not only from sources within the country, but also from the international community. But why are Thai government schools performing so poorly, and is there everything that can be done to create a better learning environment for thr thousands of students suffering in the dismally run national education system? (Ruhe, 2016) <sup>[3]</sup>. In this research study, research team would attempt to identify the biggest problems within Thai national education system, and at the end of this study we would like to explore some possible solutions to some of this study.

Although, the National Education Act, BE 2542 (1999) and educational institution to have quality assurance system within the institution where the rules of the Ministry of Education and training to maintain internal quality assurance on a yearly basis in accordance with the quality assurance system within the school developing quality of education at participating schools. The implementation of quality assurance within the institution, schools and agencies must implement the National Education Act, the Ministerial Regulation, and the quality assurance board's announcement within the basic education level. The guidelines and guidelines for quality assurance within the basic education level 2011. The standard of education is to provide the focus is on two management education; all schools have standards comparable to the standard, and standards make it clear that education will improve the quality of education, which direction? If the quality of education is monitored to assess progress or is it assessed for certification by external organizations? Education can be prepared in that evaluation. (Educational Testing Center, 2011) <sup>[4]</sup>. However, under the Secondary Educational Service Area Office 32, Buriram Province has never past one of four quality assurance board's announcement within the basic education level, what has this school happened; school environment, classroom environment, teach interpersonal behaviours, students' performances of their science skills in the 21<sup>st</sup> century, or their learning achievement critical thinking have not supported, yet.

According to the Royal Gazette, Volume 116, Section 74, dated August 19, 1999, Section 23 requires that the instructor be able to provide instructional media environment so that the learner can learn and be knowledgeable in the past 10 years. All students in each grade level tend to have a lower average of average grade point average. The results of this research (Santiboon & Fisher, 2005) <sup>[5]</sup> and the 4,675 samples were Grade 12th students. Boring teaching environment, teachers do not understand the students and have value in the punishment, do not teach on time, to give homework or give away a lot of time. Students want their teachers to friendly and understand with their modern instructional designing and fun teaching techniques. The classroom environment is a happy learning environment. Students will observe the teacher's teaching by seeing the problems and reflecting on these problems.

Classroom learning environment inventory in the 21<sup>st</sup> century flipped learning, student blogging; these are becoming perceived staples of 21st-century learning. With such ambitious practices taking the spotlight for how people regard modern classrooms, it's not surprising that a murmur of impracticality or skepticism is still a frequent response when they're first introduced. Instead of requiring students to learn, work, and think in one place all day, consider how teachers' space might become more flexible (Wade, 2016) <sup>[6]</sup>. Modern realization of best practice in education no longer supports the idea of the teacher as an authoritarian figure standing in the front of the room scrawling on a chalkboard. As educators, our role can be reshaped so that we work beside students

providing support and encouragement for their personal journey (Goerts, 2015) <sup>[7]</sup>. The instructional environment is the setting for all teaching. Teachers should be planed their instruction to make sure their students are able to comprehend by using different teaching practices (Firestone, 2015) <sup>[8]</sup>. The term "21st-century skills" is generally used to refer to certain core competencies such as collaboration; digital literacy, critical thinking, and problem-solving that advocates believe schools need to teach to help students thrive in today's world (Rich, 2010) <sup>[9]</sup>.

Teacher's role in the creation of the curriculum: A teacher can gauge whether an activity will fit into a specified time frame and engage students. When a teacher fails to properly implement a strong curriculum, she risks not covering standards or failing to implement effective practices in the classroom. Teachers own interest, ability and competence to teach the curriculum i.e confidence in teaching, attitudes and freeness to teach the subject (Patankar, 2013) <sup>[10]</sup>. In this research study, special attention was paid to the methods and procedures utilized to test theory that guides effective teacher behavior research, to integrate research from education and communication, and conclude with suggestions for future research in the communication discipline. Classroom learning environment inventory obviously concerns the dynamics of classrooms or smaller learning environments, including how children feel and experience the characteristics of this milieu. Judgments as to the nature of the classroom climate are based on a student perceptual consensus about the educational, psychological, social, and physical aspects of the environment (Santiboon, 2013) <sup>[11]</sup>.

International research efforts involving the conceptualization, assessment and investigation of perceptions of psychosocial aspects of the classroom environment have firmly established the classroom environment as a thriving field of study (Fraser, 1994<sup>[12]</sup>; Fraser & Walberg, 1991<sup>[13]</sup>; Santiboon & Fisher, 2005<sup>[5]</sup>; Santiboon 2016<sup>[11]</sup>). Researchers in the Netherlands have extended this field by focusing specifically on the interpersonal relationships between teachers and their students as assessed by the Questionnaire on Teacher Interaction (QTI) (Wubbels, Creton, & Hooymayers, 1992<sup>[14]</sup>; Wubbels & Levy, 1993<sup>[15]</sup>). The original version of the QTI developed in the early 1980s in the Netherlands had 77 items (Wubbels, Creton, & Hooymayers, 1985<sup>[16]</sup>). Later, an American version of the QTI was developed that had 64 items (Wubbels & Levy, 1991<sup>[17]</sup>). The Australian version and the Thai version of the QTI has 48 items which are arranged in cyclic order in blocks of four to facilitate hand scoring by teachers (Santiboon & Fisher, 2005) <sup>[5]</sup>. Items 1 to 24 assess the four scales called Leadership, Understanding, Uncertain and Admonishing behaviors, and Items 25 to 48 assess the scales called Helping/Friendly, Student Responsibility/Freedom, Dissatisfied and Strict behaviors. At the bottom of the QTI are eight abbreviations corresponding to the subscales (DC = Leadership, CD = Helping/Friendly, CS = Understanding, SC = Student Responsibility/Freedom, SO = Uncertain, OS = Dissatisfied, OD = Admonishing, and DO = Strict behaviours. Santiboon (2013) <sup>[18]</sup> adapted the QTI version from Australian version to Leadership (Lea), Helping/Friendly (HFr), Understanding (Und), Student Responsibility/Freedom (SRf), Strategies (Str), Morals and Relates (MRe), Emotional Quotient (EQu), and Non-Stricting (NTr) behaviours that they were positive scales of science teacher interpersonal behaviours were modified in this study.

In essence, critical thinking requires human to use their ability to reason. It is about being an active learner rather than a passive recipient of information. In addition to the critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action (Patterson, 2014) <sup>[19]</sup>. Critical thinking was described by Richard W. Paul (1995) <sup>[20]</sup> as a movement in two waves (1995) (Glaser, 1941) <sup>[20]</sup>. The "first wave" of critical thinking is often referred to as a 'critical analysis' that is clear, rational thinking involving critique. Its details vary amongst those who define it. According to Edward M. Glaser (Glaser, 1941) <sup>[21]</sup>, critical thinking means making clear, reasoned judgments. During the process of critical thinking, ideas should be reasoned, well thought out, and judged (Walters, 1994) <sup>[22]</sup>. The U.S. National Council for Excellence in Critical Thinking (Elkins, 2014) <sup>[23]</sup> defines critical thinking as the "intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action." (The Foundation for Critical Thinking, 2017) <sup>[24]</sup>. Contemporary critical thinking scholars have expanded these traditional definitions to include qualities, concepts, and processes such as creativity, imagination, discovery, reflection, empathy, connecting knowing, feminist theory, subjectivity, ambiguity, and inconclusiveness. Some definitions of critical thinking exclude these subjective practices (Walters, 1994) <sup>[22]</sup>.

Focused on the critical thinking in this research study was just **deliberately and systematically processing information** so that students can **make better decisions and generally understand things better** because critical thinking requires students to apply diverse intellectual tools to diverse information.



The value of critical thinking doesn't stop with college, however. Once students get out into the real world, critical thinking matters even more (Roberts, 2013) [26]. In this research study, as resecher team hope instructor now see, learning to think critically will benefit instructor both in the classroom and beyond. Because our learning to think critically is a lifelong journey, and there's always more to learn in this class. Then, we designed using the 24-items *Critical Thinking Ability* (CTA) Questionnaire (Santiboon, 2017) [27] was adapted and assessed graduate students in Science schooling classes in Secondary Educational Service Area Office 32, Buriram Province in this research study.

To devote to students' perceptions of psychosocial and science skill characteristics of classroom has been to make this exciting research tradition in science education more accessible to wider audiences. In its attempt to portray prior work, attention has been given to instruments for assessing classroom. Associations between outcomes and environment to use of environment dimensions as dependent variables, classroom environment instruments' differentiates between learning environments questionnaires which assesses the whole-class environment, learning environment assessments should be used in addition to student learning outcome measures to provide information about subtle but important aspects of classroom life for enhancing science education. Research team modified the strongest tradition in past classroom environment research has involved investigation of associations between students' cognitive and affective learning outcomes and their perceptions of psychosocial characteristics of their classrooms with the QTI and CAT questionnaires were selected in this research study.

## METHODOLOGY AND METEIRALS

### Research Aims

1. To investigate of students' perceptions of their science teacher interpersonal behaviours for affecting their learning achievement with their critical thinking abilities in science classes in upper secondary educational students under Secondary Educational Service Area Office 32.
2. To compare of upper secondary students' perceptions of their science teacher interpersonal behaviours according to the different schooling sizes under Secondary Educational Service Area Office 32.
3. To compare between the differentiated schooling sizes with upper secondary students' perceptions of their science classroom learning environments for enhancing their critical thinking abilities in science classes under Secondary Educational Service Area Office 32.
4. To associate between students' perceptions of their science teacher interpersonal behaviours and their critical thinking abilities in science classes under Secondary Educational Service Area Office 32.

### Sample Size

Administrations which sample size consisted of 379 upper secondary students at the 10<sup>th</sup> – 12<sup>th</sup> grade levels, each educational classified level contained of 11 schools whereas they are taught by the science teachers, each science schooling classes consisted of 30-40 students, approximately, and totalized sample size of 379 students under Secondary Service Area Office 32, Buriram Province.

### Research Instruments

1. Students' perceptions of their science teacher interpersonal behaviours were assessed with the 48-item *Questionnaire on Teacher Interaction* (QTI), which it uses a five-point responses format (from Never to Always. Student requires drawing circle the response alternatives on the questionnaire itself in eight scales that they contain six items, so that the minimum and maximum score possible on each of these scales is 6 and 30, respectively., namely; Leadership (Lea), Helping/Friendly (HFr), Understanding (Und), Student Responsibility/Freedom (SRf), Strategies (Str), Morals and Relates (MRe), Emotional Quotient (EQu), and Non-Stricting (NST) behaviours that they were positive scales of science teacher interpersonal behaviours.
2. Students' performances of their learning achievement within critical thinking were assessed with the 24-item *Critical Thinking Ability* (CTA) Questionnaire in three scales, namely; Activity Process (ACP), Thinking Principal (TPR), Critical Thinking Process, and Critical Thinking Property (CTPO)

### Data Analysis

Assuming that the scaling of the items approximated as Never to Always, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the QTI and the CAT as specified. The multiple correlations, multiple regression, and determination efficient predictive analysis were significant of students' perceptions of their science teacher interpersonal behaviours in the 21<sup>st</sup> century through learning



environment inventories for enhancing and improving science learning achievements in science classes in Under Secondary Service Area Office 32 to associate were analyzed.

## RESULTS

To investigate of the affecting science teacher interpersonal behaviours in the 21<sup>st</sup> century through learning environment inventories for enhancing and improving science learning achievements in science classes under Secondary Educational Service Area Office 32. The findings of this study, which were presented in next subsection under three main headings: (1) validation of the questionnaires; the *Questionnaire on Teacher Interaction* (QTI), and the *Critical Thinking Ability* (CAT); (1) To investigate of students' perceptions of their science teacher interpersonal behaviours for affecting their learning achievement with their critical thinking abilities in science courses in upper secondary educational students under Secondary Educational Service Area Office 32; (2) To compare of upper secondary students' perceptions of their science teacher interpersonal behaviours according to the different schooling sizes under Secondary Educational Service Area Office 32. (3) To compare between the differentiated schooling sizes with upper secondary students' perceptions of their science classroom learning environments for enhancing their critical thinking abilities in science classes under Secondary Educational Service Area Office 32, and (4) To associate between students' perceptions of their science teacher interpersonal behaviours and their critical thinking abilities in science classes under Secondary Educational Service Area Office 32. A summary of the main findings are provided that followed as:

### Investigations of Students' Perceptions of their Science Teacher Interpersonal Behaviours for Affecting their Learning Achievement with their Critical Thinking Abilities in Science Classes

Using factor loading analysis, intercorrelation circumplex nature scales, and internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales (Discrimination validity) were obtained the sample in this present study as indices of scale reliability and discriminant validity for the QTI, and the CTA. The summary of these values obtained separately for the QTI are reported in Table 1, 2 and 3.

Table 1 Factor Loading Analysis for the QTI

item	Factor Loading							
	Lea	HFr	Und	Sre	Str	MRe	EQu	NSt
2	0.777							
3	0.768							
4	0.737							
1	0.736							
6	0.716							
5	0.385							
8		0.780						
12		0.741						
9		0.728						
11		0.710						
7		0.691						
10		0.439						
14			0.806					
13			0.796					
16			0.739					
17			0.737					
15			0.733					
18			0.717					
22				0.774				
20				0.754				
19				0.722				
23				0.718				
21				0.704				

item	Factor Loading							
	Lea	HFr	Und	Sre	Str	MRe	EQu	NSt
24				0.704				
25					0.755			
29					0.754			
26					0.733			
30					0.731			
28					0.713			
27					0.693			
36						0.775		
34						0.754		
35						0.735		
33						0.734		
32						0.731		
31						0.695		
41							0.793	
39							0.779	
40							0.770	
42							0.749	
37							0.745	
38							0.695	
46								0.769
45								0.767
47								0.764
48								0.747
44								0.734
43								0.658
% of variance	48.990	47.714	57.057	53.275	53.303	54.432	57.130	55.529
	2.939	2.863	3.423	3.197	3.198	3.266	3.428	3.332

\* Loading smaller than 0.30 omitted. N=379

### Factor Loading Analysis

Factor loadings represent how much a factor explains a variable in factor analysis. Factor analysis is a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factors. Factor analysis is related to principal component analysis and use to analyze two are not identical. There has been significant controversy in the field over differences between the two techniques, Table 1 and 2 reported on exploratory factor loading analysis versus principal components analysis. Exploratory factor analyses indicated that two factors structured the eight scales. These two factors (with an eigenvalue larger than 1) explained 86% of the variance and could be interpreted as Influence and Proximity dimensions and displays the factor loadings of the two factors found. To investigate the circumflex nature of the QTI that correlations between the scales were calculated. The results are presents in Table 1 showed the circumflex nature QTI scales. Analyses also indicated that students' perceptions on the two dimensions had predictive validity: both dimensions were positively related to both cognitive and affective student outcomes.

In table 1 and 2, the forms of the QTI and the CAT were subjected to separate principal component factor analyzes (with verimax rotation) involving the individual students' score. The factor structure that emerged replicated extent, and list the items which were found to have factor loadings greater than 0.30 (which is the minimum value conventionally accepted as meaningful in factor loading analysis).

Table 2 Factor Loading Analysis for the CAT

Scale	Item	ACP	TPR	CTPR	CTPO
Activity Process (ACP)	5	0.756			
	3	0.754			
	4	0.734			
	1	0.710			
	6	0.682			
	2	0.605			
Thinking Principal (TPR)	8		0.812		
	9		0.780		
	10		0.763		
	11		0.714		
	7		0.691		
	12		0.941		
Critical Thinking Process (CTPR)	15			0.788	
	14			0.784	
	13			0.765	
	16			0.758	
	18			0.692	
	17			0.684	
Critical Thinking Property (CTPO)	22				0.804
	20				0.767
	21				0.765
	19				0.743
	23				0.732
	24				0.668
% of variance		50.232	54.124	55.689	55.894
Eigenvalue		3.014	3.247	3.341	3.354

\*Loading smaller than 0.20 omitted.  $N = 379$

On the whole, it appears that the items had factor loadings greater than 0.30 with their a priori scales, and hence, the results lend support to the factorial validity of the QTI and the CAT.

### *The Intercorrelations Circumplex Nature Scale of the Questionnaires*

In statistics, the interclass correlation of intercorrelation coefficient is an inferential statistical that can be used when quantitative measurements are made on unit that are organized into groups. It describes how strongly units in the same group resemble each other. While it is viewed as a type of correlation, unlike most other correlation measures it operates on data structured as groups, rather than data structured as paired of analysis. To investigate the circumplex nature of the QTI and the CTA, correlations between the scales were calculated. The results are presented in Table 3 and 4.

Table 3 Scale Intercorrelation Circumplex Nature for the QTI

	Lea	HFr	Und	SRf	Str	MRe	Equ	NTr
Lea		0.620***	0.638***	0.573***	0.560***	0.621***	0.598***	0.671***
HFr			0.793***	0.691***	0.569***	0.656***	0.643***	0.698***
Und				0.756***	0.760***	0.798***	0.766***	0.782***
SRf					0.728***	0.753***	0.722***	0.731***
Str						0.779***	0.738***	0.715***
MRe							0.844***	0.811***
Equ								0.830***
NTr								

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

As expected, the results show that the correlation between a scale and the next scale in generally is high, and become lower for scales further away from that scale. This is illustrated using each scale in table 1, 2 and 3. In general, the circumplex nature of the QTI and the CAT have been confirmed. Student Responsibility/Freedom (SRf), Strategies (Str), Morals and Relates (MRe), Emotional Quotient (EQu), and Non-Stricting (NSt)

Table 4 Scale Intercorrelation for the CTA

Scale	ACP	TPR	CTPR	CTPO
Activity Process (ACP)		0.760***	0.755***	0.696***
Thinking Principal (TPR)			0.789***	0.767***
Critical Thinking Process (CTPR)				0.757***
Critical Thinking Property (CTPO)				

$N = 379$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

#### Internal Consistency Cronbach Alpha Coefficient Reliability

Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales (Discrimination validity) were obtained the sample in this present study as indices of scale reliability and discriminant validity for the QTI and the CTA. The summary of these values obtained separately for the QTI, and the CTA are reported in Table 5 and 6.

Table 5 Mean, Average Mean, Standard Deviation, Variance, Cronbach Alpha Reliability, Discrimination, and F-test for the QTI

Scale	Mean	Average Mean	Standard Deviation	Variance	$\alpha$ -Reliability	Discriminant	F-test	Sig.
Leadership	19.192	3.199	3.669	13.463	0.691	0.815	2.848*	.014
Helping/Friendly	19.493	3.249	3.727	13.896	0.688	0.815	2.835*	.015
Understanding Student	19.039	3.173	3.499	12.250	0.849	0.792	7.787***	.000
Responsibility/Freedom	19.032	3.172	3.372	11.375	0.823	0.796	2.436*	.033
Strategies	19.332	3.222	3.343	11.175	0.824	0.796	10.123**	.000
Morals and Relates	19.127	3.188	3.453	11.926	0.832	0.794	1.349*	.024
Emotional Quotient	19.298	3.216	3.491	12.189	0.849	0.792	1.986*	.048
Unrestricting	19.501	3.250	3.361	11.293	0.837	0.795	18.110**	.000

$N=379$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

As reported in Table 5 and 6, the mean score ranged from 3.172 reliability coefficients for the different scales of the QTI ranged from 0.688 to 0.849. In terms of the CTA, reliability coefficients ranged from 0.800 to 0.840 when using the individual student as the unit of analysis. On the whole, these results are acceptable although somewhat higher than obtained previously validation sample (Wubbels & Levy, 1993<sup>[10]</sup>; Santiboon, 2013<sup>[14]</sup>; Elkins, 2014<sup>[22]</sup>).

Table 6 Mean, Average Mean, Standard Deviation, Variance, Cronbach Alpha Reliability, Discrimination, and F-test for the CTA

Scale	Mean	Average Mean	Standard Deviation	Variance	$\alpha$ -Reliability	Discriminant	F-test	Sig.
Activity Process	21.058	3.510	3.859	14.891	0.800	0.835	5.235***	.000
Thinking Principal	21.079	3.513	3.965	15.724	0.826	0.827	2.359*	.038
Critical Thinking Process	21.251	3.542	4.118	16.961	0.840	0.822	9.925***	.000
Critical Thinking Property	21.839	3.640	4.188	17.543	0.840	0.822	10.651***	.000

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

The outcomes of this study indicate that a reliable and valid adaptation of the QTI for the Thailand context could be made. The instrument consisted of 48 items and displayed high reliability. Also, the instrument could clearly distinguish between classes, because intra-class correlations were very high.

### Comparisons between Upper Secondary Students' Perceptions of their Science Teacher Interpersonal Behaviours according to the Different Schooling Sizes under Secondary Educational Service Area Office 32

The QTI has a five-point response scale, ranging from Never/Not at All to Always/Very. It is scored on the basis of eight sectors or two summarising dimensions of Influence (or DS) and Proximity (or CO). The QTI has demonstrated acceptable reliability and validity. Cronbach's  $\alpha$  coefficient of the eight scales was high (between 0.688 and 0.849 at the class level) and intra-class correlations of the scales ranged between 0.621 and 0.844, indicating that the instrument was capable of distinguishing between classes.

Table 7 Comparisons between Upper Secondary Students' Perceptions of their Science Teacher Interpersonal Behaviours according to the Different Schooling Sizes under Secondary Educational Service Area Office 32

Schooling Size	Accounting Sample		Total Average	Standard Deviation	Paired Sample Size	t-test	ANOVA Results ( $\eta^2$ )	Sig.
	School	Students	mean					
Extra Large	2	69	3.229	0.459	Extra-Large Size	0.241	0.547***	0.810
	3	105	3.207	0.545	Extra-Medium Size	0.126	0.537***	0.900
Medium	5	175	3.219	0.474	Extra-Small Size	3.492**	0.803***	0.002
Small	1	30	2.806	0.444	Large-Medium Size	0.037	0.385***	0.971
					Large-Small Size	2.804**	0.933***	0.009
					Medium-Small Size	3.557***	0.677***	0.001

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 8 Comparisons between Upper Secondary Students' Perceptions of their Critical Thinking Abilities according to the Different Schooling Sizes under Secondary Educational Service Area Office 32

Schooling Size	Accounting Sample	Total Average	Standard Deviation	Paired Sample Size	t-test	ANOVA Results ( $\eta^2$ )	Sig.
	School	Students	mean				
Extra	2	69	3.740	0.578	Extra-Large Size	1.426	0.601***
Large	3	105	3.590	0.601	Extra-Medium Size	0.806	0.558***
					Extra-Small Size	3.636***	0.839***
Medium	5	175	3.652	0.773	Large-Medium Size	-1.363	0.398**
Small	1	30	3.189	0.470	Large-Small Size	2.322*	0.778***
					Medium-Small Size	4.323***	0.784***

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

To compare between the differentiated schooling sizes with upper secondary students' perceptions of their science classroom learning environments for enhancing their critical thinking abilities in science classes under Secondary Educational Service Area Office 32. The class means of students' schooling sizes, the standard deviations and the  $t$ -test results for statistical significances of Extra-Large Schooling Sizes, Extra-Medium Schooling Sizes, Extra-Small Schooling Sizes, Large-Medium Schooling Sizes, Large-Small Schooling Sizes, and Medium-Small Schooling Sizes. Table 7 and 8 reveal that the differences between the compared means on the Extra-Small Schooling Sizes, Large-Small Schooling Sizes, and the Medium-Small Schooling Sizes of the QTI and CAT scales were statistically significant at the 0.01 level.

#### Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their Critical Thinking Ability (CAT) Questionnaire for NAF Scale

The simple correlation values ( $r$ ) are reported in Table 9, 10, 11, 12 and 13 which show significant correlations ( $p<0.05$ ) between students' critical thinking abilities outcomes and their science teacher interpersonal behaviours all of eight scales.

Table 9 Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their CTA in Active Process Skill

Scale	Simple Correlation ( $r$ )	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.457***	0.223***
Helping/Friendly	0.371***	-0.093
Understanding	0.452***	0.023
Student Responsibility/Freedom	0.459***	0.175*
Strategies	0.410***	-0.045
Morals and Relates	0.461***	-0.030
Emotional Quotient	0.500***	0.261**
Unrestricting	0.487***	0.096
Multiple Correlation (R) 0.551***		
Determination Efficient Predictive Value ( $R^2$ ) 0.303***		
F-test 20.117***		

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 10 Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their CTA in Thinking Principal Skill



Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.447***	0.169**
Helping/Friendly	0.417***	0.037
Understanding	0.477***	0.114*
Student Responsibility/Freedom	0.442***	0.058
Strategies	0.428***	0.027
Morals and Relates	0.456***	-0.070
Emotional Quotient	0.493***	0.228*
Unrestricting	0.483***	0.060
Multiple Correlation (R) 0.540***		
Determination Efficient Predictive Value ( $R^2$ ) 0.292***		
F-test 19.080***		

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 11 Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their CTA in Critical Thinking Process Skill

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.409***	0.080
Helping/Friendly	0.397***	-0.019
Understanding	0.529***	0.381***
Student Responsibility/Freedom	0.436***	0.049
Strategies	0.394***	-0.102
Morals and Relates	0.437***	-0.159*
Emotional Quotient	0.486***	0.204**
Unrestricting	0.496***	0.155*
Multiple Correlation (R) 0.560***		
Determination Efficient Predictive Value ( $R^2$ ) 0.314***		
F-test 21.171***		

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 12 Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their CTA in Critical Thinking Property

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.385***	0.128*
Helping/Friendly	0.347***	-0.045
Understanding	0.429***	0.106*
Student Responsibility/Freedom	0.409***	0.112*
Strategies	0.382***	0.005
Morals and Relates	0.391***	-0.219**
Emotional Quotient	0.472***	0.339***
Unrestricting	0.452***	0.126***
Multiple Correlation (R) 0.508***		
Determination Efficient Predictive Value ( $R^2$ ) 0.258***		
F-test 16.55***		

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

These associations are positive for the scales of Leadership (Lea), Helping/Friendly (HF<sub>r</sub>), Understanding (Und), Student Responsibility/Freedom (SR<sub>f</sub>), Strategies (Str), Morals and Relates (MR<sub>e</sub>), Emotional Quotient (EQ<sub>u</sub>), and Non-Stricting (NTr) scales; there was a more favourable critical thinking abilities towards their science classroom environment climates. The multiple correlations R are significant for the QTI and CAT and show that when scales are considered together there are significant ( $p<0.001$ ) associations with critical thinking abilities

with the five scales of Activity Process (ACP) (Table 9), Thinking Principal (TPR) (Table 10), Critical Thinking Process (CTPR) (Table 11), and Critical Thinking Property (CTPO) (Table 12), and Totalized of the CAT (Table 13).

Table 13 *Associations between Students' Perceptions of their Science Teacher Interpersonal Behaviours (QTI) toward their Totalized CAT*

Scale	Simple Correlation (r)	Standardized Regression Weight Validity ( $\beta$ )
Leadership	0.469***	0.164**
Helping/Friendly	0.424***	-0.033
Understanding	0.523***	0.175*
Student Responsibility/Freedom	0.483***	0.108*
Strategies	0.446***	-0.032
Morals and Relates	0.482***	-0.135*
Emotional Quotient	0.539***	0.286**
Unrestricting	0.531***	0.122*
Multiple Correlation (R) 0.589***		
Determination Efficient Predictive Value ( $R^2$ ) 0.347***		
F-test 24.546***		

$N=379$ , \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

The more conservative standardized regression coefficient ( $\beta$ ) which measures the association between students' perceptions on each scale of the QTI and their learning achievement critical thinking outcomes towards science when the effect of relationships between the scales were controlled. The findings of associations between students' perceptions of their science teacher interpersonal behaviours and their learning achievement critical thinking outcomes for Activity Process (Table 9), Thinking Principal (Table 10), Critical Thinking Process (Table 11), and Critical Thinking Property (Table 12), and Totalized of the CTA (Table 13) scales were associated.

The multiple correlations ( $R$ s) are significant for science classroom learning environment with students' perceptions of their science teacher interpersonal behaviours and their learning achievement outcomes with the CTA and showed that when the scales are considered together there is a significant ( $p<0.05$ ) association with the CTA. The  $R^2$  values indicate that 30%, 29%, 31%, 26% and 35% of their learning achievement critical thinking outcomes for Activity Process, Thinking Principal, Critical Thinking Process, and Critical Thinking Property, and Totalized of the CAT, respectively, which results of the variance in student's learning achievement critical thinking outcomes were attributable to their perceptions of their science teacher interpersonal behaviours. The beta weights ( $\beta$ ) shows that in science classroom environment inventory perceived greater leadership, helping/friendly, understanding, student responsibility/freedom, strategies, morals and relates, emotional quotient, and unrestricting scales, there were a less favorable learning achievement outcomes towards science.

## CONCLSSIONS AND DISCISSIONS

In this study, research on teacher–student relationships in classroom learning environment in science classes was explored and studies the entire world. The authors review the research that examines teaching from an interpersonal perspective using a communicative systems approach and propose a model to describe teacher–student relationships in terms of teacher behavior. The studies used the 48-items *Questionnaire on Teacher Interaction* (QTI) to collect data on students' and teachers' perceptions of the teacher–student relationship (Wubbels & Brekelmans, 2005) [12]. behaviors for which science teachers reported higher perceptions overall on eight scales of the QTI than their students' leading, helpful/friendly and understanding, student responsibility and freedom, strategies, morals and relates, emotional quotient, and non-strict behaviours have found to be positively related to students' critical thinking abilities. To determine the level of correlation between critical thinking, as measured by Atkinson's Risk, and student performance with the *Critical Thinking Ability* (CTA) *Questionnaire* (Thomas, 2014) [21] as measured upper secondary students under Secondary Service Area Office 32, Burirum Province, Thailand, which sample size consisted of 379 students who responses of their perception in 11 science schooling classes with the QTI, and the CTA questionnaires in this research study was designed.

The aims of this research study focused on students' perceptions in upper secondary educational students under Secondary Educational Service Area Office 32, were to investigate and compare of students' perceptions

of their science teacher interpersonal behaviours with their critical thinking abilities in science classes according to the different schooling sizes, and associate between students' perceptions of their science with the QTI in eight scales and the CTA in four scales in science classes under Secondary Educational Service Area Office 32. Assuming that the scaling of the items approximated a 5- point Likert scale, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the QTI and the CTA as specified. The multiple correlations, multiple regression, and determination efficient predictive analysis were significant of students' perceptions of their science teacher interpersonal behaviours in the 21<sup>st</sup> century through learning environment inventories for enhancing and improving science learning achievements in science classes in under Secondary Service Area Office 32 to associate were analyzed. The procedures appropriated statistically significant included scale analysis with factor loading analysis, the circumplex nature scales, Cronbach alpha, and discriminant validity. As expected, the results show that the correlation between a scale and the next scale in generally is high, and become higher for scales further away from that scale with the intercorrelation circumplex nature scales' analysis were illustrated of the QTI and the CTA have been confirmed.

In this study, it was also considered important to investigate associations between students' perceptions of their science teachers' interpersonal behaviours and their critical thinking theory toward science. The selection of an evaluation and assessment instrument suitable was required. The simple correlation values ( $r$ ), which show significant correlations ( $p < 0.05$ ) between students' critical thinking abilities outcomes and their science teacher interpersonal behaviours all of eight scales. These associations are positive for the scales of *Leadership, Helping/Friendly, Understanding, Student Responsibility/Freedom, Strategies, Morals and Relates, Emotional Quotient*, and *Unrestricting* scales for the QTI. There were more favourable critical thinking abilities towards their science classroom environment climates.

Associations between students' perceptions of their science teacher interpersonal behaviours and their critical thinking outcomes for *Activity Process, Thinking Principal, Critical Thinking Process, and Critical Thinking Property* scales, and Totalized of the CTA, respectively, and showed that when the scales are considered together there is a significant ( $p < 0.05$ ) association with the CTA. The  $R^2$  values indicate that 30%, 29%, 31%, 26% and of their critical thinking outcomes for *Activity Process, Thinking Principal, Critical Thinking Process, and Critical Thinking Property* and *Totality* of the CTA, respectively, which results of the variance in student's critical thinking outcomes were attributable to their perceptions of their science teacher interpersonal behaviours, there were more favorable learning achievement critical thinking outcomes towards science, significantly.

## ACKNOWLEDGEMENT

I would first like to thank my thesis of the Master of Science Education/ Faculty of Education; Advisor Dr. Tanawat Sontua and Dr. Wandee Rakrai of Faculty of Science, Faculty of Education, Rajabhat Mahasarakham University. I also thank to the 379-secondary students in 11 schools under Service Area Office 32, Buriram Province. The door to Prof. Santiboon was always open whenever I ran into a trouble spot or had a question about my research or writing. He consistently allowed this paper to be my own work, but steered me in the right the direction whenever he thought I needed it.

Finally, the greater thank to my family, Dad and Mom, and my parents who supported of this research has been going on work, completely.

## REFERENCES

- UNICEF. (2016). *Overview of Thailand education*. Retrieved from [https://www.unicef.org/thailand/education\\_303.html](https://www.unicef.org/thailand/education_303.html)
- PISA. (2015). *Collaborative problem solving: PISA results 2015*. Retrieved from <http://www.oecd.org/pisa/>
- Ruhe, J. (2016). *Why the Thai education system is running so poorly: The main problems & Possible solutions 2016*. Retrieved from <http://jaiguytravels.com/2016/02/06/why-the-thai-education-system-is-running-so-poorly-the-main-problems-and-possible-solutions-2016/>
- Educational Testing Center, Office of the Basic Education Commission. (2011). *Quality standards for basic education for internal quality assurance of educational institutions*. Retrieved from <http://satitprasarnmit.ac.th/pdf/qa.pdf>
- Santiboon, T. & Fisher, D. (2005). *Learning environments and teacher-student interactions in physics classes in Thailand*. Proceedings of the Fourth International Conference on Physics, Mathematics and Technology

- Education Sustainable Communities and Sustainable Environments: Envisioning a Role for Physics, Mathematics and Technology Education, Victoria, Vancouver, Canada.
- Wade, M. (2016). Visualizing 21<sup>st</sup>-century classroom design. *George Locus Educational Foundation*. Retrieved on 29 March 2016 from <https://www.edutopia.org/blog/visualizing-21st-century-classroom-design-mary-wade>
- Goerts, P. (2015). 10 signs of a 21<sup>st</sup> century classroom. *George Locus Educational Foundation*. Retrieved on 16 April 2015 from <https://www.edutopia.org/discussion/10-signs-21st-century-classroom>
- Firestone, M. (2015). What is a learning environment in classrooms? Retrieved on 14 June 2015 from <http://study.com/academy/lesson/learning-environment-in-the-classroom-definition-impact-importance.html>
- Rich, E. (2010). How do you define 21<sup>st</sup>-century learning. Retrieved on 11 October 2010 from <https://www.edweek.org/tsb/articles/2010/10/12/01panel.h04.html>
- Patankar, P. S. (2013). Role of teachers in curriculum development for teacher education. ResearchGate. Retrieved in October 2013 from [https://www.researchgate.net/publication/258023165\\_roleofteachers'incurriculum\\_development\\_for\\_teacher\\_education](https://www.researchgate.net/publication/258023165_roleofteachers'incurriculum_development_for_teacher_education)
- Santiboon, T. (2013). School environments inventory in primary education in Thailand. *Merit Research Journal of Education and Review* (ISSN: 2350-2282) Vol. 1 (10) pp. 250-258, November, 2013
- Fraser, B. J. (1994). Research on classroom and school climate. In D. Gabel (Ed.), *Handbook of research on science teaching and learning* (pp. 493-541). New York: Macmillan.
- Fraser, B. J., & Walberg, H. J. (Eds.). (1991). *Educational environments: Evaluation, antecedents and consequences*. Oxford, UK: Pergamon.
- Wubbels, T., Creton, H. A., & Hooymayers, H. P. (1992). Review of research on teacher communication styles with use of the Leary model. *Journal of Classroom Interaction*, 27, 1-12.
- Wubbels, T., & Levy, J. (Eds.). (1993). *Do you know what you look like? Interpersonal relationships in education*. London: Falmer.
- Wubbels, T., Creton, H. A., & Hooymayers, H. P. (1985). *Discipline problems of beginning teachers: Interactional teacher behaviour mapped out*. Paper presented at Annual Meeting of the American Education Research Association, Chicago.
- Wubbels, T., & Levy, J. (1991). A comparison of interpersonal behaviour of Dutch and American teachers. *International Journal of Intercultural Relations*, 15, 1-18.
- Santiboon, T. (2013). Assessing science students' perceptions in learning activities achievements in physics laboratory classrooms in Udon Thani Rajabhat University. 2012 *International Conference on Education and Management Innovation IPEDR Vol.30* (2012) © (2012) IACSIT Press, Singapore.
- Patterson, R. (2014). 7 ways to improve your critical skills and abilities. Retrieved from <https://collegeinfo geek.com/improve-critical-thinking-skills/>
- Paul, W. R. (1995). *Critical thinking: How to prepare students for a rapidly changing world*. 4th ed. Foundation for Critical Thinking. Retrieved 2017-03-22.
- Glaser, E. D. (1941). *An Experiment in the Development of Critical Thinking*, Teacher's College, Columbia University, 1941).
- Walters, K. (1994). *Re-Thinking Reason*. Albany: State University of New York Press. pp. 181-98.
- Elkins, J. R. (2014). Alternating currents in one teacher's thinking about the critical thinking movement. Retrieved from <http://myweb.wvnet.edu/~jelkins/critproj/overview.html>
- The Foundation for Critical Thinking (2017). Improving education in colleges, universities, and primary through secondary schools using the critical thinking. <http://www.criticalthinking.org/>
- Roberts, A. (2013). *The source of several of the seven ways to think more critically*. Retrieved from <https://www.amazon.com/Thinking-Students-Guide-College-Education-ebook/>
- Santiboon, T. (2017). An instructional design model based learning strategies for fostering students' critical thinking abilities. *Educational Research and Reviews*. Vol. 12 (15) : pp. 712 – 724.
- Elkins, J. R. (2014). Alternating currents in one teacher's thinking about the critical thinking movement. Retrieved on 23 March 2014 from <http://myweb.wvnet.edu/~jelkins/critproj/overview.html>
- Thomas, N. (2014). Achievement motivation theory (Atkinson, 1964). Retrieved on 31 October 2014 from <https://prezi.com/9q-elce2elmx/achievement-motivation-theory-atkinson-1964-12/>

# THE DEVELOPMENT OF ENGLISH READING COMPREHENSION ABILITY BASED ON THE COMMON EUROPEAN FRAMEWORK OF REFERENCE FOR LANGUAGE BY USING COOPERATIVE INTEGRATED READING AND COMPOSITION FOR MATTAYOM SUEKSA 3 STUDENTS

Chalong Onputtha<sup>1</sup>, Ladawan Wattanaboot<sup>2</sup>, Mayureesirin Siriwan<sup>3</sup>

*Student in English Language Studies at Humanities and Social Sciences of  
Rajabhat Maha Sarakham University<sup>1</sup>*

*Assistant Professor Dr. in English Language Studies at Humanities and Social Sciences of  
Rajabhat Maha Sarakham University<sup>2</sup>*

*Dr. in English Language Studies at Humanities and Social Sciences of  
Rajabhat Maha Sarakham University<sup>3</sup>*

*Corresponding author, E-mail: [Onputtha09@gmail.com](mailto:Onputtha09@gmail.com)*

## ABSTRACT

The purposes of this study were to: 1) compare the students' ability in reading comprehension before and after using cooperative integrated reading and composition technique; 2) determine the efficiency of the lesson plans for reading for reading comprehension by using cooperative integrated reading and composition technique based on CEFR with criterion 80/80; and 3) Evaluate the satisfaction of Mattayom Sueksa 3 (Grade 9) students by using cooperative integrated reading and composition technique and how it affected students' learning. Subjects used in the research were 24 students who were studying in the second semester of the academic year 2016 at Wangluang Wittayakom School, Selaphum district, Roi-et, province, under the Secondary Educational Service Office Area 27, selected through the cluster random sampling. The instruments used in this research consisted lesson plans, an achievement test and a questionnaire for measuring the students' satisfaction. The statistics used to analyze data were by mean, standard deviation and t-test.

The results of the research were as follows: 1) The students learned by using the cooperative integrated reading and composition technique. The ability of English reading comprehension after learning was higher than before with .05 level of the significance. 2) The effectiveness of the lesson plans by using the cooperative integrated reading and composition technique were 84.88 / 82.40, it was higher than the criterion which is 80 / 80. And 3) The students' satisfaction by using the cooperative integrated reading and composition technique was at the highest level which was ( $\bar{X} = 4.51$ ).

**KEYWORDS:** development, reading comprehension, The Common European Framework of Reference for Language (CEFR), Cooperative Integrated Reading and Composition (CIRC)



## INTRODUCTION

In our increasingly technology-dependent, online global society, learning a foreign language is becoming crucial. It is essential in achieving a more productive, rewarding daily life. Study of one or more foreign language has a great significance providing the following benefits: improved communication skills, a more balanced education, a powerful aid in seeking knowledge, a more personally fulfilling and possibly more lucrative livelihood, a better understanding of other cultures, and a clearer less biased vision of different world communities. Nowadays, reading skill is essential in the lives of people. Sciences and technology have changed rapidly. Communication is necessary in business and society. It is becoming an information society however the academic contents and information on a daily basis requires reading skills to understand and interpret them correctly. Although technology is everywhere, it cannot be an excuse for not developing the required reading skills which is very essential in seeking knowledge and immediate understanding of the academic progress including information. (Chirawat Petcharat. 2013 : 3). Reading helps readers to understand the society and environment that surrounded them. It encourages readers to develop knowledge and ideas with the wide world. (Auyporn Panid. 2010 : 40). Reading also helps develop today's modern man enhance intelligences, entertain and soothe the mind. The problems of teaching reading skills were from teachers and students. (Luh Rai Mayuni. 2014). Students did not show interest, appreciate in reading activity and they were bad attitude in learning English. Carrell and Foy 1987 cited in Chotika Kaewkaemket. 2012). The students were unfamiliar of the text type, inadequate background of knowledge and appropriate reduction in reading strategies which affected reading. (Chatherine E. 2003 cited in Ria Agustina. 2010). Teachers still used old traditional teaching techniques up to present.

There are ways that can be used to develop teaching of reading skills. Cooperative integrated reading and composition technique is another way to promote reading skills as well. Furthermore Cooperative integrated reading and composition technique is co-operation to integrate teaching reading and writing. The group consists of the gifted, moderate and mild students. The activities focus on group learning and teamwork activities (Slavin (1987 cited in Chaiwat Sutthirat. 2010: 191). cooperative integrated reading and composition is one of cooperative technique that divides student with ability into group. (Arend 1989 cited in Mayureesirin Siriwon. 2008). Cooperative learning makes students work in team with varying academic excellence. The team consists of gifted students, moderate and mild students of different ethnic and gender of the students.

From the context of Wangluang Wittayakom School, Selaphum district, Roi-et province under the Secondary Educational Service Area 27. It located in small community.

Most students were lack of educational opportunities. According to the result of the national test in English Mattayom Sueksa 3 for the academic year 2013- 2015, the scores of English test were lower than the average scores of provincial and national level. From the interview students and teachers found that the problems of reading English which caused to students were poor understanding on the contents.

Able to found out what caused these problems, the main purpose of this study is to enhance and develop English reading comprehension ability by using the cooperative integrated reading and composition technique. For another reason, it was to make students' reading ability which accepted with international standards. The Common European

Framework of Reference for Language (CEFR) used as a guideline for teaching English reading.

### Purposes of the Study

1. Compare the students' ability in reading comprehension before and after using cooperative integrated reading and composition technique;
2. Determine the effectiveness of the lesson plan for reading comprehension by using cooperative integrated reading and composition technique for Mattayom Sueksa 3 (Grade 9) students with criterion 80/80.
3. Evaluate the satisfaction of Mattayom Sueksa 3 (Grade 9) students by using cooperative integrated reading and composition technique and how it affected students' learning.

### Research Hypothesis

The achievement in English reading comprehension ability Mattayom Sueksa 3 students was after learning higher than before learning.

### Research Scope



The samples are 24 students from Mattayom Sueksa 3 (Grade 9) students in the second semester of the academic year 2016 Wangluang Wittayakom School Selaphum district, Roi-et province under the Secondary Educational Service Office Area 27, obtained by cluster random sampling.

### Expected Research Benefits

1. Cooperative integrated reading and composition technique can improve the students' ability in English reading comprehension.
2. Cooperative integrated reading and composition technique can improve the students' ability in English reading comprehension in accordance with the Common European Framework of Reference for Language.
3. The students are satisfied with the cooperative integrated reading and composition technique.

### RESEARCH METHODOLOGY

**Population and Samples:** The population groups were two classes of Mattayom Sueksa 3 (Grade 9) students of Wangluang Wittayakom School, Selaphum district, Roi-et province under the Secondary Educational Service Office Area 27 who enrolled in Fundamental English Course in the second semester of the academic year 2016 with 48 students. The samples were 24 students obtained by cluster random sampling.

#### The Research Instruments

1. Lesson plan was used in the development of English reading comprehension ability based on of the Common European Framework of Reference for Language by using the cooperative integrated reading and composition technique.
2. The achievement test (Pre-test and Post-test)
3. Satisfaction test (Questionnaire)

#### Data Collection

The steps of data collection were as follows:

1. Presented the finalized 6 lesson plans for 16 hours to the director of Wangluang Wittayakom School for approval and to set learning activities for the sample group Mattayom Sueksa 3 (Grade 9) students in the second semester of academic year 2016.
2. Let the students took the test to measure their ability in English reading comprehension (pre-test). The test consisted of 40 items with 4 multiple choices.
- 3 Set learning activities based on the contents of the Common European Framework of Reference for Language by using the cooperative integrated reading and composition technique for the sample group Mattayom Sueksa3 (Grade 9) students with 6 lesson plans for 16 hours in the second semester of academic year 2016. The measurement and evaluation were both of before and after the completed learning.

#### Data Analysis

The data were analyzed in the following steps:

1. After teaching activities completely. Students had the test (post-test) using the same question from pre-test.
2. Gathered the score of each student to compute the average score ( $\bar{X}$ ), standard deviation (S.D.) and percentage (P) was to compare the students' ability in English reading comprehension before and after using the cooperative integrated reading and composition technique by t-test.
3. Students answered the satisfaction questionnaire to measure learning activities, group process, social skills and mixed ability class. The data used analyze the average score ( $\bar{X}$ ) and standard deviation (S.D.).

### RESEARCH RESULTS

1. The comparison of an achievement between pre-test and post-test.

Table 1: Summary of pre-test and post-test mean score of the sampling group

Sampling Group	N	Total Score	$\bar{X}$	S.D.	t	sig
Pre-test	24	40	13.38	2.98	30.89	0.00*
Post-test	24	40	32.96	2.35		

\* Significance difference at 0.05 level using t-test

The result of pre-test and post-test on table 2 showed that the students gained a higher post-test mean score ( $\bar{X} = 32.96$ ) than pre-test mean score ( $\bar{X} = 13.38$ ). The mean scores of the pretest and posttest were found at the 0.00\*level of the significance.

2. The effectiveness of the lesson plans for reading comprehension by using the cooperative integrated reading and composition technique.

Table 2: The effectiveness ( $E_1$ ) ( $E_2$ ) of lesson plan: the development of English reading comprehension ability based on the Common European Framework of Reference for Language by using the cooperative integrated reading and composition technique.

Learning Outcome	Total Score	$\bar{X}$	S.D.	Percentage
$E_1$	178	151.08	2.41	84.88
$E_2$	40	32.96	2.35	82.40
The effectiveness of $E_1/E_2$ were 84.88/82.40				

Based on the table above, the mean score was ( $\bar{X}$  151, showing that The efficiency ( $E_1$ ) was 84.88. The average score of post- test was 32.96, showing that the efficiency ( $E_2$ ) was 82.40. It was higher than the criteria 80/80.

3. The students' satisfaction by using the cooperative integrated reading and composition technique that has affected English reading comprehension ability.

Table 3: The result of the average score of the students' satisfaction using the cooperative integrated reading and composition technique.

Items	Topics	$\bar{X}$	S.D.	Levels
	Satisfaction in reading activities			
1.	The activities are interesting.	4.46	0.51	High
2.	Students can practice in reading activities.	4.50	0.51	High
3.	Students know meaning and pronunciations of vocabulary.	4.63	0.49	Highest
4.	Students can read English passage well.	4.50	0.59	High
5.	Students can apply in daily life.	4.42	0.72	High
	Total	4.50	0.56	High
	Satisfaction in group			
6.	Students can make a plan together.	4.42	0.66	High
7.	Students can work systematically	4.67	0.56	Highest
8.	Students are confident in learning English.	4.33	0.76	High
9.	Students can do activities step by step.	4.54	0.78	Highest
10.	Students work together in group.	4.42	0.65	High
	Total	4.43	0.68	High
	Satisfaction in social skills			
11.	Activities are fun	4.38	0.71	High
12.	Learning activities are to promote cooperation and unity in the community.	4.67	0.70	Highest
13.	Students can suggest their opinions.	4.71	0.55	Highest
14.	Students are responsible and punctual.	4.63	0.65	Highest
15.	Students accept the idea of each other.	4.54	0.66	Highest
	Total	4.58	0.65	Highest

Items	Topics	$\bar{X}$	S.D.	Levels
16.	Satisfaction in mixed ability classes	4.46	0.93	High
17.	It solves the problem of students' reading	4.67	0.76	Highest
18.	Students' ability in English reading comprehension was higher than before.	4.54	0.83	Highest
19.	Students are willing to help their friends.	4.75	0.68	Highest
20.	Students feel to be the part that makes the group successful.	4.13	0.99	High
	Students have the opportunity to evaluate their own work and theirs friends.	4.51	0.84	Highest
	Total			
Total		4.51	0.68	Highest

Based on the table above, the students' satisfaction with CIRC technique on English reading comprehension ability overall was 4.51. It was the highest level.

### CONCLUSION AND DISCUSSIONS

1. The students' ability in English reading comprehension based on the Common European Framework of Reference for Language CEFR was higher after using the cooperative integrated reading and composition technique than before with at 0.00\* level of the significance. This proved the effectiveness of the lesson plan and learning activities with group process based on the cooperative integrated reading and composition technique. It focused on the learner center by having students with different abilities in a group. Beside; the clever students helped the slower learners to further understand reading activities. Each of member encouraged to share responsibilities in a certain task to participate and their opinions as well as to answer questions from the passages or story. (Pattareya Dontaolek. 2015) the effectiveness of the lesson plans on developing ability and encourage students to aim for after higher score than before was at the.05 level of the significance. (Netwara Srisin. 2013:87) as a result of that post- test was higher than pretest score by using the cooperative integrated reading and composition technique with at.05 level of the significance.

2. The effectiveness of the lesson plans using the cooperative integrated reading and composition technique were 84.88/ 82.40, it was higher than criterion 80/80. A result of the advisors were checked and recommended the lesson plan. The experts also checked the quality and appropriate of contents as well as a suggestion. Moreover, researcher created a systematic lesson plan based on foreign language curriculum, indicators, strands, learning activities, media, learning resources, measurement and evaluation. The lesson plan was tried out to find a mistake and apply with the sampling group. It makes an effectiveness lesson based on the criteria which defined

3. The students' satisfaction using the cooperative integrated reading and composition technique overall, the highest levels. A result of students learned together in a small group, helped and shared knowledge. They learned happily and became aware of the importance team work. All members lead to ensure the success of their goals.

### RECOMMENDATION

Researchers should give orientation to students about the cooperative integrated reading and composition technique for further understanding. It facilitates in teaching and learning to improve the students' ability in English reading.

Researchers should be flexible in term of time reading activity since the cooperative integrated reading and composition technique emphasized the cooperation of all students in their group, otherwise teacher should have sufficient time in each activity. It is very essential for the students to be able to show their potentials.

Researchers should compare the achievement ability in English reading comprehension by using the cooperative integrated reading and composition technique and other methods.

### ACKNOWLEDGEMENT

This is in the acknowledgement of Rajabhat Maha Sarakham University, advisor, co-advisor and experts for this occasion and helping.

## REFERENCES

- [ 1 ] Auypon Panid. (2010). Language and Writing to Communicate (6<sup>th</sup> ed.). Bangkok : Chulalongkorn University Press.
- [ 2 ] Chaiwat Sutthirat. (2009). 80 Innovation for learning that focuses on the learner (3<sup>rd</sup> ed.). Bangkok: Daniel Nextel International Cooperation.
- [ 3 ] Chirawat Petcharat. (2013). Academic Reading and Writing. Bangkok: Odeon Store.
- [ 4 ] Chotika Kaewkaemket. (2012). An instructional model to improve Thai high school learners' reading comprehension: Integrated reading activities with different task types and complexity (Master's thesis). Mahasarakham: Mahasarakham University.
- [ 5 ] Luh Rai Mayuni. (2014). Teaching reading comprehension through cooperative integrated reading and composition (CIRC) to the Eighth grade students of SMPN3 Sukawati (Master's thesis). Mahasarakham: Denpasar University.
- [ 6 ] Mayureesirin Siriwon. (2013). Cooperative Learning Technique CIRC in English reading Skill for understanding of Mattayomsuksa 1 (Master's thesis). Bangkok: Kasetsart University.
- [ 7 ] Netwara Srisin. (2013). Cooperative Learning Technique CIRC in English reading Skill for understanding of Mattayomsuksa 1 (Master's thesis). Bangkok: Kasetsart University.
- [ 8 ] Pattareya Dontaolek. (2015). The development of comprehension reading ability by using learning activity package with cooperative learning CIRC technique in foreign language strand for Mattayom Sueksa 3 students (Master's thesis) Mahasarakham: Rajabhat Maha Sarakham University.
- [ 9 ] Rai Agustina. (2010). The effectiveness of using cooperative integrated reading and composition (CIRC) technique in teaching reading comprehension of the eight grade students of MTsN Tunggangri (Master's thesis). Tulungagung: State Islamic Collage ( Stain).

**THE APPLICATIONS OF CONCEPT ANALYSIS DIAGRAM WITHIN ARTIFICIAL NEURAL NETWORKS IN THE DIAGNOSIS OF DIRECT IGNITION CONTROL SYSTEM**

Weerayute Sudsomboon<sup>1</sup> Weeraphol Pansrinuan<sup>1</sup>  
Montri Reuangpradap<sup>2</sup> Wittaya Wongklang<sup>2</sup>

<sup>1</sup>*Graduate Program in Industrial Technology*

<sup>2</sup>*Mechanical Engineering Program*

*Automotive Technology and Agricultural Industrial Technology Research Unit*

*Faculty of Industrial Technology, Nakhon Si Thammarat Rajabhat University, Thailand*

*(Author for correspondence, e-mail : weerayute\_sud@nstru.ac.th; Fax +66-75-377-439)*

**ABSTRACT**

The purpose of this study was to study how students develop the concept analysis diagram within artificial neural networks in the diagnosis of direct ignition control system and their views on the use of concept analysis diagram as a learning activity in a class. The research methodology was a quantitative approach consisting of an analysis of the contents of the concept analysis diagram with students. The study was conducted in a faculty of industrial technology at Nakhon Si Thammarat Rajabhat University. Participants were 27 students who attended the 5593510 automotive engineering subject respectively of an undergraduate mechanical technology student class in semester 1/2017. The students in both the morning and afternoon classes were allocated into nine groups (3 students per group). Each group was asked to design one concept analysis diagram based on a given scenario, and then to participate in a follow-up. Two raters individually assessed the concept analysis diagram, and then discussed their views with each other. Among the concept maps that were drawn, three were selected. Their three core features of those diagrams were: a) the integration of informative for direct ignition system diagnosis; b) the delivery of attributes; c) the use of generate ideas for antecedents and consequences; and d) consequences and sub-concept. Both raters were concerned about how informative the presentation was, feedforward networks could be used for modeling a broad spectrum of systems, and the ease of using a suitable neural network size, and evaluated the presentation and effective use of diagrams. This study showed that an alternative way for students to generate ideas within the use of The CADs provide faculty with a succinct "conceptual approach" in teaching and learning a concept-based learning to facilitate student learning.

**KEYWORDS:** Artificial Neural Network, Applications, Concept Analysis Diagram, Diagnosis, Direct Ignition Control System

## INTRODUCTION

In 2015, Thailand's automobile production capacity is approximated to be 3.66 million units (inclusive of planned capacity expansions announced by automakers), while actual production amounted to 1.92 million units which was the world's 12<sup>th</sup> rank and ASEAN's no. 1 (OICA, 2015) [1]. The competitive advantage of Thailand are mainly the availability of highly qualified human capital, competitive operating costs, strategic geographical location, an attractive domestic market, and legal certainty. Additionally, Thai automobile industry has increasingly relied on the export market, which has outpaced the domestic market, an extended supply chain and decades of experience.

Recently, the direct ignition system (DIS) has strong potential for increasing combustion efficiency. There is the potential to increase thermal efficiency at part loads and to improve engine performance effect at full load [2]. Since the direct coil is sparked into the cylinder directly, many combustion strategies can be applied to increase engine performance. The DIS has been factor affecting to control emission legislation. An ever tightening emission legislation requirements around the globe coupled with an increasing customer desire for improved vehicle performance has been among the drivers of new engine technologies. New technologies include the use of variable cam timing/phasing, variable valve timing/lift, variable intake manifold length, charge motion valves for inducing swirl and direct gasoline injection systems with variable injection timing [3]. As the number of actuators associated with these new technologies increases, it introduces an exponential dependency between the time and cost outlays for mapping such increasingly complex engine problems [4]. Therefore, the increase in the number of the degrees of freedom increases the number of input and output combinations that would have to be tested in order to achieve the problems, making the diagnosis task increasingly complex problems. One way of dealing with the increasing complexity in the DIS diagnosis and mapping task is to use the model-based approach which involves the use of statistical methods of Design of Experiments (DOE) methodology. For reducing the number of engine diagnosis that would be representative of teacher efficacy, this paper efforts to be persistent in performing assigned teaching tasks, which in turn further enhances efficacy. In addition, students learning from efficacious teachers appear to be more motivated and achieve more satisfactory academic outcomes, compared with those learning from less efficacious teachers [5]. The traditional look-up tables resulting from the diagnosis and engine mapping process increase in size with an increase in engine complexity leading to an increase in the engine control module (ECM) required for storing the look-up tables. The use of look-up tables does not guarantee output accuracy over the operating range of an engine.

With development, Teaching and learning in Automotive Mechatronics System (TLAMS) at Nakhon Si Thammarat Rajabhat University is one of the main sources of competitiveness to promote Thailand's automotive industry, because of its high quality and specialization. Automotive service technicians have the highest demands of productivity in the automotive industry; important challenges for the future remain, such as the development of more research and development training centers, local design for automotive components, and the attraction of high added value industrial processes. In order to promote research institutional priority, how to establish innovate and transform the technological knowledge according to Thailand 4.0 policy, which the automotive technology is the important point of view. Thus, this research focuses on the development of teaching and learning and training for learning to solve the modern automotive mechatronics system, particularly the ones associated with the automotive industry.

## OBJECTIVE

The purpose of this study was to study how students develop the concept analysis diagram within artificial neural networks in the diagnosis of direct ignition control system and their views on the use of concept analysis diagram as a learning activity in a class.

## LITERATURE REVIEW

### *Description of the Concept Analysis Diagram (CAD) to Enhance Teaching and Learning*

The implementation of modern control technology to employ DIS problems in students training is inevitable in modern mechanical engineering. In training programs, teacher educators encounter students raised in environments with various electronic devices; moreover, these students will teach in an environment where computers are common tools used in daily life. The most commonly adopted type of communication in teacher training programs is computer-mediated communication (CMC), because it is time- and cost-efficient and flexible [6], [7].



A means to facilitate student understanding of concepts and to support learning task was needed to maintain conceptual learning/teaching within the new concept-based learning. An approach was needed to promote the application of comparisons and contrasts thereby encouraging the retention of knowledge without requiring a massive amount of rote memory. The tool should also reinforce the concept-based learning by readily being operationalized to the practicum. The CADs provide faculty with a succinct “conceptual approach” in teaching and learning a concept-based learning [8].

A CAD represents the repetitive form used for each concept in the teaching and learning. The top of CAD page lists the definitions used to guide the content analysis. The first part of the diagram in the upper left corner represents the DIS diagnosis. Primary, secondary, and tertiary are indicative of all aspects of experts’ views. Students are printed slightly above the other components of the diagram because DIS diagnosis and implementation all aspects of the diagram prior to determining the causes and effects required [8]. The dotted arrows from the DIS diagnosis indicate that students is not always needed if the concept is functioning optimally in the decision making.

- The primary concept will always be listed in the middle with the designated conceptual definition. When the primary concept is working optimally, certain attributes occur. Students’ assesses/measures the DIS control system attributes to determine if the concept is functioning optimally. An arrow goes from the antecedents to the primary concept and an arrow extends from attributes to the concept as attributes reveal the level at which the concept is functioning.

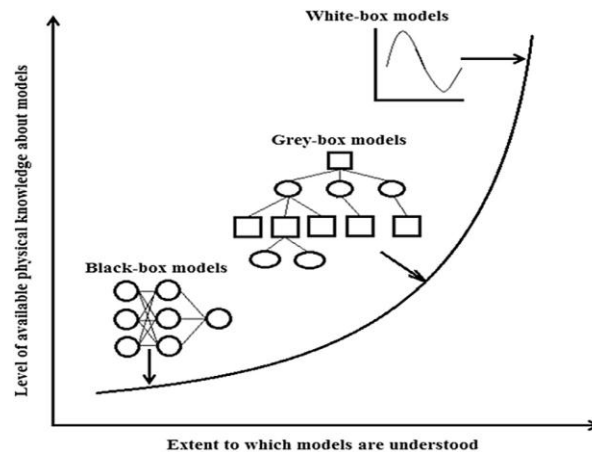
- The secondary concept will consequences/outcomes are shown lower in the diagram and are either positive or negative. There is a solid line to the consequences because consequences are going to happen, but will they be conduct skills or think? That is a variable that can change. If the concept was working optimally, think consequences would be expected; however, if the concept is weakened and not functioning optimally, then skills consequences occur.

- When the skills consequence occurs, students will reevaluate the antecedents with the intent of identifying which antecedent are compromised and directing conceptual interventions to strengthen the weakened antecedent. The intervention would be considered effective when the optimal measurement and the consequences/outcomes are positive. Some individuals will always have a compromised antecedent and therefore the DIS diagnosis and attributes would be modified accordingly. The skills consequences would remind to reevaluate the antecedents to determine if an antecedent is compromised and thereby compromising the function of the concepts. Attributes would be reassessed to determine which assessment finding is weak. These assessments would guide which diagnosis interventions should be implemented [9], [10].

#### ***Applications of artificial neural network to solve DIS diagnosis***

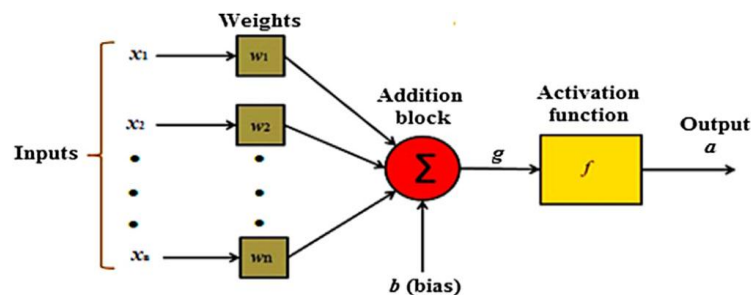
The artificial neural networks (ANN) present a black-box approach for matching the mechatronic elements—sensor inputs with outputs in a non-linear manner that is free from noise [10]. For example, artificial neural networks are gaining attention for producing outputs that are accurate regardless of the variation in input parameters. The ANN represents one of three modeling techniques as shown in Figure 1. These techniques include white-, gray- and black-box modeling with neural networks belonging to the latter technique. The difference between these techniques is the level of physical knowledge available about the model and the extent to which the user could interpret the models. The white-box modeling technique relies on the use of physical laws in establishing the relationships between variables and parameters. Similarly, in a black-box model, it is possible to match inputs to outputs without any clear knowledge about the relationship between the inputs and corresponding outputs. Furthermore, gray-box models are in-between the white- and black-box modeling techniques, in terms of the level of model transparency [11].

From Figure 1, instructors can be applied that white-box model have the highest transparency level regarding the extent to which the model is understood, with black-box models having the lowest transparency levels. In-between these two extremes, come gray-box models with a transparency level lying between that of white- and black-box models. The lack of transparency on the part of artificial neural networks comes in handy in situations where it is virtually impossible to obtain a description of the various parts of a system using physical equations as in the case of white- and gray-box modeling. The black-box modeling approach presented by artificial neural networks allows the input and output relationship to be modeled with no concern over the physical details of system parts.



**Figure 1.** Three modeling techniques [12]

A neural network comprises a single or a number of interconnected neurons similar to those found in biological nervous systems. A neural network can be trained to respond to a number of given inputs without any particular mathematical relationship between the inputs and outputs. The taxonomy of artificial neural networks is such that they could be classified broadly into two classes: feedforward and recurrent neural networks. Feedforward neural networks could further be classified into single-layer perceptron networks, multi-layer perceptron networks and radial basis function networks. Similarly, recurrent neural networks could also be classified further into competitive and Hopfield type of networks, together with other network types [12]. Variants of both neural network classifications find applications in the design and development of engine management systems and would therefore be described in subsequent sections as shown in Figure 2.



**Figure 2.** Artificial neural Network conceptual framework [12]

## METHODS

### Design

In this study, a quantitative design was conducted consisting of an analysis of the contents of both concept analysis diagram and interviews with students. The CAD produced by the students were examined, since the process of making the CAD allowed the participants to express their knowledge and skills to generate ideas in a more innovative and active.

### Participants

Participants were 27 students who attended the 5593510 automotive engineering subject respectively of an undergraduate mechanical technology student class in semester 1/2017.

### Procedures

Students were created a CAD for each DIS diagnosis concept. Elimination is a concept readily understood by all; therefore, it is used to demonstrate how the CAD is operationalized as shown in Figure 3. The definition for the concept of elimination is seen in the middle of its CAD. The antecedents adjacent to the primary concept of elimination indicate what must be in place for elimination to function optimally that may accrue via the use of multi-layer feedforward artificial neural networks include the following [13]:

1. With the availability of data, feedforward networks could be used for modeling a broad spectrum of systems.
  2. Feedforward neural networks could be useful for applications where analytical methods are yet to be discovered.
  3. Using a suitable neural network size, it is possible to capture the non-linear dependencies between the input and outputs to a reasonable degree of accuracy.
- To determine the concept of elimination's level of effectiveness, attributes would be assessed as shown in Figure 3.

### Construction of a Concept Analysis Diagram for DIS Diagnosis

1. Direct Ignition System Diagnosis
  - Students' requirements of engine control system include the cause and effects of dimensionality; the use of DOE for obtaining few measurements as practicable (Skills), with the aim of reducing engine reliability; the required flexibility that allows model parameters to be optimized to avoid overfitting; therefore, the facilitation of automated online optimization during the engine diagnosis process.
2. Attributes
  - Defining characteristics of the concept
  - Data must be present for the concept to exist
3. Antecedents
  - What preceded the concept to exist the availability of data, feedforward networks could be used for modeling a broad spectrum of systems
  - Procedures that must happen before the concept
4. Consequences
  - Knowledge or outcomes that occur due to promote functional within the concept
  - Skills that occur due malfunction within the concept
5. Interrelated Concept
  - Concept can transform in the other system
  - Concept can do together to obtain the solving problems process
6. Sub-Concept
  - Critical components of major concept

### Data Collection

In the case scenario below, they were asked to collaboratively generate a creative CAD on paper in about 30 min and after that were done by computer. The students in both the morning and afternoon classes were allocated into nine groups (3 students per group). Each group was asked to design one concept analysis diagram based on a given scenario, and then to participate in a follow-up interview. Two raters individually assessed the concept analysis diagram, and then selected the best three CAD discussed their views with each other for appropriateness criteria of concept analysis diagram.

### Data Analysis

Data was analyzed by mean.

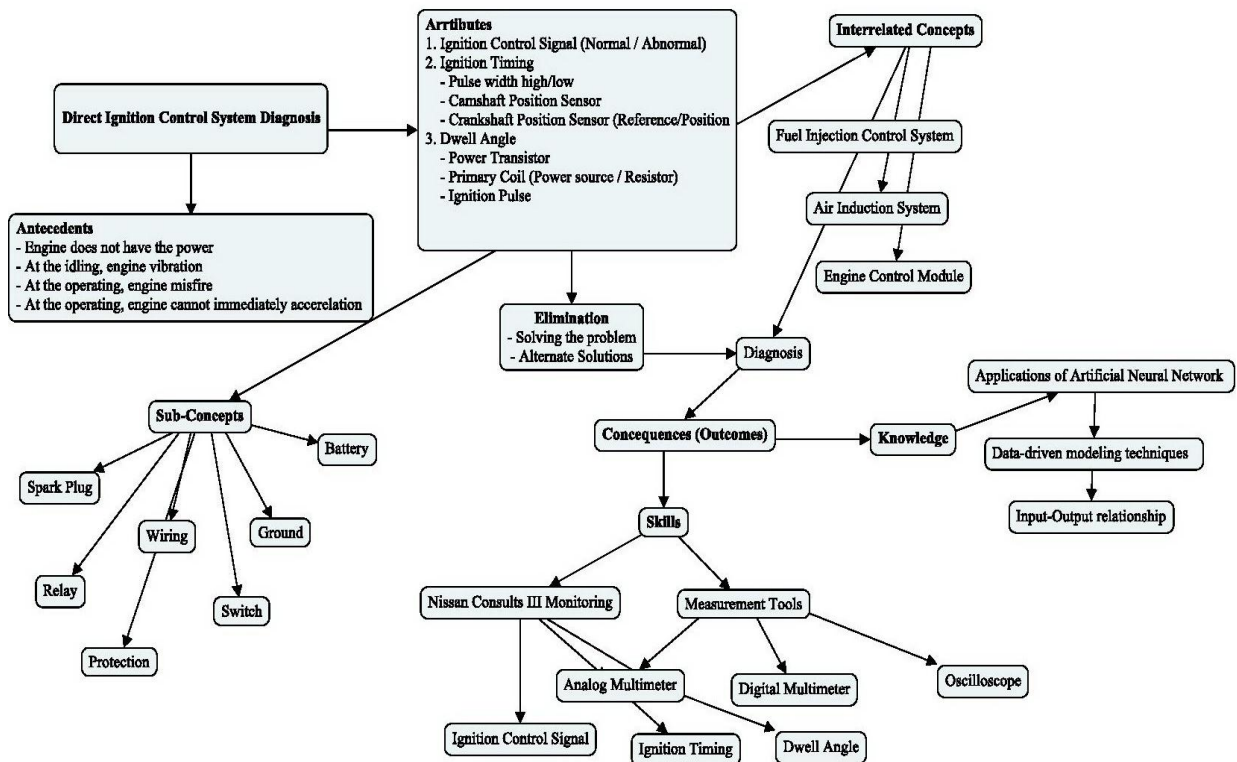


Figure 3. Construction of a Concept Analysis Diagram for DIS Diagnosis

## RESULTS

**Table 1** Rating of concept analysis diagram

Evaluation	Direct Ignition System Diagnosis	Attributes	Antecedents & Consequences	Interrelated Concept & Sub-Concept	Mean Score
CAD 1					
Rater 1	3	4	4	4	3.75
Rater 2	3	3	4	3	3.25
CAD 2					
Rater 1	4	4	5	4	4.25
Rater 2	5	3	5	3	4.00
CAD 3					
Rater 1	4	3	5	4	4.00
Rater 2	3	4	4	4	3.75

From Table 1, the two raters assessed the three CADs separately using the abovementioned five-point scale. The mean score of the concept maps was 3.83 and the inter-rater reliability was 0.91. The CAD 2 received the highest scores from both raters, while Rater 1 rated CAD 1 the lowest and Rater 2 rated CAD 1 the lowest as well as. The diagrams gained higher scores for “antecedents & consequences”, and lower scores for “attributes”. The two raters’ comments were generally similar. Both were concerned about the informativeness of the presentation, the composition of the elements, and the comprehensibility of the presentation. They especially appreciated the three CADs presentation and effective use of ideas.

## DISCUSSION AND CONCLUSIONS

A CAD represents the repetitive form used for each concept in the teaching and learning. The top of each CAD page lists the definitions used to guide the content of the analysis. The first part of the diagram in the upper left corner represents the DIS diagnosis. Primary, secondary, and tertiary are indicative of all aspects of experts’. Students are printed slightly above the other components of the diagram because DIS diagnosis and implementation all aspects of the diagram prior to determining the care required. The dotted arrows from the DIS diagnosis indicate that students is not always needed if the concept is functioning optimally in the perform [7], [8].

Among the concept maps that were drawn, three were selected. Their three core features of those diagrams were: a) the integration of informative for direct ignition system diagnosis; b) the delivery of attributes; c) the use of generate ideas for antecedents and consequences; and d) consequences and sub-concept. Both raters were concerned about how informative the presentation was, feedforward networks could be used for modeling a broad spectrum of systems, and the ease of using a suitable neural network size, and evaluated the presentation and effective use of diagrams.

To enhance the trustworthiness of the research results, the two raters analyzed the CAD individually, and then held regular meetings to discuss the issue of inter-rater reliability and to compare similarities and differences in their analyzes. The results showed that primary concept will always be listed in the middle with the designated conceptual definition. When the primary concept is working optimally, certain attributes occur. Students’ assesses/measures the DIS control system attributes to determine if the concept is functioning optimally. An arrow goes from the antecedents to the primary concept and an arrow extends from attributes to the concept as attributes reveal the level at which the concept is functioning.

Furthermore, the secondary concept will consequences/outcomes are shown lower in the diagram and are either knowledge or skills. There is a solid line to the consequences because consequences are going to happen, but will they be skills or knowledge? That is a variable that can change. If the concept was working optimally, positive consequences would be expected; however, if the concept is weakened and not functioning optimally, then negative consequences occur.

When a skills consequence occurs, students will reevaluate the antecedents with the intent of identifying which antecedent are compromised and directing conceptual interventions to strengthen the weakened antecedent. The intervention would be considered effective when the optimal measurement and the consequences/outcomes are knowledge and skills. Some individuals will always have a compromised antecedent

and therefore the DIS diagnosis and attributes would be modified accordingly. The negative consequences would remind to reevaluate the antecedents to determine if an antecedent is compromised and thereby compromising the function of the concepts. Attributes would be reassessed to determine which assessment finding is weak. These assessments would guide which diagnosis interventions should be implemented [14].

Artificial neural networks have gained attention for a spectrum of applications including spark-ignition engine calibration. This is because trained artificial neural networks are able to satisfy a majority of the modeling requirements for engine calibration. The modeling requirements include the ability to deal with the curse of high-input dimensionality; the use of DOE for obtaining few measurements as practicable, with the aim of reducing engine calibration time and resource outlays; flexibility that allows model parameters to be optimized to avoid overfitting.

The CAD may be used to introduce the students to understand the concept in the direct ignition control system. It may also be used in a pre-practicum to measure the understanding of system analysis. In preparation for diagnosis, students could be trained to highlight the areas that are signal processing to their ignition pattern or they could be asked to highlight the areas as they provide for the DIS diagnosis. The CAD intervention transposes theory to practice and applies concepts to practicum into the DIS diagnosis. It operationalizes student-centered learning with purpose and application. Because of the attributes of concepts throughout the curriculum, the application of the interrelated concepts supports curriculum progression and growth in application artificial neural network and practice.

The CAD reinforces how to do practice among knowledge, control theory and prior knowledge as a procedural analysis. The CAD necessitates the usage of correlation and interrelatedness promoting higher level thinking and engagement of faculty and student through the application of analysis in theory and practice. The CAD reinforces the five students learning efficacy of review, assessment, analysis, intervention, and evaluation; it operationalizes the concept-based learning and promotes critical thinking and the DIS diagnosis. This study showed that an alternative way for students to generate ideas within the use of The CADs provide faculty with a succinct “conceptual approach” in teaching and learning a concept-based learning to facilitate student learning.

## SUGGESTIONS

The attribute assessment of the CAD quality findings, the DIS diagnosis may exhibit knowledge or skills consequences.

- Knowledge consequences (Figure. 3) for elimination include ignition signal analysis leading to ignition timing, camshaft position sensor, crank shaft position sensor (Reference and Position), and dwell angle.
- Skills consequences (Figure. 3) for elimination include power sources from battery, on/off signal from ECM, and pulse width high/low.
- Interrelated concepts that might affect elimination or be affected by elimination could include.

The advantage of artificial neural networks represents one of two classical data-driven modeling techniques, with polynomial regression models representing the other. While polynomial regression models are able to approximate the input–output relationship fairly well for steady-state engine operation, it is not able to capture the non-linearity in a global engine model satisfactorily. This is normally due to the fact that polynomial models could be prone to measurement errors including noise and outliers. As an alternative, artificial neural networks are able to capture the non-linear behavior better than polynomial regression models.

The diagnosis approach for students is triggered by compromised antecedent (s), decreased quality of attribute (s), skills consequence (s), and/or a potentially negative impact interrelated concept (s). When a knowledge consequence occurs, the students will reevaluate the antecedents with the intent of identifying which antecedent was compromised and, then, DIS diagnosis interventions to strengthen the weakened antecedent. The intervention would be considered effective when the attribute (s) reach (es) optimal measurement and the outcomes are knowledge.

## ACKNOWLEDGEMENTS

This research was supported by grants from Institute of Research and Development at Nakhon Si Thammarat Rajabhat University contract no. 10/2560 and 29/2560. Researcher would like to express really sincere gratitude to Mr.Thammanoon Sangkhawan, General Manager in Networking Division, Mr.Kullachat Chutichawakul General Manager in Training Division, Mr.Preecha Atthamane, Manager in Training Division, and trainers from Nissan Motor (Thailand) Co.,Ltd for technical contribution.



## REFERENCES

- [1] OICA. (2015). Production Statistics. [Online Available] : <http://www.oica.net/category/production-statistics/2015-statistics/>
- [2] Li, Z.-H., He, B.-Q., and Zhao, H. (2014). Application of a hybrid breakup model for the spray simulation of a multi-hole injector used for a DISI gasoline engine. *Applied of Thermal Engineering*, 65, 282–292.
- [3] Powers, W.F., and Nicastrì, P.R. (2000). Automotive vehicle control challenges in the 21st century, *Control Engineering Practice*, 8, 605–618.
- [4] Vogel, D. (2009). Trading Up: Consumer and Environmental Regulation in a Global Economy, Harvard University Press.
- [5] Goddard, R. D., Hoy, W. K., and Hoy, A. W. (2004). Collective efficacy beliefs: Theoretical developments, empirical evidence, and future directions. *Educational Researcher*, 33 (3), 3-13.
- [6] Sudsomboon, W. (2010 a). Applications of Competency-based Education: In the Context of Diversity and Change. *Journal of King Mongkut's University of Technology North Bangkok*, 20 (2), 370-381.
- [7] Sudsomboon, W. (2010 b). A competency-based curriculum development development model in automotive technology subject. *Technical Education Journal King Mongkut's University of Technology North Bangkok*, 1 (2), 11-19.
- [8] Linden, L. (2012). Concept analysis as foundational to concept-based instruction. *Presentation at implementing a concept-based curriculum, Kansas City, MO*.
- [9] Sudsomboon, W., & Hemwat, B. (2012). The Development of Automotive Mechatronic Systems Training Strategy for Enhancing Problem Solving Skills within Current Situation. *Journal of Srinakarinwirot (Science & Technology)*, 4 (8), 51-69.
- [10] Sudsomboon, W. (2014). The Effects of Problem Solving Skills Strategy on Automotive Mechatronic Systems for Undergraduate Mechanical Technology Students. *Technical Education Journal King Mongkut's University of Technology North Bangkok*, 5 (2), 1-13.
- [11] Yu, W., and Li, X. (2001). Some new results on system identification with dynamic neural networks, *IEEE Transaction Neural Networks*, 12, 412–417.
- [12] Zhai, Y.-J., and Yu, D.-L. (2009). Neural network model-based automotive engine air/fuel ratio control and robustness evaluation, *Engineering Application of Artificial Intelligent*, 22, 171–180.
- [13] Giustolisi, O., Doglioni, A., Savic, D., and Webb, B. (2007). A multi-model approach to analysis of environmental phenomena, *Environmental Modelling & Software*, 22, 674–682.
- [14] Sudsomboon, W., Muangmungkhun, T., Jinwan, W., Pansrinuan, W., & Wongklang, W. (2017). Effects of an Automotive Mechatronics Systems Design Program on Students' Perception of Knowledge Representation Competence. *Proceeding of the 3rd National and International Conference on Curriculum and Instruction "Discipline of Diversity for Unity" (NICCI 2017)*, February 4, Faculty of Education, Khon Kaen University, Thailand, 320-327.

**SOLVING THE LOCATION ROUTING PROBLEM OF BIOMASS POWER PLANT BY APPLYING  
A MATHEMATICAL MODEL****Chamnan Poonsawat<sup>1\*</sup> Thanchuda Phannikul<sup>1</sup>**

*Department of Industrial Engineering, Faculty of Engineering, Ubon Ratchathani University  
Sathonmark Rd., Muang Sri Khi, Warinchamrap, Ubon Ratchathani, 34190, Thailand.  
Corresponding E-mail: chamswt@gmail.com*

**ABSTRACT**

This research presents the problem solving of location selection (Location Problem : LP) and raw material transportation routing (Vehicle Routing Problem : VRP) for biomass power plant which has aims to 1) find the number of power plants which suitable to spatial biomass volume, 2) find the proper locations of power plants and 3) find the routes to send raw materials to the power plants to get the lowest total cost. The factors used to consider to find results of problems comprise of biomass volume in the target area, cost of power plant establishing, electric wiring cost and raw material transportation cost. Research implementation start from mathematical model design and apply to find the results by using Lingo Program version 11. The testing data was collected in Songkhla province, Thailand, by using sub districts level sample groups 87 sub district units which have average total biomass volume 1836.898 tons per day, the research found that Songkhla province suitable for biomass power plant establishing by using rubber wood as raw material at production capacity 9.5 megawatt which amount of power plant is 6 power plants, the suitable locations to locate the power plants are the 8th location (Saikao village, Thoongwang sub district, Muang district), The 17th location (Bangriang sub district, Khuanniang district), the 27th location (Sadao sub district, Sadao district), the 29th location (Phangla sub district, Sadao district), the 55th location (Khuntudwai sub district, Jana district) and the 85th location (Khaoaeng sub district, Sabayoy district). The result of raw material transportation routing found that total transportation cost of 6 power plants is 18,622 bahts per day and total cost of 6 power plants is 665,589.93 bahts per day.

**KEYWORDS** : Location Problem, Vehicle Routing Problem, Biomass Power Plant, Mathematical Model

## INTRODUCTION

Electricity production from renewable energy such as biomass is one of policy that is allocated in electric production capacity development plan of Thailand in 2015 – 2036[1] to respond the mission which to provide enough energy to electric demand of Thailand. Such electric production from renewable energy policy of the government aims to solve the generally social problems such as commune waste problem and agricultural abundant products which has the strategy to promote bioenergy namely energy from waste, biomass and biogas are the first priority. For biomass potential in Thailand found that the remain potential could produce electricity 2,500 megawatt by estimate. From biomass electric production summary report of Thailand in 2014 found that the production capacity is 2,541.8 megawatts and within year 2036, the goal is set to be 5,570 megawatts.

Although Thailand has high biomass potential, to apply the biomass to produce the electricity is still has problems and obstacles such as the biomass that has so many but they are scatter which make difficulty to collect such as sliver, slab, rubber tree root, sawdust which being in the ranch and farm. The biomass amount which sent to factory and nearby area is not enough to produce electricity. So we must find the other kinds of biomass from other sources to supply the power plants. The transportation cost will occur, the further the source is, the higher in transportation cost is occur. Thus, to take biomass to produce electricity, it has to implement two important parts which are 1) power plant location selection 2) raw material transportation route to the power plant. These two parts are strategic decision factors that effect to worthiness of business.

Thailand has enormous volume of rubber planting area which is counted in the second place of the world next below Indonesia. [2] The rubber planting area in 2014 is 22,176,714 rais. [3] The rubber planting area scatter in different parts of Thailand especially in Songkhla province which has plant volume at 2,062,626 rais that is the second place in Thailand next below Suratthani province with 2,633,892 rais. Meanwhile the rubber trees which over 20 age years often yield latex lower than standard, and the agriculturists have to cut them down and plant the new ones to compensate. These old rubber trees are agricultural abundant biomass products. The cutting down 1 rai of rubber trees can give 3 tons of sawdust, 12 tons of slab and sliver and 5 tons of roots, Totally, 1 rai of rubber tree cutting down can give 20 tons of biomass. [4] So using the biomass from rubber tree as a raw material to produce electricity is another way to respond the renewable energy electric production policy. So this research is the beginning to develop method to find the amount of rubber wood biomass power plant that suitable with potential of areal biomass, find the location of power plant and raw material transportation routing from raw material resources to each power plants by using mathematical model which use the actual data of Songkhla province as the case study.

## LITERATURE REVIEW

Location routing problem could separate into two problems which are Location Problem (LP) and Vehicle Routing Problem (VRP).

2.1 The location problem, generally is the NP-hard problem [5], has 4 specific characteristics namely (1) customer has certain location, (2) factory that want to find the location, (3) the location which customer and factory site on and (4) the distance or time to travel between factory and customer. [6] Besides, Owen and Daskin[7] had divided problem characters as target equation into three types namely covering problem, median or average distance problem and center problem as the example.

2.1.1 Location problem in case of specific number of establishment amount P unit.

Location problem of distribution center or point of purchase amount P unit (P-Median Problem) which was developed for the first time in 1964 by Hikimi [8] is to find the location of distribution center amount P unit (P-Median) by giving weight the distance in network of goods demand point, n point, to let the distribution center delivery or receive goods from customer which has both limitation resource (Capacitated P-Median) and non limitation of resource (Uncapacitated P-Median) distribution center.

P-Median distribution center is the problem which has the location selection of distribution center amount P unit within the amount of customer n unit include to make a decision that selected distribution center will delivery the goods to any customers by setting the total transportation distance of every distribution centers to every customers in the shortest distance. Osman and company[9] conclude that the location problem which has limitation of resource (Capacitated P-Medians Problem ; CPMP) is the special type of distribution center location selection which similar to P-Median Problem but it concentrate in delivery capacity, limit of goods of distribution point and customer demand also.

2.2 Vehicle Routing Problem (VRP)

The vehicle routing problem is the NP-Hard Problem which the first presented in the research of Dantzig and Ramser[10], Golden and company[11], after that many researchers interested in VRP solving

method development. The interested VRP have been added other limitation issues as case studies or actual events in everyday life such as receive - delivery time limitation (Vehicle Routing Problem with Time Window), in the case of receiving and delivery time is coincident[12], and the transportation distance may has known or unknown value character, for example. Besides, the researchers which have the important role in VRP development such as Golden et.al (1977) [13], Christofides et.al [14], Laporte et.al [15], Toth and Vigo[16] and Kytöjoki et.al [17].

## METHODOLOGY

Research implementation start from problem characteristic studying, theories and related researches studying, related data collection, mathematical model design and development, finding the result by Lingo Program and research conclusion.

### 3.1 Data Collection and Analysis

3.1.1 rubber wood biomass potential data in Songkhla province between March 2014 to the end of February 2015 show in Table 1.

**Table 1** The example of biomass volume summary in each area.

No.	Raw Material Resource or Supplier	Volume (Tons/Day)
1	Khuankob Village Office of The Rubber Replanting Aid Fund (ORRAF) Khlonghoykhong sub district,) Khlonghoykhong district Songkhla province	78.224
2	Thoonglan sub district,) Khlonghoykhong district, Songkhla province	47.890
3	Khokemuang sub district,) Khlonghoykhong district, Songkhla province	25.414
...		
87	Thankhiri sub district, Sabayoy district, Songkhla province	11.841

3.1.2 Biomass sub district position coordinates data collection by using GPS machine: Garmin eTrex 20 and Google Maps Program simultaneously create distance data between each sub districts as show in Table 2.

**Table 2** The distances between each sub districts.

Coordinate	D1	D2	D3	...	...	D86	D87
D1	0	21.9	17.0	...	...	172.0	98.9
D2	21.9	0	15.0	...	...	108.0	103.0
D3	17.0	4.80	0	...	...	109.0	171.0
.	.	.	.	...	...	.	.
.	.	.	.	...	...	.	.
D86	172.0	108.0	109.0	...	...	0	95.6
D87	98.9	103.0	171.0	...	...	95.6	0

3.1.3 Electric wiring cost estimation between the location of power plants that expect to establish to the main wire of Provincial Electricity Authority (PEA) in each 87 area units as show in Table 3.

**Table 3** The example of electric wiring cost in each area.

No.	Raw Material Resource or Supplier	Electric Wiring Cost (Baht)
1	Khuankob Village Office of The Rubber Replanting Aid Fund (ORRAF) Khlonghoykhong sub district,) Khlonghoykhong district Songkhla province	6,017,693.00
2	Thoonglan sub district,) Khlonghoykhong district, Songkhla province	513,705.50
3	Khokemuang sub district,) Khlonghoykhong district, Songkhla province	5,577,374.00
...		
...		
86	Bahoy sub district,, Sabayoy district, Songkhla province	31,893,772.90
87	Thankhiri sub district, Sabayoy district, Songkhla province	17,260,504.80

### 3.1.4 Power plant establishing cost and raw material transportation cost.

The power plant establishing cost is calculated as the 9.5 megawatts power plant which cost 787 million baht. Raw material transportation cost is calculated at 4 bahts per kilometer.

### 3.2 Mathematical Model Specification

The objectives of mathematical model are (1) to find the amount and location selection of power plant which suitable to biomass volume in target area (2) to routing of raw material transportation to power plant to get the minimum of transportation cost (3) to find the lowest total cost which include transportation cost, power plant establishing cost and electric wiring cost. In this case, mathematical model is created separate into two procedures as following:

**First Procedure** Mathematical model for finding the result by assignment.

#### Index

$i, j$  are position index of all nodes of raw material sellers (Suppliers) and power plants (depots) which  $N$  is the set of suppliers and power plant sequence  $N = \{1, 2, \dots, n\}$  which  $i$  and  $j$  are member of  $N$ .

$I$  is the set of integer  $\{0, 1, 2, 3, \dots\}$

#### Parameters

$C$  is transportation cost per distance between suppliers with each other and between suppliers and power plants (Bahts/Km).

$F$  is the power plant establishing cost (Baht/Plant).

$g_i$  is raw material volume which supplier  $i$  could supply (Kg/Day).

$h_j$  is electric wiring cost from power plant  $j$  to main wire of Provincial Electricity Authority (PEA) (Bahts).

$T_{\min}$  is the minimum amount of raw material which power plant (depot) demand (Kg/Day).

$T_{\max}$  is the maximum amount of raw material which power plant (depot) can get (Kg/Day).

$d_{ij}$  is the distance between  $i$  to  $j$  (Km).

#### Decision Variable

$$x_{ij} = \begin{cases} 1 & \text{if transportation from supplier } i \text{ to power plant } j \text{ occur.} \\ 0 & \text{in other cases.} \end{cases}$$

$$y_j = \begin{cases} 1 & \text{if position } j \text{ is chosen to be the location of power plant.} \end{cases}$$

0 in other cases.

### Objective Function

To find the amount of power plant and power plant location by considering sum of the lowest cost consist of raw material transportation cost, power plant establishing cost and electric wiring cost.

$$\text{Min} = C \sum_{i \in N} \sum_{j \in N} d_{ij} x_{ij} + F \sum_{j \in N} y_j + \sum_{j \in N} h_j y_j \quad (1)$$

### Constraint

$$\sum_{j \in N} x_{ij} = 1, \forall i \quad (2)$$

$$\sum_{i \in N} g_i x_{ij} \geq y_j T_{\min}, \forall j \quad (3)$$

$$\sum_{i \in N} g_i x_{ij} \leq y_j T_{\max}, \forall j \quad (4)$$

$$x_{ij} \in \{0, 1\} \forall i \forall j \quad (5)$$

$$y_j \in \{0, 1\} \forall j \quad (6)$$

The objective equation (1) consist of 3 terms which are (a) to find total distance in the system which must minimum (b) to find total cost of power plant set up in every locations and (c) to find total cost of electric wiring.

Equation (2) is constraint that each supplier must supply raw material to one power plant only. Equation (3) is constraint that each power plant (depot) j must receive raw material not lower than the specific minimum volume. Equation (4) is constraint that each power plant (depot) j must receive raw material not over the specific maximum volume. Inequality (5) - (6) are binary decision variable constraint.

### Second Procedure Mathematical model for vehicle routing.

This use for raw material transportation routing to the selected power plant in the first procedure by routing raw material to each power plant which has two methods, they are 1) direct network transportation routing (direct shipment) between each power plant and each supplier by allocation to consider the full truck load is the first priority, 2) in case of supplier's raw material volume is not full truck load, so apply with Vehicle Routing Problem : VRP.

### Index

i, j is the position index of all nodes of raw material sellers (suppliers) and power plant (depot) which N is the set of suppliers and power plant sequence  $N = \{1, 2, \dots, n\}$  which i and j are member of N.

I is the set of integer  $\{0, 1, 2, 3, \dots\}$

### Parameters

C is transportation cost per distance between suppliers with each other and between suppliers and power plants (Baht/Km).

F is the power plant establishing cost (Baht/Plant).

h is electric wiring cost from power plant to main wire of Provincial Electricity Authority (PEA) (Bahts/Plant).

K is the amount of routing transportation vehicle.

V is the maximum capacity loading of transportation vehicle (Kg/vehicle).

$d_{ij}$  is the distance from supplier i to power plant (depot) j (km).

$g_i$  is raw material volume which supplier i could supply (Kg/Day).

### Decision Variable

$$x_{ij} = \begin{cases} 1 & \text{if transportation from supplier i to power plant j occur.} \end{cases}$$



0 in other cases.

$p_i$  = the amount of round which vehicle go to receive raw material at supplier  $i$  in the direct shipping model whereas  $p_i \leq I$

### Support Parameter

$r_i$  = is raw material weight which leftovers from direct shipping model transportation which supplier  $i$  use to find the route by routing model.  
 $u_i$  = is for Sub-tour correcting.

### Sign Function

$$\text{sign}(x) = \begin{cases} 1 & x > 0 \\ 0 & x = 0 \end{cases}$$

Sign function will give value as 1 when  $x$  get value more than 0 or the volume occur but if value of  $x$  equal to 0 which mean no volume, sign function will give value as 0. This sign function use to indicate the volume having of  $x$  value.

### Objective Function

This function is used to find the lowest total cost consists of raw material transportation cost, power plant establishing cost and electric wiring cost.

$$\text{Min} = C \left( \sum_{i \in N} \sum_{j \in N} d_{ij} x_{ij} + \sum_{i \in N} p_i (d_{li} + d_{il}) \right) + F + h \quad (7)$$

### Constraint

$$g_i = p_i V + r_i, \forall i \in N \quad (8a)$$

$$0 \leq r_i \leq V \quad (8b)$$

$$\sum_{\substack{j \in N \\ j \neq i}} x_{ij} = \text{sign}(r_i), \quad \forall i \in N, i \neq 1 \quad (9)$$

$$\sum_{i \in N} x_{il} = K \quad (10)$$

$$\sum_{i \in N} x_{ij} = \sum_{i \in N} x_{ji}, \quad \forall i \in N \quad (11)$$

$$\forall i, j \in N \\ u_i - u_j + V x_{ij} \leq V - r_j, \quad i \neq j, i \neq 1, j \neq 1 \quad (12a)$$

$$r_i \leq u_i \leq V \quad (12b)$$

$$x_{ij} \in \{0, 1\} \quad \forall i, \forall j \in N \quad (13a)$$

$$p_i \in I \quad \forall i \in N \quad (13b)$$

The objective equation (7) consists of three terms which are term (a) use to find the lowest transportation cost which consist of sub-term no.1 in the parentheses which use to find the distance in the VRP transportation management. Sub-term no.2 use to find the distance in the direct network routing management (direct shipment). Term (b) is the power plant set up cost and term (c) is the electric wiring cost.

Equation (8a) and (8b) are constraints total raw material weight of supplier  $i$  must equal to amount of full truck load transportation round multiply by the maximum loading capacity and add with raw material weight volume which leftovers at supplier  $i$ . Whereas the leftovers from direct shipping model transportation must

lesser than vehicle capacity. Equation (9) is constraint of the amount of departure of node  $i$ , the transportation will occur when raw material leftovers (Sign ( $r_i$ )). Equation (10) is constraint of the total of arrival transportation of each power plant that must equal to amount of transportation trip (vehicle unit). Equation (11) is constraint of total arrival transportation of each supplier equal to the departure. Equation (12a,b) is constraint to eliminate subtour by using vehicle accumulated weight method. Inequality (13a) is to allocate the transportation round amount in direct shipment model which  $I$  has the integer value.

3.3 The testing of mathematical model with the actual problems is done by using Lingo Program version 13 and computer with Window 8 Intel (R) Core (TM) i7-4700HQ CPU@2.4GHz 4.00GB Ram with these constraints.

- 1) 10-wheel truck loading capacity not over 20 tons.
- 2) 9.5 megawatt power plant has raw material consumed rate at 300 tons per 24 hours production
- 3) Biomass volume data of Songkhla province in 2014
- 3.3.1 Mathematical model testing for Location Assignment Problem (LAP).

The testing result show in table 4,5 and 6.

**Table 4 :** The result of power plant number finding.

Number of Suppliers	Lingo Result Time (Hr)	Status	Number of Power plant
87	0:00:02	Global Optimal	6

In table 4, the result by using 87 supplier sample groups use 2 seconds to find the global optimal result. The result shown that 6 power plants should be established. In table 5, six locations are selected which include 1) the 8th location Thoongwang sub district, Muang district, Songkhla province 2) the 17th location Bangriang sub district, Khuanniang district, Songkhla province 3) the 27th location Sadao sub district, Sadao district, Songkhla province 4) the 29th location Phangla sub district, Sadao district, Songkhla province 5) the 55th location Khuntudwai sub district, Jana district, Songkhla province 6) the 85th location Khaodaeng sub district, Sabayoy district, Songkhla province. The raw material volume is 1,836.898 tons/day. And in Table 6, the total cost is 670,280.12 bahts per day.

**Table 5:** Power plant locations, supplier groups and raw material volume.

Selected location	Group member location which supply raw material to power plant	Raw material volume supply (tons/day)
8	8,2,4,5,6,7,9,10,11,13,42,44,45,53,57,60,67,68	301.570
17	17,3,14,15,16,18,19,20,21,22,23,24,25,26,36,37,39,40,41,43	306.16
27	27,28,30,33,34,78	316.197
29	29,1,12,31,32,35,38,46,47,72	301.343
55	55,48,49,50,51,52,54,56,58,59,61,64,69,70,71,73,74,75,76	303.219
85	85,62,63,65,66,77,79,80,81,82,83,84,86,87	308.409
Total raw material volume		1836.898

**Table 6 :** Total cost of location selection and raw material transportation by assignment.

Locations	Number of Supplier	Total cost (bahts/day)			
		Transportation Cost	Electric wiring cost	Power plant establishing cost	Total
8	18	6,053.60	76.4	107,808.22	113,938.22
17	20	6,224.00	4.02	107,808.22	114,036.24
27	6	2,727.60	4.02	107,808.22	110,539.84

Locations	Number of Supplier	Total cost (bahts/day)			
		Transportation Cost	Electric wiring cost	Power plant establishing cost	Total
29	10	2,384.80	4.02	107,808.22	110,197.04
55	19	3,106.40	14.07	107,808.22	110,929.32
85	14	2,934.40	16.08	107,808.22	110,758.70
Total	87	23,430.8	118.61	646,849.32	670,280.12

### 3.1.2 Mathematical model testing of Vehicle Routing Problem (VRP).

The result of raw material transportation routing and total cost of 6 power plants show in table 7 and table 8.

**Table 7** : Raw material transportation cost of 6 power plants.

Locations	Number of Supplier	Lingo Results		
		Time (Hr)	Status	Transportation Costs (bahts/Plant)
8	18	0:00:22	Global Optimal	4,969.60
17	20	5:04:07	Feasible	4,049.64
27	6	0:00:01	Global Optimal	2,481.60
29	10	0:00:00	Global Optimal	2,027.20
55	19	0:00:25	Global Optimal	2,423.60
85	14	0:00:00	Global Optimal	2,616.80

**Table 8:** Total cost of location selection and raw material transportation routing of biomass power plant.

Locations	Number of Supplier	Total cost (bahts/day)			
		Transportation Cost	Electric wiring cost	Power plant establishing cost	Total
8	18	4,969.06	76.4	107,808.22	112,853.68
17	20	4,049.64	4.02	107,808.22	111,861.88
27	6	2,481.60	4.02	107,808.22	110,293.84
29	10	2,027.20	4.02	107,808.22	109,839.44
55	19	2,423.60	14.07	107,808.22	110,245.89
85	14	2,616.80	16.08	107,808.22	110,441.10
Total	87	18,567.90	118.61	646,849.32	665,535.83

## RESULTS

The mathematical model was created to solve the location selection and vehicle routing problems. Then the actual data in Songkhla province was applied as the case study. By using Lingo Program with Window 8 Intel (R) Core (TM) i7-4700HQ CPU@2.4GHz 4.00GB Ram, the best result is found. In order to find the solution, the problem was divided into two 2 procedures. Procedure 1 is used to find the amount of 9.5 megawatt production power plant which can get the proper number at 6 power plant units. The selected locations are 1) the 8th location Thoongwang sub district, Muang district, Songkhla province 2) the 17th location Bangriang sub district, Khuanniang district, Songkhla province 3) the 27th location Sadao sub district, Sadao district, Songkhla province 4) the 29th location Phangla sub district, Sadao district, Songkhla province 5) the 55th location Khuntudwai sub district, Jana district, Songkhla province 6) the 85th location Khaodaeng sub district, Sabayoy district, Songkhla province. The total transportation cost is 23,430.8 bahts per day and total cost is 670,280.12 bahts per day. Procedure 2 is used to rearrange the vehicle routing which get the total transportation cost at 18,567.9 bahts per day which can reduce 20.75% from the procedure 1 and total cost is 665,535.83 bahts per day.

## CONCLUSIONS AND DISCUSSION

This research aim to solve the problem of location selection and vehicle routing for biomass power plant by using mathematical model and using Songkhla province area data as the case study. The result found that biomass potential of rubber wood in Songkhla province could supply to six of 9.5-megawatt power plants. Total cost was considered from 3 factors: transportation cost, power plant establishing cost and electric wiring cost. The final result was found at 665,535.83 bahts per day.

However, from searching data by Lingo Program, there is still having limitation to find the best result in case of complicated problem. For example in Table 7, most problem which has number of suppliers less than 20 would take a short time searching and got the best result easily but in the 17th location which has 20 suppliers took 5 hours 4 minutes and 7 seconds to get only possible result but did not get the best result. So, the further research should develop Metaheuristic or other methods which suitable to apply with actual data to get faster and better results.

### ACKNOWLEDGEMENTS

This research was supported by department of engineering, Ubon Ratchthani University, Thailand. The authors would like to thanks Assist Professor Thanchuda Phannikul, Ph.D. for useful advising.

### REFERNCES

- [1] Energy Policy and Planning Office (EPPO), *Ministry of Energy. Electric energy development plan of Thailand 2015 – 2036 (PDP 2015)*. Energy Policy and Planning Office, Bangkok, 2015.
- [2] Rubber Research Institute, Department of Agriculture. *rubber wood planting area of each country, world rubber statistic*, The Thai Rubber Association, 2015.
- [3] Rubber Research Institute, Department of Agriculture. *rubber wood planting area in Thailand, Thai rubber statistic*, The Thai Rubber Association, 2015.
- [4] Energy Policy and Planning Office (EPPO), *Ministry of Energy*. Summary report for executive of the studying and channel allocation project to promote heat energy production by biomass as 15 years alternative energy development plan, 2011.
- [5] Snyder, L.V. *Facility Location under Uncertainty*, IIE Transactions. 38:537-554, 2006.
- [6] ReVell, C.S., Eiselt, H.A. Location analysis: A synthesis and survey. *European Journal of Perational Research*. 165: 1-19, 2005.
- [7] Owen, S.H. and Daskin, M.S. Strategic Facility Location: A Review, *European Journal of Operational Research*. 111:423-447, 1998.
- [8] Hakimi, S. Optimum Location of Switching Centers and Absolute Centers and Medians of a Graph. *Operations Research*, Vol. 12, pp.450-459, 1964.
- [9] Osman and Cnristofides. Capacitated P-Median Problem (CPMP) is an Important Variation of Facility Location problem. *European Journal of Operational Research*. 135 (2) : 413-427, 2001.
- [10] Dantzig, G.B. and Ramser, J.H. *The Truck Dispatching problem*. Management Science. 6: 80-91, 1959.
- [11] Golden, B., T. Magnanti and H. Nguyen. Implementing Vehicle Routing Algorithms. *Network 7*: 113-148, 1977.
- [12] Nagy, G., and Salhi, S. Heuristic Algorithms for Single and Multi Depot Vehicle Routing Problems with Pickups and Deliveries. *European Journal of Operational Research*, 162, 126-141, 2005.
- [13] Golden, B., T. Magnanti and H. Nguyen. Implementing Vehicle Routing Algorithms. *Network 7*: 113-148, 1977.
- [14] Christofides, N. Worst-Case Analysis of a New Heuristic for the Traveling Salesman Problem. *Technical Report. University: Carnegie-Mellon*, 1979.
- [15] Laporte, G., Gendreau, M., Potvin, J.-Y. and Semet, F. Classical and Modern Heuristics for the Vehicle Routing Problem. *Technical Report, Les Cahiers du Gerad*, G-99-21, 1999.
- [16] Toth, P. and Vigo, D. An Overview of Vehicle Routing Problems. *SIAM Monographs on Discrete Mathematics and Application*. Philadelphia, 2002.
- [17] Kytöjoki, J., Nuotio, T., Braysy, O. and Gendreau, M.. An Efficient Variable Neighborhood Search Heuristic for Very Large Scale Vehicle Routing Problem. *Computers and Operations Research*. 34: 2743-2757, (2007).

**DIVERSITY OF ZINGIBERACEAE IN THANH HOA PROVINCE, VIETNAM**Dau Ba Thin<sup>1\*</sup>, Dao Thi Minh Chau<sup>2</sup>, Do Ngoc Dai<sup>3</sup>.*Affiliation Institute for research and development of new technologies**Address: 17 Pham Kinh Vy street, Ben Thuy ward, Vinh city, Nghe An province, Vietnam*<sup>1</sup>*Hong Duc University, Vietnam.*<sup>2</sup>*Nghe An University of Economics, Nghe An province, Vietnam.*<sup>3</sup>*Vinh University, Vietnam.**(\*Department of Management - Hong Duc University, 565 Quang Trung - Thanh Hoa City, email: [daubathin@hdu.edu.vn](mailto:daubathin@hdu.edu.vn); Tel: 0912483189)***ABSTRACT**

This paper presents results of research on the Zingiberaceae family in Thanh Hoa province, from 2015 to 2017. A total of 50 species belonging to 8 genera of Zingiberaceae were collected and identified. There were 10 species found as new records for the plant list of Thanh Hoa published in 2007, 2008, 2013 and 2016. *Alpinia* is the most diverse genus (17 species), followed by *Amomum* (10 species), *Zingiber* (9 species), *Hedychium* (6 species) and other genus (1 to 4 species). The species of the Zingiberaceae in the study area have different uses, with 47 species producing essential oil, 37 species of medicinal plants, 15 species are edible and 3 species are ornamental plants. Ginger families in the study area have three major geographic factors, tropical elements accounting for 66 % of total species; temperate elements occupy 4 %, solid and sub-endemic elements account for 30 %. The ginger habitat in Thanh Hoa has 39 species under forest canopy; 34 species along the stream, 37 species in the secondary forest, 17 species in the primary forest and 19 species in the scrubland.

**KEYWORDS:** Species diversity, Zingiberaceae, Thanh Hoa.



## INTRODUCTION

In the angiosperms, the Zingiberaceae is not widespread, with only 52 genera and 1,500 species. Ginger species are distributed mainly in the tropics and subtropics, especially in Southeast Asia. Vietnam is a tropical monsoon country with complex terrain and many geographic and climatic zones, so it is very favorable for the growth and development of plants in general and Ginger family in particular.

Thanh Hoa is considered as one of the centers of biodiversity in Vietnam and the world with many endemic species, one National Park (NP) – Ben En and three Nature Reserves (NR) - Xuan Lien, Pu Luong and Pu Hu. Of these, more than 2,000 species of vascular plants have been identified, which have a great potential for plant resources producing essential oils. However, research on the diversity of plant resources in general and Ginger families in particular has not been fully and systematically studied.

## MATERIALS AND METHODS

2.1. *Research materials*: Ginger species in Thanh Hoa and the collection of 216 specimens which are stored at the Department of Botany, Faculty of Natural Sciences, Hong Duc University.

2.2. *Research Methods*:

- + Specimens were collected according to research method by Nguyen Nghia Thin (2008) [8], R.M. Klein and D.T. Klein (1979) [6], implementation period from 8/2015 to 11/2017.
- + Identification: Using the morphological comparison method according to documents of Pham Hoang Ho (2000) [5], Nguyen Quoc Binh (2011) [2], Flora of China (2000) [10].
- + Valuation based on participatory interview (PRA) and documents by Vo Van Chi (2012) [3], Tran Dinh Ly et al. (1993), Nguyen Quoc Binh (2011) [2].
- + Geographical evaluation by Nguyen Nghia Thin (2008) [8].

## RESULTS AND DISCUSSION

### 1. Diversity of species

50 species within 8 genus have been identified in the family Ginger (Zingiberaceae) in Thanh Hoa through investigating, sampling and identifying. Having added 10 new species (marked \*) in the Ginger family in Thanh Hoa, compared with the results of some other published studies on Ginger species in the National Park and nature reserve such as Do Ngoc Dai et al (2007) [4], Hoang Van Sam et al. (2008) [7] and the list of plants in the report of the Conservation Planning and Sustainable Development Project for Special-use Forests of Ben En National Park to 2020 of the Management Board of Ben En National Park (2013) [1], Dau Ba Thin et al (2016), Dang Nguyen Vu (2016) [9], Hoang Van Sam et al. (2013) [7]. Detailed results are presented in Table 1.

Table 1. Valuation, distribution and diversity of Zingiberaceae species in Thanh Hoa province.

No.	Scientific name	Vietnamese name	Geographic factors	Usage value	Habitat	Distribution
1.	<i>Alpinia blepharocalyx</i> K. Schum.	Riềng dài lông mếp	4.2	CTD, THU	a,c	2,3,4
2.	<i>Alpinia conchigera</i> Griff.	Riềng gừng	4	AND, CTD, THU	a	3,4
3.	<i>Alpinia galanga</i> (L.) Willd.	Riềng nếp	5.4	AND, CTD, THU	b,e	1,2,3,4
4.	<i>Alpinia globosa</i> (Lour.) Horan.	Sẹ	6.1	CTD, THU	c,e	1,3,4
5.	<i>Alpinia hainanensis</i> K. Schum.	Riềng hải nam	6.1	CTD, THU	b,c	2,3
6.	<i>Alpinia kwangsiensis</i> T. L. Wu & S. J. Chen	Riềng quảng tây	4.4	AND, CTD, THU	b,c,e	1,2,3,4
7.	<i>Alpinia maclurei</i> Merr.	Riềng maclure	4.4	CTD	a	2
8.	<i>Alpinia macroura</i> K. Schum.*	Riềng đuôi nhọn	4.4	CTD	c,e	1
9.	<i>Alpinia malaccensis</i> (Burm.f.) Rosc.*	Riềng malacca	4	CTD, THU	b,c,e	1

No.	Scientific name	Vietnamese name	Geographic factors	Usage value	Habitat	Distribution
10.	<i>Alpinia menghaiensis</i> S.Q. Tong & Y. M. Xia*	Riềng meng hai	6.1	AND, CTD, THU	b,c,e	1
11.	<i>Alpinia napoensis</i> H. Dong & G. J. Xu	Riềng	6.1	CTD, THU	a,b,c	1
12.	<i>Alpinia oblongifolia</i> Hayata	Riềng tàu	4.1	AND, CTD, THU	a,c,d	2,3,4
13.	<i>Alpinia officinarum</i> Hance	Riềng thuốc	4	AND, CTD, THU	a,c,e	1,2,3,4
14.	<i>Alpinia phuthoensis</i> Gagnep. sec. Phamh.	Riềng phú thọ	6	CTD, THU	a,b	3
15.	<i>Alpinia polyantha</i> D. Fang*	Riềng nhiều hoa	6.1	CTD, THU	a,b,c	1
16.	<i>Alpinia tonkinensis</i> Gagnep.	Riềng bắc bộ	6.1	CTD, THU	a,c,e	1,3
17.	<i>Alpinia zerumbet</i> (Pers.) B. L. Burtt. & R. M. Sm.	Riềng đẹp	5.4	CAN, CTD, THU	b,c,d,e	1,2,3,4
18.	<i>Amomum biflorum</i> Jack	Riềng hai hoa	4	CTD, THU	b,c,d	3
19.	<i>Amomum gagnepainii</i> T. L. Wu, K. K. Larsen & Turland*	Riềng ảm	6.1	AND, CTD, THU	a,d,e	1
20.	<i>Amomum maximum</i> Roxb.	Đậu khấu chín cánh	4	CTD, THU	a,c,d	1,2
21.	<i>Amomum mengtzensense</i> H.T. Tsai & P.S. Chen	Sa nhân khế	4.4	AND	a,b,c,d	2
22.	<i>Amomum muricarpum</i> Elmer*	Sa nhân quả có mỏ	4.1	CTD, THU	a,b,c,e	1
23.	<i>Amomum ovoideum</i> Pierre ex Gagnep.	Sa nhân trứng	4.1	AND, CTD, THU	a,c	2
24.	<i>Amomum repoeense</i> Pierre ex Gagnep.	Sa nhân miền	4.5	CTD, THU	a,b	2
25.	<i>Amomum vespertilio</i> Gagnep.	Sa nhân thầu dầu	6	AND, THU	a	4
26.	<i>Amomum villosum</i> Lour.	Sa nhân	4.2	AND, CTD, THU	a,b,c	1,3,4
27.	<i>Amomum xanthoides</i> Wall. ex Baker*	Sa nhân ké	4.2	AND, CTD, THU	a,b,e	1
28.	<i>Curcuma aromatica</i> Salisb.	Nghệ trắng	4.2	CTD, THU	a,d,e	1,2
29.	<i>Curcuma elata</i> Roxb.	Mì tinh rừng	4.3	CTD	a,b,c	2
30.	<i>Curcuma longa</i> L.	Nghệ	2.2	AND, CTD, THU	a,b,e	1,4
31.	<i>Curcuma zedoaria</i> (Berg.) Rosc.	Nghệ đen	4	AND, CTD, THU	a,e	1,4
32.	<i>Distichochlamys benenica</i> Q. B. Nguyen & Škorničk	Gừng đen Bến en	6	CTD, THU	a,b,c	1,2
33.	<i>Distichochlamys citrea</i> M.F. Mewman	Gừng đen	6	CTD, THU	a,b,c	3,4
34.	<i>Elettariopsis unifolia</i> (Gagnep.) M. F. Newman	Riềng một lá	6	CTD	a,b,c,d	3
35.	<i>Hedychium coronarium</i> Koenig.	Bạch diệp	4.2	CTD, THU	a,b,c	2

No.	Scientific name	Vietnamese name	Geographic factors	Usage value	Habitat	Distribution
36.	<i>Hedychium coronarium</i> Koenig. var. flavum (Roxb.) K. Schum.	Ngải tiên vàng	4.2	CTD	a,b,d	2
37.	<i>Hedychium forrestii</i> Diels var. latebracteatum K. Larsen	Ngải tiên lá bắc rộng	6	CTD	a,b,c,d	3
38.	<i>Hedychium gardnerianum</i> Rosc.	Ngải tiên gardner	4.2	CTD	a,b,c	1,2
39.	<i>Hedychium villosum</i> Wall.*	Ngải tiên lông	4	CTD	a,b,c,e	1
40.	<i>Hedychium yunnanense</i> Gagnep.	Ngải tiên vân nam	4.4	CTD	a,b,c,d	2
41.	<i>Kaempferia galanga</i> L.	Địa liên	3.1	CTD, THU	a,b,c,d	1,2
42.	<i>Zingiber aff. acuminatum</i> Val.	Gừng nhọn	4.1	CTD	a,b,c	2
43.	<i>Zingiber eberhardtii</i> Gagnep.	Gừng eberhardt	6	CTD	a,b,c	1,2
44.	<i>Zingiber gramineum</i> Blume*	Gừng lúa	4.1	CTD, THU	a,c,d	1
45.	<i>Zingiber monophyllum</i> Gagnep.	Gừng một lá	6	CTD, THU	a,d	1,4
46.	<i>Zingiber montanum</i> (Koenig) Link ex A. Dietr.*	Gừng núi	4	CTD, THU	c,d,e	1
47.	<i>Zingiber officinale</i> Rosc.	Gừng	4	AND, CTD, THU	b,c,d,e	1,2,4
48.	<i>Zingiber purpureum</i> Rosc.	Gừng tía	4	CTD, THU	a,c,d	2
49.	<i>Zingiber rubens</i> Roxb.	Gừng đỏ	4.2	CAN, CTD, THU	a,b,c	1,2
50.	<i>Zingiber zerumbet</i> (L.) Smith	Gừng gió	4	CAN, CTD, THU	a,b,c,d,e	1,2,3

Notation:

▪ Geographic factors: 4. Tropical Asia: 4.1. Indochina - Malezi; 4.2. Asian tropical continent; 4.4. Indochina - South China; 4.5. Indo - China; 5.1. East Asia - North America; 5.4. East Asia; 6. Endemic; 6.1. Near endemic.

▪ Usage value: AND (edible plants) ; CTD (essential oil plants) ; CAN (ornamental plants) ; THU (medicinal plants) ;

▪ Distribution: 1 (Ben En NP), 2 (Xuan Lien Nature Reserve) ; 3 (Pu Luong Nature Reserve) ; 4 (Pu Hu NR) ;

▪ Habitat: a (under canopy) ; b (streamside) ; c (secondary forest) ; d (primary forest) ; e (bushes).

▪ \*: Added 10 new species in the Ginger family in Thanh Hoa compared with the secondary data.

**2. Diversity of taxon levels**

By combining the plant species list of the Ginger (Zingiberaceae) with analyzing the diversity of species, the results are presented in Table 2.

Table 2. Numbers of species in the genus Zingiberaceae in Thanh Hoa

No.	Genus		Species	
	Latin name	Vietnamese name	Numbers of species	Proportion %
1	Alpinia	Riềng	17	34
2	Amomum	Sa nhân	10	20
3	Curcuma	Nghệ	4	8
4	Distichochlamys	Gừng đen	2	4
5	Elettariopsis	Tiểu đậu	1	2
6	Hedychium	Ngải tiên	6	12
7	Kaempferia	Đạ liên	1	2
8	Zingiber	Gừng	9	18
Total			50	100

Table 2 shows that among the eight genus of the Ginger family in the study area, Alpinia was the richest species, with 17 species (34 % of total species), followed by Amomum (10 species) accounting for 20 % of total species, Zingiber has 9 species (18 %), Hedychium has 6 species (12 %), and Curcuma has 4 species (8 %). There is 1 genus – Distichochlamys, which has 2 species and makes up for 4 % of total species; only 2 % of all species are from two genres - Elettariopsis and Kaempferia, which have one species.

While according to the research results of Nguyen Quoc Binh (2011) on the Ginger family in Vietnam [2], Thanh Hoa accounts for just 3.38% of the total area of the country. There, the Ginger family in the province has 8/19 genus (42.11% of total) and 50/144 species (34.72 % of total species). This proves that the distribution of Ginger in Thanh Hoa is quite diverse in terms of genus levels.

### 3. Diversity of habitats

During the Ginger (Zingiberaceae) survey in Thanh Hoa, the species mainly lived in five main habitats: forest canopy, stream stream, secondary forest, primary forest and shrub; of which 39 species live under canopy accounts for 78 %, 32 species inhabit along the stream (64%), secondary forests with 37 species accounts for 74%, primary forests with 17 species accounts for 34 %, 38% 19 species of shrubs. Thus, it is absolutely reasonable for the species of Ginger to mainly live under canopy and secondary forest because they are moisture – loving plants.

### 4. Diverse value for use

The use value of the species in Ginger family in Thanh Hoa was determined by using the participatory interview method (PRA) and documents: "1900 useful trees of Vietnam" Tran Dinh Ly et al. Vo Van Chi (2012) [3], "Vietnamese herbs" by Pham Hoang Ho (2000) [5], "Medicinal plants and Vietnamese medicinal plants Nam" by Do Tat Loi (2003), "Non-Timber Forest Products of Vietnam" by Trieu Van Hung (2007), has identified 49 species accounting for 98 % of total species in the Ginger family used for various purposes such as medicine, spice, oil, food, ornaments. In particular, one species can have one or more different uses such as: 12 species with one use; 21 species have 2 uses and 16 species have 3. The value of plant species in Zingiberaceae family in Thanh Hoa is shown in Table 3.

Table 3. Value of species in Ginger family (Zingiberaceae) in Thanh Hoa

No.	Use value	Notation	Numbers of species	Proportion %
1	Group of essential oil plants	CTD	47	94
2	Group of medicinal plants	THU	37	74
3	Group of edible plants	AND	15	30
4	Group of ornamental plants	CAN	3	6

Looking at the table, it can be seen that the group of essential oil plants contributes the largest proportion, 94 % with 47 species; followed by medicinal plants with 37 species (74 %) ; group of edible plants has 15 species (30 %) and 3 species are of ornamental plants (6 %).

## 5. Geographic diversity

By integrating data from the list of plant species in Zingiberaceae family and the Geographic classification system by Nguyen Nghia Thin (2008), the distribution of geographic factors of 31/31 species (100 %) of Ginger family in Ben En National Park, Thanh Hoa were indentified and are presented in Table 4.

Table 4. *Geographical factors of species in Zingiberaceae in Thanh Hoa*

Geographic factors (notation)	Numbers of species	Proportion (%)
Intertropical (2.2)	1	2
Subtropical (3.1)	1	2
Tropical Asia (4; 4.1; 4.2; 4.4)	31	62
North temperate (5.4)	2	4
Endemic to Vietnam (6; 6.1)	15	30
<b>Total</b>	<b>50</b>	<b>100</b>

Table 4 shows that Tropical Asia accounts for the largest proportion (62 %), with 31 species, followed by those which are endemic to Vietnam (30 %), with 15 species. Intertropical and subtropical both have only 1 species with the same figures (2 %), which is double as much as that of North temperate. Among the tropical Asia factors, tropical Asia has the most number of species (11 species), accounting for 22 %; followed by the tropical Asian Continent with 8 species (16 %), Indochina-Malezia and Indochina-South China both have 5 species and account for 10 %. The lowest is Indochina with only one species (2 %). Vietnam endemic has 8 species (16 %) and near endemic Vietnam - China has 7 species (14 %).

## CONCLUSIONS

- The research results have identified 50 species (5 species more than Nghe An province) and 8 genus (equal to Nghe An) of the Ginger family in Thanh Hoa, of which 10 species were first found in this area.
- The most diverse genus in the study area is *Alpinia* (17 species), *Amomum* (10 species), *Zingiber* (9 species).
- Ginger species in the study area have different uses: 47 species for essential oils, 37 species for medicinal values, 15 edible species and 3 ornamental species.
- Ginger families in the study area belong to 5 main geographic factors, Asian tropical accounts for 62 %, Vietnam endemic and sub-endemic accounts for 30 %, North temperate is 4 %, intertropical and subtropical each makes up for 2 %.
- Regarding living environment, there are 39 species of Ginger family in Thanh Hoa live under canopy, along stream with 32 species, secondary forest with 37 species, primary forest with 17 species and scrub with 19 species.

## ACKNOWLEDGEMENTS

The authors wish to thank Rajabhat Maha Sarakham University (Thailand) and Affiliation Institute for research and development of new technologies for the giving us the opportunity to attend the conference and publish this article. This research was funded by the Ministry of the Environment, Code: B2017-HĐT-03.

## REFERENCES

- [1] Management Board of Ben En NP, *Report on the planning, conservation and sustainable development of special-use forests of Ben En NP until 2020*, Thanh Hoa, 2013.
- [2] Nguyen Quoc Binh, *Research on the classification of Zingiberaceae in Vietnam*, PhD thesis in Biology, Institute of Ecology and Biological Resources, 2011.
- [3] Vo Van Chi, *Dictionary of medicinal plants in Vietnam*, Volume 2, Medical Publishing House, Hanoi, 2012.
- [4] Do Ngoc Dai, Le Thi Huong, Pham Hong Ban, "Assessing the Diversity of Flora in Bac En National Park in Bac En National Park, Thanh Hoa", *Journal of Agriculture and Rural Development*, 19, Agriculture-Hanoi Publishing House, 2017, 6 pages (106-111).

- [5] Pham Hoang Ho, *Vietnamese Herb*, Volume 1, Young Publisher, Ho Chi Minh City, 2000.
- [6] Klein R.M., Klein D.T., *Plant research methods*, Vol. 2, Science and Technology Publishing House, Hanoi, 1979.
- [7] Hoang Van Sam, Pieter Baas, Paul A. J. Kessler: *Plant Biodiversity in Ben En National Park, Vietnam*, Agriculture Publishing House, Hanoi, 2008.
- [8] Nguyen Nghia Thin, *Methods of Plant Research*. Hanoi National University Publishing House, 2008.
- [9] Dang Quoc Vu, Research on *Plant Diversity as the basis for conservation in Xuan Lien Nature Reserve*, Thanh Hoa province, PhD thesis in Biology, Institute of Ecology and Biological Resources, 2016.
- [10] Delin Wu & Kai Larsen, *Zingiberaceae in Flora of China*, Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis, 2000.



**A PROPOSED OF AUTOMOTIVE DIRECT IGNITION COIL FAULT DIAGNOSIS THROUGH AN  
ADAPTIVE FUZZY LOGIC CONTROL**

Weerayute Sudsomboon

*Graduate Program in Industrial Technology*

*Automotive Technology and Agricultural Industrial Technology Research Unit*

*Faculty of Industrial Technology, Nakhon Si Thammarat Rajabhat University, Thailand*

*(Author for correspondence, e-mail : weerayute\_sud@nstru.ac.th; Fax +66-75-377-439)*

**ABSTRACT**

Automotive direct ignition coil fault diagnosis is the most important system for performing vehicle inspection and maintenance, but it is very difficult to perform because a modern automotive engine is a complex integration of mechatronics, electromechanical and computer control systems. In the present study, an expert fault diagnosis system using discrete wavelet transform and fuzzy logic controller is proposed for guideline further research. This system will be further conducted by researcher the general faults. For instance, by investigating only the ignition faults, the defective element can be detected. Also, sensor faults can be detected in SI engines with electronic management systems by comparing the sensor signals of normal and defective engines. By changing the rule base and increasing the numbers of input variables, more faults can be detected. The developed system can be converted to an appropriate tool for fault diagnosis with appropriateness training without removing the engine from the vehicle.

**KEYWORDS:** Automotive Direct Ignition Coil, Fault Diagnosis, Fuzzy Logic Control

## INTRODUCTION

Automotive direct ignition coil fault diagnosis is the most important system for performing vehicle inspection and maintenance [1], but it is very difficult to perform because a modern automotive engine is a complex integration of mechatronics, electromechanical and computer control systems [2]. Furthermore, the possible malfunction may occur on engine performance which is not easy to inspect. The car dealers although on-board diagnostic tools [3], which are available for prompt engine, fault diagnosis in automotive service technicians, these tools are only applicable to the overall of ignition control systems. For those electromechanical parts on transducers, the automotive service technicians usually require the vehicle owner to provide the qualitative symptom descriptions of the engine faults.

In figure 1, an approach is used to generate high voltage electrical power for spark ignition (SI) engine operating. The principle of a direct ignition coil is to convert the electrical power of the battery into high voltage electrical power more than 25,000 Volts for ignition the intake and fuel mixing mechanical energy to generate mechanical power. The system must be able to react quickly to high load demands from the electrical systems [5]. If the direct ignition coil does not supply enough high voltage electrical power, it will make the engine run roughly or stall. Most of the direct ignition coil on vehicles use a power transistor to generate condition, however, the protective devices cannot show which component is abnormal in a direct ignition coil set. In general, the direct ignition coil output waveforms are important information for understanding and inspecting the condition of the direct ignition coil

For a novice automotive service technician, the output waveforms can be used to diagnose faults in power transistor such as faults in the voltage sources, wiring and coil. In other words, the automotive service technician had solved the simple problems should always be checked first before beginning a major repair. But many problems are complexity to classify correctly solely using automotive service technician capability in practical fault diagnosis. In the present study, an expert fault diagnosis system using discrete wavelet transform and fuzzy logic controller is proposed for guideline further research.

## LITERATURE REVIEW

The automotive direct ignition coil diagnostic methods are mainly classified into three categories [6]: model-based, data-driven and knowledge-based methods. Model-based diagnostics threshold are very accurate, but to identify the appropriate values of the model parameters is very time consuming and automotive service technicians demanding. Thus, model-based method is very expensive to perform comprehensively apply in practice. Moreover, due to the different faults and the modeling uncertainty, which no single model-based approach can diagnose all the faults. In other words, many models for various types of engines are required. Data-driven engine diagnosis methods, on the other hand, rely on signal-based diagnosis analysis. Signal-based diagnosis is recently the most popular method because it is very suitable for laboratories and the development of automotive scan tools, computerized engine analyzers, engine condition monitoring and on-board diagnostic systems.

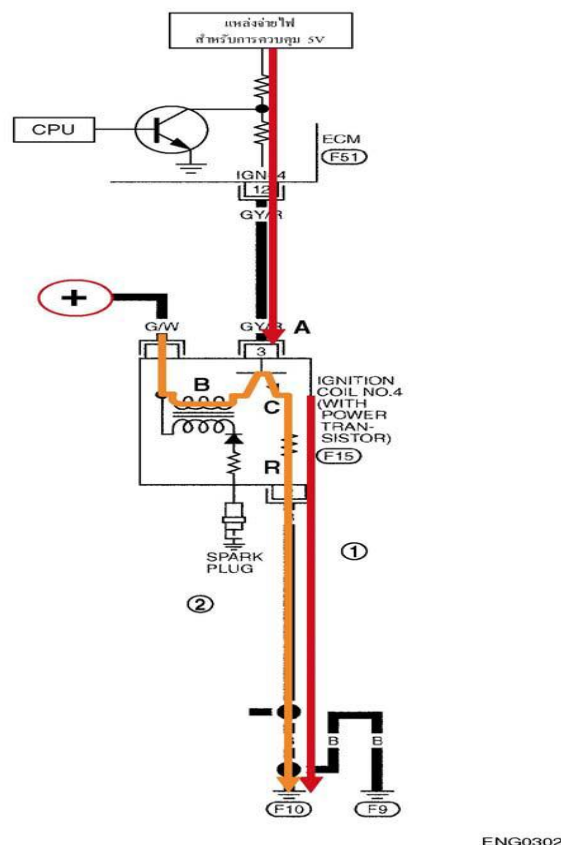


Figure 1. Direct ignition coil [7]

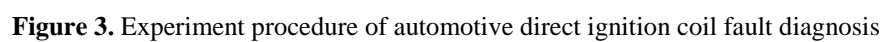
Therefore, the signal-based diagnostics become impractical for automotive service technicians. Knowledge-based methods, by contrast, have the capability of handling the qualitative symptom descriptions. However, on most vehicle diagnostic problems, the diagnostic knowledge is limited and incomplete to build a decision tree due to the complexity of modern vehicles. In recent decade, a famous technique called fuzzy logic provides a generalized solution to qualitative fault. In this case, automotive service technician analyzes the diagnostic problems via linguistic descriptions based on general and/or specific qualitative expert knowledge, which is very suitable for automotive service centers or workshops. Applications of fuzzy logic to engine fault diagnosis can be found in the studies [8].

In order to inspection a reliable fuzzy logic system, multiple sources of qualitative knowledge need to be digested and transformed into a set of complicated fuzzy rules which are very difficult to define accurately. Azarian et al. [8], therefore, proposed a car enterprise information system that integrates the technician feedback, heuristic knowledge and model-based knowledge from the database and knowledge of the car manufacturers. The work is very good, but their main achievement is to diminish the time of diagnosis sessions in the workshop only.

In the automotive direct ignition coil diagnosis, the use of electronic tools to inspect several functions has considerably increased during the last decade as shown in Figure 2. These electronic systems are composed of voltage supplies, sensors and actuators linked to electronic control module by a wire harness. They are equipped with an auto-diagnosis function delivering fault codes that reliably detect the failing electric circuits which are connected to this electronic control module, although they are unable to localize precisely the faulty components. Diagnosis starts with a set of preliminary symptoms gathered by the garage mechanic. In addition to fault codes, there are client symptoms and other preliminary garage mechanic observations. Then, fault isolation is performed by successively applying the test that brings the best discrimination among the diagnostic hypotheses.



## METHODS



In Figure 3, the characteristic of wavelet transform gives short intervals for the high-frequency bands and long intervals for the low-frequency bands. The continuous wavelet transform (CWT) was conducted for power quality analysis [9]. Wavelet transform (WT) is an efficient data processing method applied in signal processing. However, it usually produces an enormous amount of wavelet coefficients, and therefore will be highly redundant in CWT. The signal transformation is often used to obtain further information from the signal that is not easily available in the raw signal. In wavelet transform, a fully scalable window is used to solve the signal discontinuities problem. The window is translation and scale operation along the signal to calculate the wavelet coefficients. The CWT can decompose a signal to both the time domain and frequency domain

$$\text{CWT}(a,b) = \frac{1}{\sqrt{a}} \int_{-\infty}^{\infty} f(t) \psi\left(\frac{t-b}{a}\right) dt$$

Where  $a$  and  $b$  are continuously varying scaling and translation parameters,  $(t)$  is the complex conjugate. This definition of the CWT shows the wavelet analysis is a measurement of the similarity between the basis functions and the signal itself. Here, the similarity is in the sense of similar frequency content. It provided good resolution in both the time and frequency domains.

Fuzzy Logic Controller (FLC) :

**Step 1** Define linguistic variables and terms as follows: To design the system we took the initial parameters. Sources = {very low, low, normal, high, very high}

**Step 2** Construct membership functions for them. In this section, the fuzzy logic controller is designed systematically to control the power transistor. The designed has two input signals that are the error voltage (E) and the dwell angle of (DA). The input signals, FLC generates one output that is duty cycle of power transistor.

**Step 3** Construct knowledge base rules and create a matrix of target values and the expected values, which will be further applied to construct the IF-THEN-ELSE rules.

**Step 4** Obtain fuzzy value and fuzzy set operations perform evaluation of rules. The operations used for OR and AND are Max and Min respectively. Combine all results of evaluation to format final result. The result is fuzzy value.

**Step 5** Perform defuzzification. It is performed according to membership function for output variable.

## DISCUSSION

The fuzzy logic classifier model developed using MATLAB Simulink for fuzzy logic fault diagnosis. In this study, input variables were transferred from the MATLAB working environment to the fuzzy logic controller. Fuzzification was performed according to the number of membership and the type of membership function selected by the fuzzy logic classifier. Fuzzy values are the rules defined by an expert and using fuzzy logic operations, output membership functions, and values of membership functions were obtained. The experiment is then informed of the obtained fault diagnosis. The experiment can change the number of input and output variables of the fuzzy logic controller and limit the values of membership functions in the MATLAB fuzzy inference system editor and can add rules to the rule base or can change the existing rules. In the fuzzy inference system editor, the shape and the number of membership functions of input and output variables can be changed. These features give flexibility to fuzzy logic fault diagnosis and provide clearer results.

## CONCLUSIONS AND FUTURE RESEARCH

In this study, researcher proposed a fuzzy logic based automotive direct ignition coil fault diagnosis system detecting was presented. As experimental is guideline more susceptible to faults diagnosis, the fault detection was performed to enhance the automotive service technicians problem-solving skills during training. By the designing system, faults can be observed in the SI engine were effectively to employ detected. The fuzzy logic fault diagnosis system was tested concerning different faults. The fuzzy logic classifier was found to classify the further data. This system will be further conducted by researcher the general faults. For instance, by investigating only the ignition faults, the defective element can be detected. Also, sensor faults can be detected in SI engines with electronic management systems by comparing the sensor signals of normal and defective engines. By changing the rule base and increasing the numbers of input variables, more faults can be detected. The developed system can be converted to an appropriate tool for fault diagnosis with appropriateness training without removing the engine from the vehicle.

### ACKNOWLEDGEMENTS

This research was supported by grants from Institute of Research and Development at Nakhon Si Thammarat Rajabhat University contract no. 10/2560 and 29/2560. Researcher would like to express really sincere gratitude to Mr.Thammanoon Sangkhawan, General Manager in Networking Division, Mr.Kullachat Chutichawakul General Manager in Training Division, Mr.Preecha Atthamane, Manager in Training Division, and trainers from Nissan Motor (Thailand) Co.,Ltd for technical contribution.

### REFERENCES

- [1] Dinca, L., Aldemir, T., and Rizzoni, G. (1999). A model-based probabilistic approach for fault detection and identification with application to the diagnosis of automotive engines, *IEEE Transactions on Automatic Control*, 44, 2200–2205.
- [2] Wong, P.K., Tam, L.M., Li, K., and Vong, C.M. (2010). Engine idle-speed system modeling and control optimization using artificial intelligence, Proceedings of the Institution of Mechanical Engineers, Part D, *Journal of Automobile Engineering*, 224, 55–72.
- [3] Schweppe, H. Zimmermann, A. and Grill, D. (2010). Flexible on-board stream processing for automotive sensor data, *IEEE Transactions on Industrial Informatics*, 6, 81–92.
- [4] Mohammadpour, J., Franchek, M., and Grigoriadis, K. (2012). A survey on diagnostic methods for automotive engines, *International Journal of Engineering Research*, 13, 41–64.
- [5] Hollembeak, B. (1997). *Automotive electricity & electronics*. New York: Delmar Publisher.
- [6] Azarian, A., and Siadat, A. (2012). A global modular framework for automotive diagnosis, *Advanced Engineering Informatics*, 26, 131–144.
- [7] Silapawilas, R. (2016). Analysis and Diagnosis of Nissan Direct Ignition Control System, *Industrial Technology Journal of Nakhon Si Thammarat Rajabhat University*, 9 (2), 51-56.
- [8] Azarian, A. Siadat, A., and Martin, P. (2011). A new strategy for automotive off-board based on a meta-heuristic engine, *Engineering Applications of Artificial Intelligence*, 24, 733–747.
- [9] Poisson, O., Rioual, P., & Meunier, M. (1999). New signal processing tools applied to power quality analysis. *IEEE Transactions on Power Delivery*, 14 (2), 561–566.



**TREND AND CHANGE-POINT DETECTION IN RIVER RUNOFF OF THE HIEU RIVER,  
VIETNAM****Ho Thi Phuong***School of Chemical, Biological and Environmental Technologies, Vinh University, 182, Le Duan Street, Vinh  
City, Nghe An, Vietnam**Corresponding Tel: (+84) 986189146, E-mail address: phuongmt.dhv@gmail.com***ABSTRACT**

Hieu River is the largest tributary on the left bank of the Ca River, which is one of the large basins in north-central Vietnam. Annual rainfall and runoff data for the period 1962–2014 were used for this study. Cumulative anomaly test and Pettitt test were used to determine the turning points of the time series. In addition, a non-parametric Mann-Kendall trend test was used to analyse the trends of these series. The results of our statistical analysis reveal a breaking point in 1982 for the rainfall time series and in the late 1970s and late 1990s for the discharge time series. The trend test results indicated that the rainfall has the negative trend. The discharge at Quy Chau station have positive Kendall's (S) values during 1961–2014, however, discharge at Nghia Khanh have negative Kendall's (S) value during 1973–2014. No significant trend at significant level 0.05 of rainfall and discharge was observed.

**KEYWORDS:** discharge, turning points, cumulative anomaly test, Pettitt test, Mann-Kendall test.

## INTRODUCTION

More attention has been paid to the subject of trend detection in historic stream-flow during the last decades, due to its correlation to global climate changes and human activities. For instances, Yao et al. (2015) investigated the runoff and sediment load variations of the Xiliugou Basin in the Upper Yellow River during 1960–2012 [1]. Salami et al. (2014) studied the trend of hydro-meteorological variables of the Niger river in 1960–2012 [2]. Salarijazi et al. (2012) investigated the trend and changing-point detection for the annual stream-flow of the Karun River watershed located in the southwest region of Iran [3]. It has been reported that the current global climate change has changed the situation of the water cycle, which causes a series of problems about water resources [5]. The decrease of the river runoff is observed in many rivers due to the increase of temperature and the decrease of precipitation [6]. Anthropogenic factors such as afforestation, water withdrawing for developing economies, water diversion for agricultural irrigation [6–8]. Land utilizations and reservoirs construction could also affect on the natural water environment, altering the dynamic equilibrium of the hydrologic cycle and initiating new processes and events [9, 10]. Identification of trends in long-term runoff is one of the important themes in hydrologic science, which may contribute to water resource management. This study investigated breaking-point and trends in annual runoff at the Hieu River basin in Vietnam during 1962–2014, using Mann-Kendall, cumulative anomaly, and Pettitt tests.

## STUDY AREA AND DATA COLLECTION

### Study area

Hieu River is the largest tributary on the left side of the Ca River, which is one of the large basins in north-central Vietnam. The Hieu river basin is located between 19°20'–19°50'N and 104°30'–105°20'E, covers an area of Nghe An's districts such as Que Phong (11 communes), Quy Chau, Quy Hop, Nghia Dan, Thai Hoa, Tan Ky, Anh Son (3 communes) and Nhu Xuan district (7 communes) of Thanh Hoa province. The catchment area of the Hieu River basin is 5,340 km<sup>2</sup> with a length of 228 km, originates from Pu Hoat Range in the Laos-Vietnam border, flowing into the Ca River at Anh Son.

### Data collection

Discharge data were available from 1962 at Quy Chau hydrological station and from 1973 at Nghia Khanh hydrological station. Meteorological data are collected at Quy Chau station during 53 years (1962–2014). All data were provided by the *North-Central Hydro-meteorological Centre of Vietnam*.

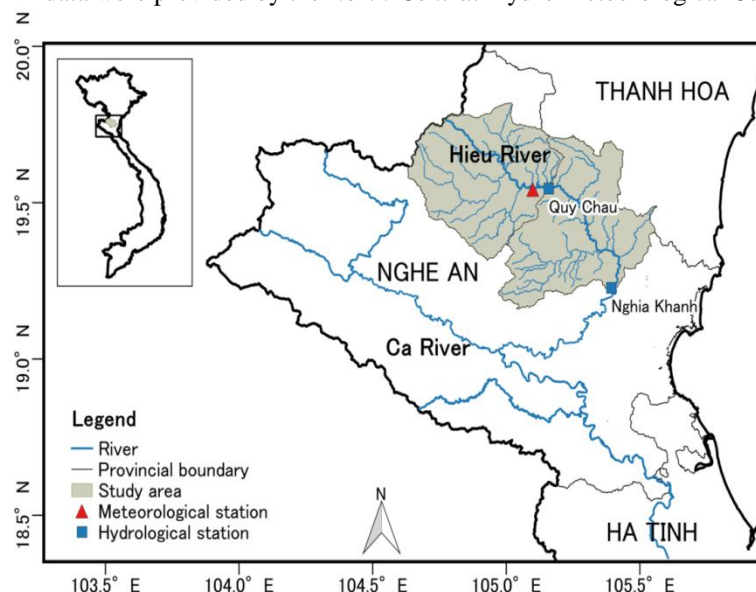


Figure 1. The map of Hieu river

## METHODS

### Cumulative anomaly

The cumulative anomaly is a statistical method to visually identify the change tendency of discrete data and is extensively used in meteorology [11]. For a discrete series  $x_i$ , the cumulative anomaly ( $X_i$ ) for data point  $x_i$  can be expressed as

$$X_t = \sum_{i=1}^t (x_i - x_m), t = 1, 2, \dots, n, (1)$$

$$\text{where: } x_m = 1/n \sum_{i=1}^t x_i (2)$$

where  $x_m$  is the mean value of the series  $x_i$ , and  $n$  is the number of discrete data points. The cumulative anomaly method could be used to analyze the inflection extend of a discrete data series.

#### **Pettitt test**

The Pettitt test is a nonparametric method widely applied to detect the abrupt changes of water discharge [1]. For a given time series  $X (x_1, x_2, \dots, x_N)$ , divided into two samples  $x_1, x_2, \dots, x_t$  and  $x_{t+1}, x_{t+2}, \dots, x_N$ , the Pettitt test uses a version of the Mann-Whitney statistic  $U_{t,N}$  calculated as

$$U_{t,N} = U_{t-1,N} + \sum_{j=1}^N \text{sgn}(x_t - x_j), t = 2, 3, \dots, N, (3)$$

$$\text{where: } \text{sgn}(x_t - x_j) = \begin{cases} 1 & \text{if } x_t > x_j \\ 0 & \text{if } x_t = x_j \\ -1 & \text{if } x_t < x_j \end{cases} (4)$$

The breakpoint is defined to be where  $|U_{t,N}|$  reaches its maximum value:

$$K_N = \text{Max}|U_{t,N}| (1 \leq t \leq N), (5)$$

The significance level associated with  $K_N$  is determined approximately by

$$p \cong 2 \exp \left[ \frac{-6(K_N)^2}{(N^3 + N^2)} \right] (6)$$

If  $p < 0.05$ , a significant change point exists.

#### **Mann-Kendall test**

The non-parametric Mann-Kendall test is commonly employed to detect monotonic trends in series of environmental data, climate data or hydrological data [3, 4]. The null hypothesis,  $H_0$ , is that there has been no trend over time. The alternative hypothesis,  $H_1$ , is that data follow a monotonic trend (increasing or decreasing) over time. The mathematical equations for calculating Mann-Kendall  $S$ ,  $V(S)$  and standardized test statistics  $Z$  are as follows :

$$S = \sum_{i=1}^{n-1} \sum_{j=i+1}^n \text{sgn}(x_j - x_i), (7)$$

$$\text{where : } \text{sgn}(x_j - x_i) = \begin{cases} 1 & \text{if } (x_j - x_i) > 0 \\ 0 & \text{if } (x_j - x_i) = 0 \\ -1 & \text{if } (x_j - x_i) < 0, \end{cases} (8)$$

$$V(S) = \frac{1}{18} [n(n-1)(2n+5) - \sum_{p=1}^q t_p(t_p-1)(2t_p+5)], (9)$$

$$Z = \begin{cases} \frac{S-1}{\sqrt{\text{Var}(S)}} & \text{if } S > 0 \\ 0 & \text{if } S = 0 \\ \frac{S+1}{\sqrt{\text{Var}(S)}} & \text{if } S < 0. \end{cases} (10)$$

where:  $x_i$  and  $x_j$  are the time series observations in chronological order,  $n$  is the length of time series  $t_p$  is the number of ties for  $p$ th values, and  $q$  is the number of tied values.

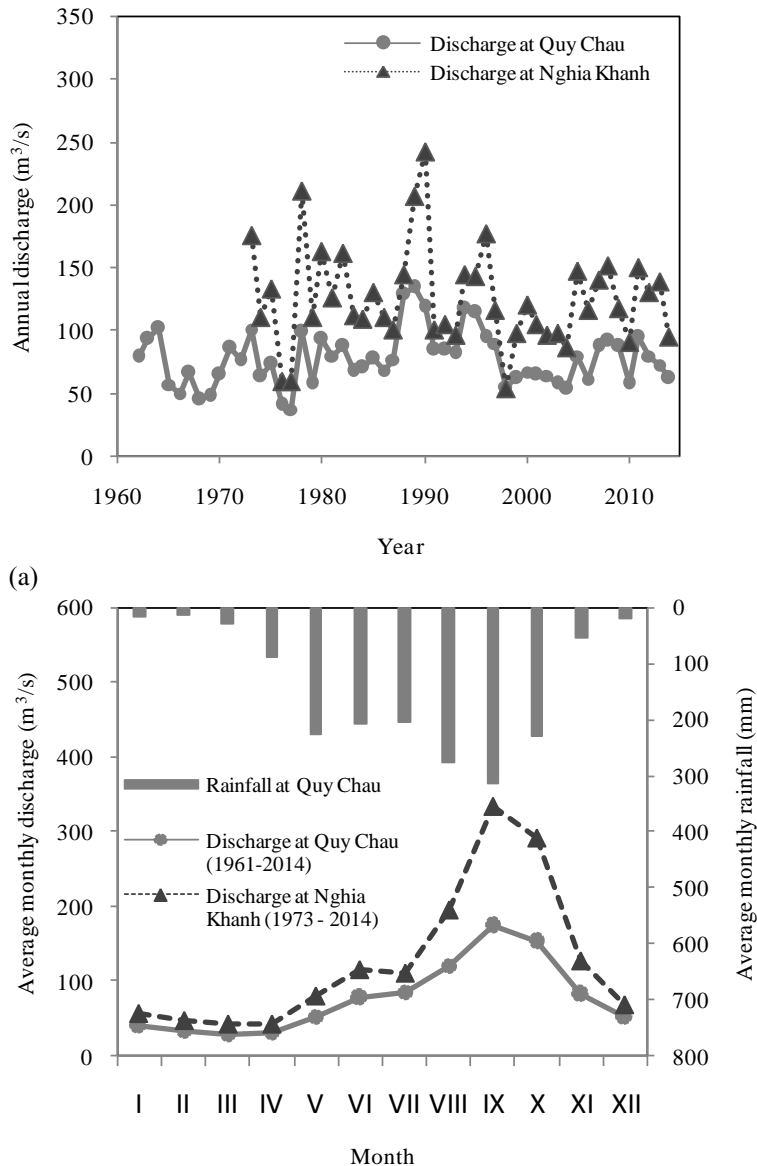
Positive  $Z$  values indicate an upward trend in the hydrologic time series; negative  $Z$  values indicate a negative trend. If  $|Z| > Z_{1-\alpha/2}$ ,  $H_0$  is rejected and a statistically significant trend exists in the hydrologic time series. The critical value of  $Z_{1-\alpha/2}$  for a  $p$ -value of 0.05 from the standard normal table is 1.96.

## **RESULTS**

### **Annual and monthly in precipitation, evaporation and runoff for period 1962-1985**

The collected data showed that the average annual precipitation and the Piche evaporation at Quy Chau station were, respectively, 1,668 mm and 732 mm during 1962–2014. The highest annual precipitation was 2,482 mm in 1978. The lowest annual precipitation was 1,102 mm in 1976. The mean annual flow was 77 m<sup>3</sup>/s during 1962–2014 at Quy Chau station. It was 126 m<sup>3</sup>/s during 1973–2014 at Nghia Khanh station. The annual discharge at Nghia Khanh was higher than that at Quy Chau, on average by approximately 1.6 times. The

average monthly flow varied respectively from 15 to 312 m<sup>3</sup>/s at Quy Chau station and from 42 to 334 m<sup>3</sup>/s at Nghia Khanh station. The average monthly discharge of Nghia Khanh was higher than that of Quy Chau, especially during the flood season.



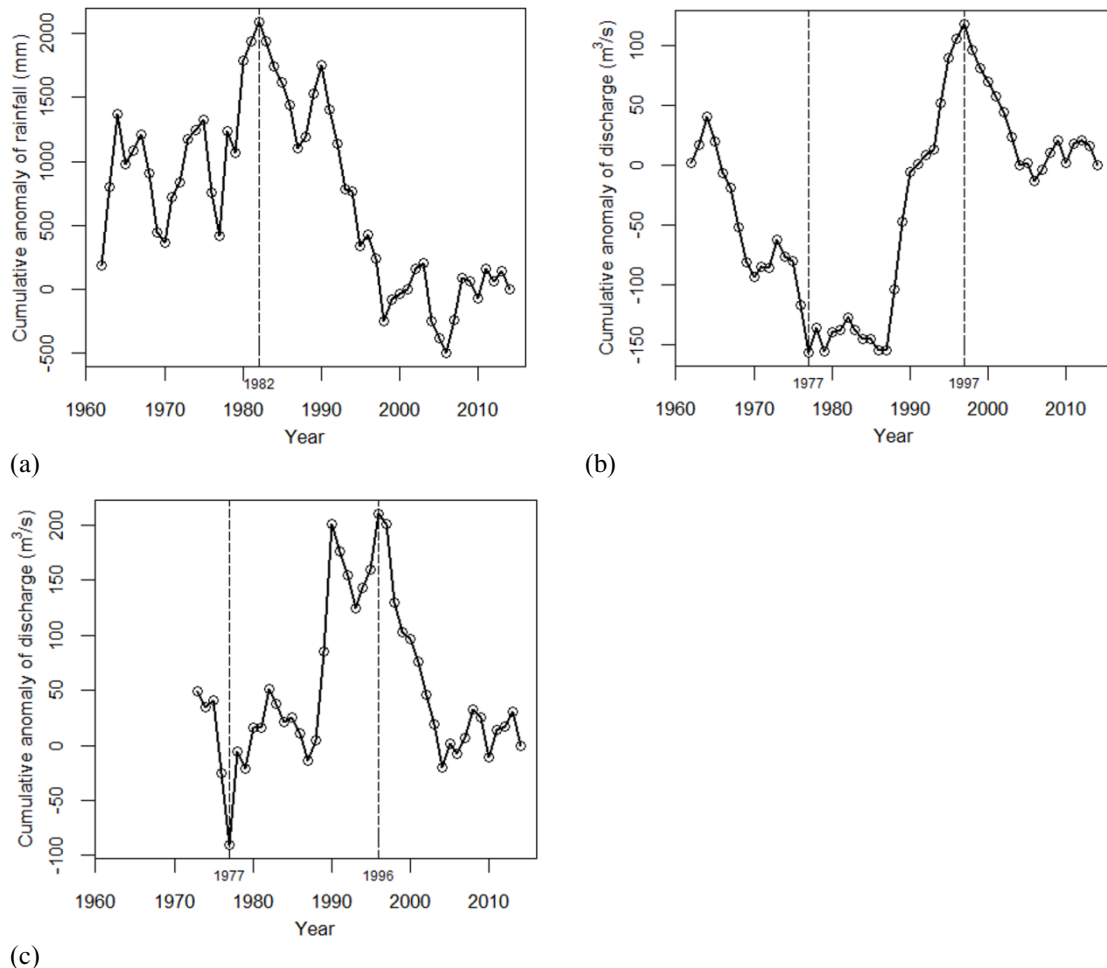
(b) **Figure 2.** Annual discharge (a) and mean monthly discharge rainfall (b) during 1962–2014 for the hieu river basin

#### *Change-point test of annual rainfall and discharge*

Cumulative anomaly test and Pettitt test are used to determine the turning points of the annual rainfall and discharge during 1962–2014. The Pettitt test results is shown in Table 1, indicates the changing points of annual rainfall series are at 1982 ( $K = 190$  and  $p = 0.4796$ ), annual discharge series for Quy Chau station at 1977 ( $K = 245$  and  $p = 0.2117$ ) and annual discharge series for Nghia Khanh station at 1996 ( $K = 120$  and  $p = 0.6402$ ). According to the Pettitt test results, the Cumulative anomaly test results in Figure 3 indicates the turning points of annual rainfall series is at 1982, of annual discharge series are at 1977 and 1997 for Quy Chau station and of annual discharge series 1977 and 1996 for Nghia Khanh station.

**Table 1.** Results of Pettitt test for the annual rainfall and annual discharge

No.	Station name	Parameter	Data period	Pettitt test		
				Change point	$K$	$p$
1	Quy Chau	Rainfall	1962-2014	1982	190	0.4796
		Discharge	1961-2014	1977	245	0.2117
2	Nghia Khanh	Discharge	1973-2014	1996	120	0.6402



**Figure 3.** Cumulative anomaly test results of annual rainfall (a), annual discharge at Quy Chau station (b) and annual discharge at Nghia Khanh station (c)

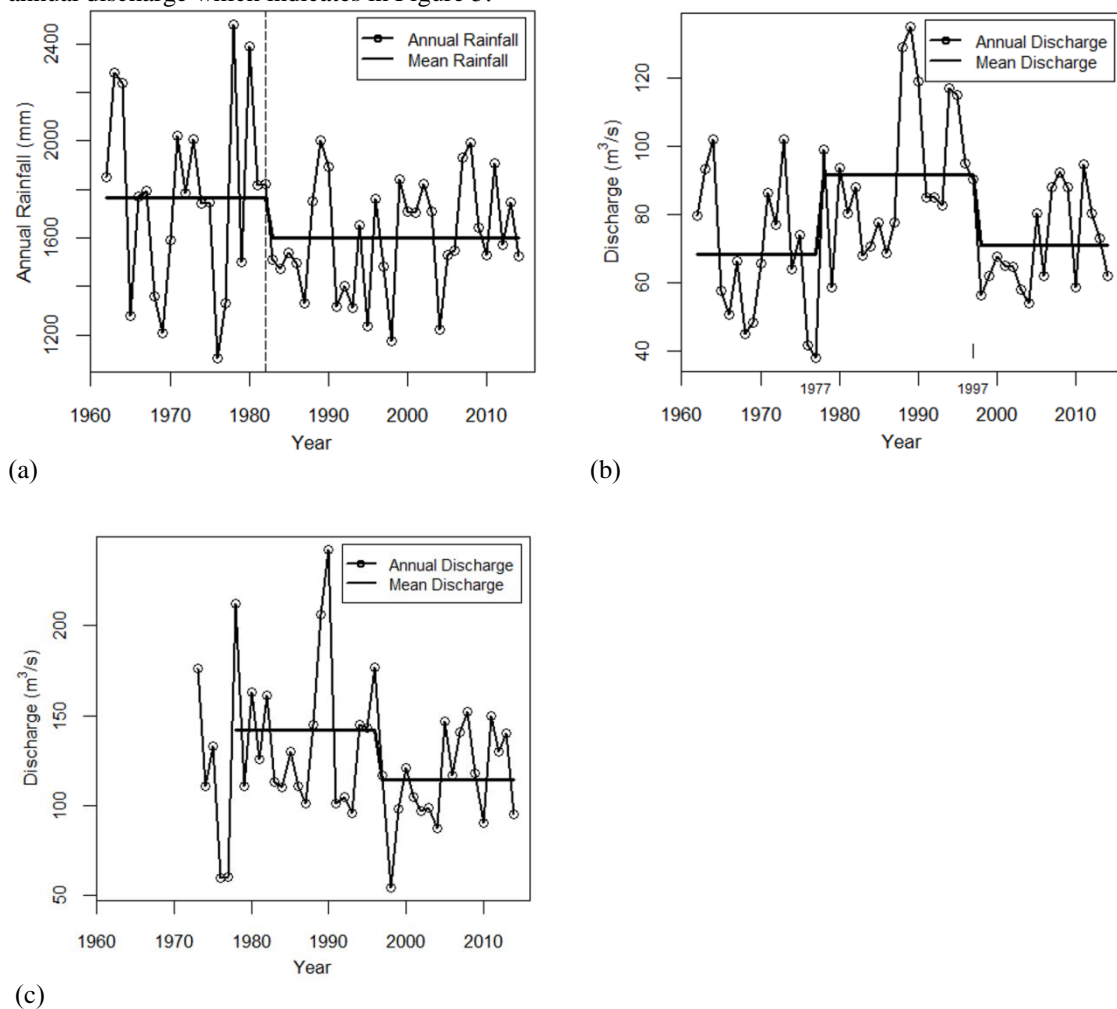
#### *Trend test of annual rainfall and discharge*

The non-parametric Mann-Kendall test is used to determine the direction and evaluate the trend of the rainfall and discharge series during period time 1962–2014 and period times at the changing points, which results in Table 2. The results indicate that the rainfall has the negative trend for all period times. The discharge at Quy Chau station have positive Kendall's ( $S$ ) values during 1961–2014, however, discharge at Nghia Khanh have negative Kendall's ( $S$ ) value during 1973–2014. For period 1996–2014, both stations show a positive trend in discharge. In addition, test statistic ( $Z$ ) values of all period time are less than 1.96, thus insignificant trend at significant level 0.05 of rainfall and discharge was observed.

**Table 2.** Results of Mann-Kendall test for the annual rainfall and runoff

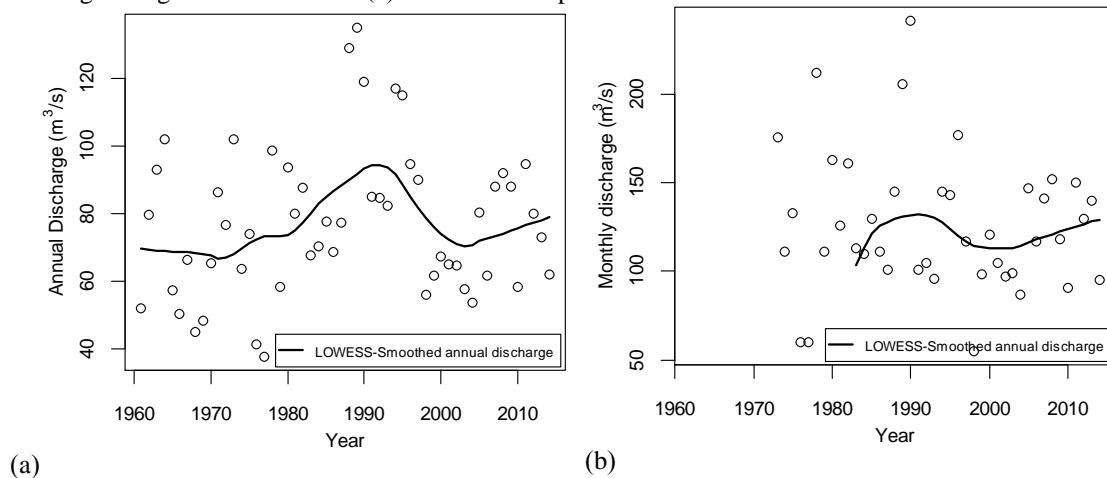
Station name	Parameter	Data period	Mann-Kendall test			
			S	Z	Trend nature	Trend significance
Quy Chau	Rainfall	<b>1962-2014</b>	-118	-0.90	Negative	No
		1962-1982	-25	-0.99	Negative	No
		1983-2014	-116	-1.50	Negative	No
	Discharge	<b>1961-2014</b>	104	0.77	Positive	No
		1961-1977	-25	-0.99	Negative	No
		1978 - 1997	44	1.40	Positive	No
		1998 - 2014	38	1.53	Positive	No
Nghia Khanh	Discharge	<b>1973-2014</b>	-73	-0.78	Negative	No
		1973 - 1977	-6	-1.22	Negative	No
		1977 - 1996	-16	-0.53	Negative	No
		1997 - 2014	36	1.33	Positive	No

Figure 4 shows the mean annual rainfall and discharges at Quy Chau and Nghia Khanh stations for different periods. The average annual rainfall is decreased from 1,768 mm in pre-1982 to 1,602 mm in post-1982. The average annual discharges are observed with the highest values at time period 1978–1997 for both stations, they are 91.6 m<sup>3</sup>/s at Quy Chau station and 142 m<sup>3</sup>/s Nghia Khanh station. The following are the period from 1998–2014 and finally the period before 1977, however, the differences between these periods are not noticeable. The results correspond to the results of the Lowess smoothed annual discharge which indicates in Figure 5.





**Figure 4.** Mean annual rainfall (a), mean annual discharge at Quy Chau station (b) and mean annual discharge at Nghia Khanh station (c) where a break point is identified



**Figure 5.** Lowess smoothed lines of annual discharge at Quy Chau station (a) and annual discharge at Nghia Khanh station (b) ( $f=0.4$ )

### CONCLUSIONS AND DISCUSSION

With cumulative anomaly tests and Pettitt tests, we detected turning points in annual rainfall and discharge. Our results reveal turning points in annual rainfall series in 1982 and turning points in the annual discharge series in 1977 and 1997 at Quy Chau. At Nghia Khanh, we noted turning points in the annual discharge series in 1977 and 1996.

The non-parametric Mann-Kendall test is used to determine the direction and evaluate the trend of the rainfall and discharge series during period time 1962–2014 and period times at the changing points. The results indicate that the rainfall has the negative trend for all period times. The discharge at Quy Chau station have positive Kendall's ( $S$ ) values during 1961–2014, however, discharge at Nghia Khanh have negative Kendall's ( $S$ ) value during 1973–2014. In addition, test statistic ( $Z$ ) values of all period time are less than 1.96, thus insignificant trend at significant level 0.05 of rainfall and discharge were observed.

Reportedly, the annual runoff of many rivers in arid and semi-arid regions around the world has decreased remarkably during recent decades [11]. The decrease in precipitation and/or the increase in evapotranspiration are regarded as direct influencing factors on the runoff decrease. The runoff decrease also might be caused by anthropogenic influences in the catchment, e.g. river regulation, dam construction or irrigation. In the study of Wang *et al.* (2014) points out that human activities have become a dominant influencing factor on the runoff increment changes in the Yellow River since the 1980s [3]. The streamflow and sediment load in the Yellow River basin have decreased greatly owing to anthropogenic impacts such as building dams and soil-water conservations [1]. The growth of population, temperature rise, construction of three dams, implementing the different projects for developing agricultural and conservation from soil and water resources can be due to the significant decreasing trend in the two sub-series of discharge (two sub-series at changing point) on the Karun River [3]. In this research site, the water budget of Hieu River basin was investigated for three different periods corresponding to the detected turning points. The results show that the single meteorological station (Quy Chau) was not quite well representative for the whole catchment during 1978–1998. The heavy rainfall may occur significantly at the upstream during 1982–1998. A marked decrease in runoff has occurred since 1999 at both hydrological stations, likely due to reservoir construction and water being intensively used for residential purpose and economic development.

### REFERENCES

- [1] Yao, H., Shi, C., Shao, W., Bai, J., Yang, H. (2015). Impacts of climate change and human activities on runoff and sediment load of the Xiliugou Basin in the Upper Yellow River. *Advances in Meteorology*, 2015. <http://dx.doi.org/10.1155/2015/481713>.

- [2] Salami, A.W., Mohammed, A.A., Abdulmalik, Z.H., Olanlokun, O.K. (2014). Trend analysis of hydro-meteorological variables using the Mann-Kendall trend test: Application to the Niger River and the Benue sub-basins in Nigeria. *International Journal of Technology*, 2014 (2), 100–110.
- [3] Salarijazi, M., Akhond-Ali, A., Adib, A., Daneshkhah, A. (2012). Trend and change-point detection for the annual stream-flow series of the Karun River at the Ahvaz hydrometric station. *African Journal of Agricultural Research*, 7 (32), 4540–4552.
- [4] Ahmad, I., Tang, D., Wang, T., Wang, M., Bakhtawar Wagan, B. (2015). Precipitation Trends over Time Using Mann-Kendall and Spearman's rho Tests in Swat River Basin, Pakistan. *Advances in Meteorology*, 2015. <http://dx.doi.org/10.1155/2015/431860>.
- [5] World Water Assessment Programme (2009). *The United Nations World Water Development Report 3: Water in a Changing World*. Paris: UNESCO Publishing, and London: Earthscan. [www.unesco.org/water/wwap/wwdr/wwdr3/](http://www.unesco.org/water/wwap/wwdr/wwdr3/)
- [6] Liu, C., Zheng, H. (2002). Hydrological cycle changes in China's large river basin: The Yellow River drained dry. In *Climatic Change: Implications for the Hydrological Cycle and for Water Management*, Beniston M (ed). Kluwer Academic Publishers; 209–224.
- [7] Miller, C., Cotter, J. (2013). *An Impending storm: Impacts of deforestation on weather patterns and agriculture*. Greenpeace Research Laboratories Technical Report (Review) 04-2013.
- [8] Zhang, L., Dawes, W.R., Walker, G.R. (2001). Response of mean annual evapotranspiration to vegetation changes at catchment scale. *Water Resources Research*, 37 (3), 701–708.
- [9] Zhao, Q.H., Liu, S.L., Deng, L., Dong, S.K., Wang, C., Yang, J.J. (2012). Assessing the damming effects on runoff using a multiple linear regression model: A case study of the Manwan Dam on the Lancang River. *Procedia Environmental Sciences*, 13, 1771–1780.
- [10] Shiklomanov, I.A. (1993). World water resources. In *Water in Crisis*, Gleick PH (ed). Oxford University Press: New York & Oxford.
- [11] Wang, S., Yan, M., Yan, Y., Shi, C., He, L. (2012). Contributions of climate change and human activities to the changes in runoff increment in different sections of the Yellow River. *Quaternary International*, 282, 66–77.

AN EXAMPLE REGARDING THE MEROMORPHIC  $\varphi$ -NORMAL FUNCTIONSDinh Bich Hao<sup>(1)</sup>, Dang Thi Thu Hien<sup>(2)</sup> and Nguyen Thi Hien<sup>(3)</sup>

(1) : Department of Mathematics, Hoa Lu University, Ninh Nhat, Ninh Binh city, Ninh Binh province, Viet Nam,  
haohao.209@gmail.com

(2) Department of Mathematics, Hoa Lu University, Ninh Nhat, Ninh Binh city, Ninh Binh province, Viet Nam,  
hientoanhl@gmail.com

(3) Department of Mathematics, Hoa Lu University, Ninh Nhat, Ninh Binh city, Ninh Binh province, Viet Nam,  
Email of Corresponding Author: haohao.209@gmail.com

## ABSTRACT

In this paper we give an example regarding the meromorphic  $\varphi$ -normal functions and some properties of meromorphic  $\varphi$ -normal functions.

**KEYWORDS:** Spherical derivative, normal function, meromorphic function.

## INTRODUCTION

Let  $M(D)$  denote the set of all meromorphic functions in the unit disc  $D := \{z : |z| < 1\}$  of the complex plane  $C$ . Lehto and K.I. Virtanen [2] showed that  $f \in M(D)$  is normal if and only if its spherical derivative  $f^\#(z) := |f'(z)| / (1 + |f(z)|^2)$  satisfies  $\sup_{z \in D} f^\#(z)(1 - |z|^2) < \infty$ .

Recently, R. Aulaskari and J. Rättyä [1] extend the definition of normal function to  $\varphi$ -normal function, where  $\varphi$  is smoothly increasing.

DEFINITION 1. An increasing function  $\varphi : [0, 1) \rightarrow (0, \infty)$  is called smoothly increasing if

$$\varphi(r)(1-r) \rightarrow \infty, \quad \text{as } r \rightarrow 1^- \quad (1)$$

and

$$R_a(z) := \frac{\varphi(|a + \frac{z}{\varphi(|a|)}|)}{\varphi(|a|)} \rightarrow 1 \quad \text{as } |a| \rightarrow 1^- \quad (2)$$

uniformly on compact subsets of  $C$ . For a given such  $\varphi$ , a function  $f \in M(D)$  is called  $\varphi$ -normal if

$$\|f\|_{N_\varphi} := \sup_{z \in D} \frac{f^\#(z)}{\varphi(|z|)} < \infty.$$

The class of all  $\varphi$ -normal functions is denoted by  $N^\varphi$ .

Moreover, a function  $f \in N^\varphi$  is said to be  $\varphi$ -strongly normal function, denoted by  $f \in N_0^\varphi$  if

$$f^\#(z) = o(\varphi(|z|)), \quad \text{as } |z| \rightarrow 1^-.$$

The first, we give an example regarding the meromorphic  $\varphi$ -normal functions.

EXAMPLE 1. Let  $\varphi : [0, 1) \rightarrow (0, \infty)$ ,  $r \mapsto \varphi(r) = (1-r)^{-\alpha}$ ,  $\alpha \in (1, \infty)$  is increasing such that (1) is satisfied. If  $\psi := \frac{1}{\varphi}$  is differentiable and convex on  $[r_0, 1)$  for some  $r_0 \in (0, 1)$ , then  $\varphi$  is smooth increasing. This because, let  $K \subset C$  be compact and choose  $R > 0$  such that  $K \subset \overline{D(0, R)}$ . Then, by (1), there exists an  $r_R \in (0, 1)$  such that  $\phi_a(z) := a + z/\varphi(|a|) \in D$ , for all  $z \in \overline{D(0, R)}$  if  $|a| \in (r_R, 1)$ , and thus  $R_a(z)$  is well-defined in this case.

Since  $\psi$  is decreasing, differentiable and convex on  $[r_0, 1)$  for some  $r_0 \in (0, 1)$ , we have

$$\sup_{z \in K} R_a(z) \leq \frac{\psi(|a|)}{\psi(|a| + R\psi(|a|))} \leq \frac{1}{1 + R\psi'(|a|)}$$

For all  $a$  such that  $|a| > \max\{r_R, r_0\}$ .

Since (1) is satisfied, we also have that  $\psi'(|a|) \rightarrow 0$  as  $|a| \rightarrow 1^-$  by the convexity. Therefore,

$$\limsup_{|a| \rightarrow 1^-} \sup_{z \in K} R_a(z) \leq 1.$$

In a similar manner, we can show that

$$\liminf_{|a| \rightarrow 1^-} \sup_{z \in K} R_a(z) \geq 1.$$

Hence we obtain (2).

Let  $\varphi: [0,1) \rightarrow (0,\infty)$ ,  $r \mapsto \varphi(r) = (1-r)^{-\alpha}$ ,  $\alpha \in (1,\infty)$  and a function  $f(z) = \frac{1}{z^2}$ . Then  $f(z) = \frac{1}{z^2}$  is a meromorphic normal function in the unit disc  $D$  and it also is a meromorphic  $\varphi$ -normal function.

The next results, we prove the following theorem.

**THEOREM 1.** Let  $\varphi: [0,1) \rightarrow (0,\infty)$  be smoothly increasing and let  $f \in M(D)$ . Then  $f \in N^\varphi$  if and only if there exists  $R > 0$  and  $M_R > 0$  such that

$$\sup \{ |f'(z)| / \varphi(|z|) : |f(z)| < R \} < M_R.$$

Moreover,  $f \in N_0^\varphi$  if and only if there exist  $R > 0$  such that

$$\lim_{|z| \rightarrow 1^-, |f(z)| < R} |f'(z)| / \varphi(|z|) = 0.$$

**THEOREM 2.** Let  $\varphi: [0,1) \rightarrow (0,\infty)$  be smoothly increasing and let  $f \in M(D)$ . Then  $f \in N^\varphi$  if and only if there exist  $r, \lambda \in (0,1)$  such that

$$\sup_{\lambda \leq |a| < 1} \int_{\Delta_\varphi(a,r)} (f^\#(z))^2 dA(z) < \pi \quad (3)$$

with  $\Delta_\varphi(a,r) = \{ \phi_a(\omega) : |\omega| < r \}$ .

## MATERIAL AND METHODS

Theoretical research method: research books, newspaper.

## RESULTS

### 3.1. PROOF OF THEOREM 1

Let  $f \in M(D)$  and  $R > 0$ . If  $\sup \{ |f'(z)| / \varphi(|z|) : |f(z)| < R \} < \infty$  then Theorem 2[3] implies  $f \in N^\varphi$ . Conversely, if  $f \in N^\varphi$  then clearly

$$\sup_{|f(z)| < R} \frac{|f'(z)|}{\varphi(|z|)} = \sup_{|f(z)| < R} (1 + |f(z)|^2) \frac{f^\#(z)}{\varphi(|z|)} \leq (1 + R^2) \|f\|_{N^\varphi}.$$

To prove the second assertion, let  $f \in M(D)$  and  $R > 0$ . If  $\lim_{|z| \rightarrow 1^-, |f(z)| < R} |f'(z)| / \varphi(|z|) = 0$  then

Theorem 2 [3] implies  $f \in N_0^\varphi$ . Conversely, if  $f \in N_0^\varphi$  then

$$\begin{aligned} \lim_{|z| \rightarrow 1^-, |f(z)| < R} \frac{|f'(z)|}{\varphi(|z|)} &= \lim_{|z| \rightarrow 1^-, |f(z)| < R} (1 + |f'(z)|^2) \frac{f^\#(z)}{\varphi(|z|)} \\ &\leq (1 + R^2) \lim_{|z| \rightarrow 1^-, |f(z)| < R} \frac{f^\#(z)}{\varphi(|z|)} = 0. \end{aligned}$$

### 3.2. Proof of theorem 2

If  $f \in N^\varphi$ , then (2) implies that there exist  $C > 0$  and  $\lambda \in (0,1)$  such that

$$\begin{aligned} \int_{\Delta_\varphi(a,r)} (f^\#(z))^2 dA(z) &< \|f\|_{N^\varphi}^2 \int_{\Delta_\varphi(a,r)} (\varphi(|z|))^2 dA(z) \\ &\leq C \|f\|_{N^\varphi}^2 \int_{\Delta_\varphi(a,r)} (\varphi(|a|))^2 dA(z) \\ &\leq C \|f\|_{N^\varphi}^2 \pi r^2 \end{aligned}$$

for all  $|a| \geq \lambda$ . The assertion (3) follows by choosing  $r$  sufficiently small.

If (3) is satisfied, then

$$\sup_{\lambda \leq |a| < 1} \frac{1}{\pi} \int_{D(0,r)} ((f \circ \phi_a)^\#(z))^2 dA(z) < 1$$

And hence

$$\sup_{\lambda \leq |a| < 1} \int_{\Delta_\phi(a,r)} ((f \circ \phi_a)^\#(0))^2 = \sup_{\lambda \leq |a|, 1} f^\#(a) / \phi(|a|) < \infty$$

by Dufresnoy's theorem: "if  $f(z)$  is meromorphic in  $|z| < r_0$  and  $S(r_0) = S(r_0, f) < 1$  then

$$(f^\#(0))^2 \leq \frac{1}{r_0^2} \frac{S(r_0)}{1 - S(r_0)}."$$

It follows that  $f \in \mathcal{N}^\phi$ .

## DISCUSSION AND CONCLUSIONS

We gave an example regarding the meromorphic  $\phi$ -normal function and proved some results for  $\phi$ -normal function. One of the developing directions of the article is to establish an analogue for meromorphic map.

## ACKNOWLEDGEMENT

WE WOULD LIKE TO THANK TO PROF. NGUYEN HUYNH PHAN, PRESIDENT OF INSTITUTE FOR RESEARCH AND DEVELOPMENT OF NEW TECHNOLOGIES, VINH CITY FOR SHOWING US AN ERROR IN EARLY VERSION OF THIS MANUSCRIPT AND THE REFEREE FOR HELPFUL COMMENTS.

## REFERENCES

- [1] R. Aulaskari and J. Räsänen. 2011. *Properties of meromorphic  $\phi$ -normal functions*, Michigan Math. J. (60), 93-111.
- [2] O. Lehto and K.I. Virtanen. 1957. *Boundary behaviour and normal meromorphic functions*, Acta Math. (97), 47-65.
- [3] Dinh Bich Hao and Dang Thi Thu Hien. *On the meromorphic- $\phi$ -normal function*, ICSSS2016.



**A PERFORMANCE STUDY OF ANALYTIC HIERARCHY PROCESS FOR  
ORGANIZING DYNAMIC TEAM IN MULTIPLAYER ONLINE GAMES**

Jakkrit Chotkiattikun\* and Suntorn Witosurapot

*Department of Computer Engineering**Prince of Songkla University, Thailand**Corresponding E-mail: Jakkrit.ch@outlook.com and wsuntorn@coe.psu.ac.th***ABSTRACT**

Many multiplayer online games need to organize their players with a variety of game experiences as a team for playing games or sports. This is considered a critical problem that will cause the unfair competitiveness of the team, if some inefficient method of team assignment is employed. However, we are in favor of the method that empowers players to be involved into the assignment process for enabling a better engagement to the game. This is in contrast to typical method that takes merely the players' skill into consideration. In this paper, we study how such a requirement can be accomplished by using the multiple decision approach of Analytic Hierarchy Process. Based on our numerical analysis, the results of selection process look promising and the system can be flexible to provide the optimal selection of players to a team, depending on the players' requirements.

**KEYWORDS:** Multiplayer Online Games, Priority-based Matchmaking, Multi-Criteria Decision Making, Analytic Hierarchy Process

## INTRODUCTION

Multiplayer Online Games, also known as MOGs [1] has drastically gained its popularity since it can allow multiple players to join as a team for fulfilling the common objective as found in various games of Multiplayer Online Battle Arena, such as Defense of the Ancients 2 (DOTA 2), League of Legends (LOL) and Heroes of Newerth (HON), etc. However, this sort of game only takes a viewpoint of game server into consideration for assigning players to suitable teams owing to their skills [2 - 4] or geographical location [5]. While this sort of game server-centric approach is rather straightforward to select a compatible team for certain player, it does not take the player's preferences into consideration. Therefore, it is not well-suited for serving a game policy that may require the assorted levels of skilled players, either for practicing or more challenging purposes in games. In this regard, some form of priority-based matchmaking mechanism will be needed for enabling the required game policy.

Among several choices of Multi-Criteria Decision Making (MCDM), the choice of Analytic Hierarchy Process (AHP) [6] is in favor, due to many salient features [7] as follows: a) allowing both qualitative and quantitative criteria to be considered together in the system, b) computing relative priorities of decision criteria using pairwise-based comparisons, and c) enabling the inconsistency detection of data involved into the decision-making process. So far, AHP has not yet found applying in the online game environment [8]. However, the system architecture under consideration involving with AHP in the matchmaking mechanism (the circle number 2) can be depicted in the Fig. 1. It can be noticed that a player's preference (the circle number 1) will need to be fed as an input to the system and the output will be the list of players assigning to the same team (the circle number 3) will be given as a result. In this paper, we aim to determine how different criteria and sub-criteria should be constituted for building an efficient hierarchical structure needed for the AHP model working in the MOG environment.

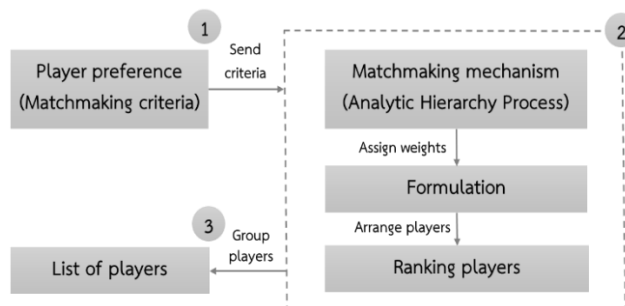


Fig. 1 The system architecture of a game engine and players

## MATERIALS AND METHODS

In this section, we summarize the AHP method that will be used to organize players with different playing skills and personal preferences in dynamic teams of MOGs. Indeed, AHP is a ranking process that derives ratio scales from paired comparisons of criteria, and allows for some small inconsistencies in judgments, which are subjective opinions, such as player's skill and preferences, in our case, but are transformed to 1-9 numeric scale of relations. By working in this manner, AHP will allow us to weight coefficients and compare alternatives with relative ease. In essence, the AHP method helps us to prioritize the selection criteria, and differentiate the more important criteria from the less important ones in an easy manner. Using AHP [9], it is required that the problem must be modelled as a hierarchy structure so that a) possible decision criteria, sub-criteria, and alternatives can be known, and b) the most significant criteria with respect to the decision objective can be selected. Then, the pairwise comparisons will be performed in such a way that logical inconsistencies can be discovered and corrected if necessary. The similar step will continue for the sub-criteria so that the final result of priorities for alternatives can be known, and calculated further for obtaining the ranking value of certain player as desired.

Based on the AHP process [9] described briefly above, our proposed AHP model will be described in the next section, following with the empirical study on the performance of our model. In this regard, DOTA 2 game<sup>1</sup> will be considered as an example in the paper. Due to the nature of multiplayer online battle arena game,

<sup>1</sup> <http://dota2.com/>

it demands two teams of five players to fight against each other. So, many issues of skill, language, region, and the game mode can be well-used for formulating the strength of a team. As shown in Table I, these issues will be needed to classify into levels so that various combinations of these issues can be arbitrarily formed. Noted that the other issues can be used, depending on the kind of games, such as roles in collaborative game (e.g. Ragnarok Online<sup>2</sup>), or ages in horror games (e.g. Home Sweet Home<sup>3</sup>) etc. Nevertheless, our experiment will demonstrate on the case of DOTA 2 game. In this experiment, the description of player's preference metrics as given in Table I will be considered, and a dataset of 20 simulated players and preferences as seen in Table II will be involved. Here, we assume that the desired requirement for recruiting players to a team is as follows: Skill = Low, Language = Spanish, Region = Southeast Asia and Game Mode = All Pick. In addition, to highlight our proposed method, the experiments will be conducted and compared with the typical method, where the same issues will be similarly concerned, but the "if-else" style of operations will be sequentially performed.

Table 1 : Preference metrics of players in the DOTA 2 game

Issues	Levels
Skill	Low, Medium, High, Very High
Language	English, Chinese, Russian, Spanish
Region	China, Russia, Australia, Southeast Asia
Game Mode	All Pick, Captains Mode, Random Draft

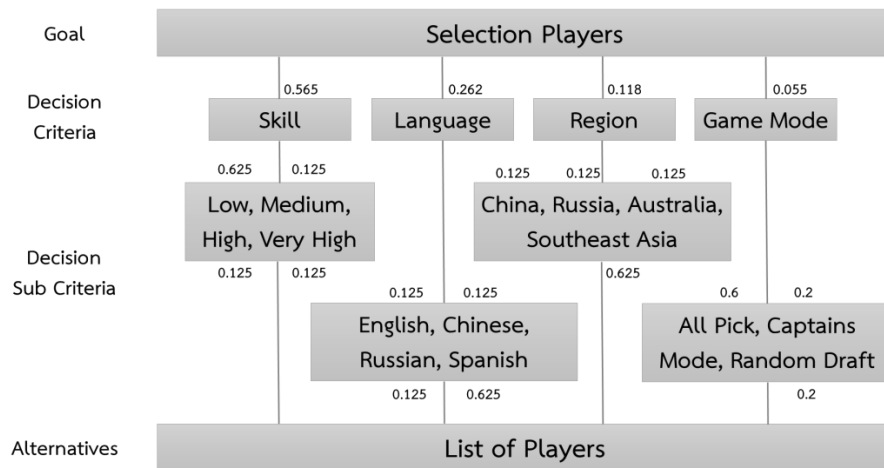


Fig. 2 The proposed AHP model involving player's skill and preferences for team selection.  
(Note: All weighted values are assumed to be the experiment of case 2)

<sup>2</sup> <https://ro.exe.in.th/>

<sup>3</sup> <https://www.homesweethomegame.com/>

Table 2 Dataset of players

Player No.	Skill	Language	Region	Game Mode
1	Medium	English	Southeast Asia	All Pick
2	Low	Spanish	Southeast Asia	All Pick
3	Medium	Chinese	China	Captains Mode
4	V. High	Spanish	Australia	Random Draft
5	Low	Chinese	Southeast Asia	All Pick
6	Low	Spanish	Russia	Captains Mode
7	Low	Spanish	Southeast Asia	Random Draft
8	Medium	Russian	China	Random Draft
9	Low	Russian	Australia	Random Draft
10	High	Chinese	Southeast Asia	Random Draft
11	Low	Chinese	China	Captains Mode
12	V. High	Spanish	Russia	Random Draft
13	Medium	English	Southeast Asia	Random Draft
14	High	Spanish	Russia	Captains Mode
15	V. High	Chinese	Russia	Captains Mode
16	V. High	Chinese	China	Captains Mode
17	Low	Russian	Southeast Asia	Random Draft
18	Medium	Russian	Russia	All Pick
19	High	Spanish	Southeast Asia	All Pick
20	V. High	Chinese	China	Random Draft

## RESULTS AND DISCUSSION

In Fig. 2, we show our proposed AHP hierarchical model that looks promising for serving the general MOGs, but are especially focused on the case of DOTA 2 game for the ease of understanding. In what follows; let assume the weights of criteria and the normalized weights of sub-criteria under each criteria as shown in Table III and IV respectively. We conduct our experiments in two testing scenarios as follows:

Case 1: Equal normalized weights of decision criteria

(Skill = 0.25, Language = 0.25, Region = 0.25 and Game Mode = 0.25)

Case 2: Different normalized weights of decision criteria

(Skill = 0.565, Language = 0.262, Region = 0.118 and Game Mode = 0.055)

Table 3 : Weights of each decision criteria: Case 1 (left) and Case 2 (right)

Decision Criteria	Weight	Consistency Ratio	Ranking	Decision Criteria	Weight	Consistency Ratio	Ranking
Skill	0.25	0	1	Skill	0.565	0.043	1
Language	0.25		1	Language	0.262		2
Region	0.25		1	Region	0.118		3
Game Mode	0.25		1	Game Mode	0.055		4

Table 4 : Normalized weights of decision sub-criteria under each criteria

Decision Criteria	Decision Sub-criteria				Consistency Ratio (CR)
Skill	<i>Low</i>	<i>Medium</i>	<i>High</i>	<i>Very High</i>	0
	0.625	0.125	0.125	0.125	
Language	<i>English</i>	<i>Chinese</i>	<i>Russian</i>	<i>Spanish</i>	0
	0.125	0.125	0.125	0.625	
Region	<i>China</i>	<i>Russia</i>	<i>Australia</i>	<i>Southeast Asia</i>	0
	0.125	0.125	0.125	0.625	
Game Mode	<i>All Pick</i>	<i>Captains Mode</i>	<i>Random Draft</i>		0
	0.60	0.20	0.20		

Table 5 : Total score of top 5 players (Case 1)

Player No.	Skill	Language	Region	Game Mode	Total score
2	Low	Spanish	Southeast Asia	All Pick	0.61875
7	Low	Spanish	Southeast Asia	Random Draft	0.51875
5	Low	Chinese	Southeast Asia	All Pick	0.49375
19	High	Spanish	Southeast Asia	All Pick	0.49375
6	Low	Spanish	Russia	Captains Mode	0.49375

Table 6 : Total score of top 5 players (Case 2)

Player No.	Skill	Language	Region	Game Mode	Total score
2	Low	Spanish	Southeast Asia	All Pick	0.623625
7	Low	Spanish	Southeast Asia	Random Draft	0.601625
6	Low	Spanish	Russia	Captains Mode	0.542625
5	Low	Chinese	Southeast Asia	All Pick	0.492625
17	Low	Russia	Southeast Asia	Random Draft	0.470625

After randomized selection of players, it can be noticed we can potentially obtain a different set of players in a team according to the all settings in decision criteria and sub-criteria as seen in Table V and VI above. Here, only the top 5-ranking players will be selected from the list ranking with total score to fit a 5-player team.

- In the case 1: All weights of criteria are equal. Only a player (Player No.2) in the team is exactly matched to the desired specification as shown in Table V. The rest of players are selected via the compromise among the other criteria (by the AHP algorithm) from the sorted list by the total score).

- In the case 2: The “Skill” criteria has the highest weight compared with the other one, but specifying with the “low” sub-criteria. According to the AHP algorithm, all “low-skilled” players can be best-selected to form a team as shown in Table VI.

Based on the bar graphs shown in Fig. 3, it can be clearly seen that AHP-based method of player selection is indeed more flexible than that of typical rule-based method. It is in the sense that the compromised criteria can be applied to fill up the required number of players. Unlike the typical rule-based one, only the exact match of all criteria will be strictly concerned, hence the lower number or none of players may be possibly obtained.

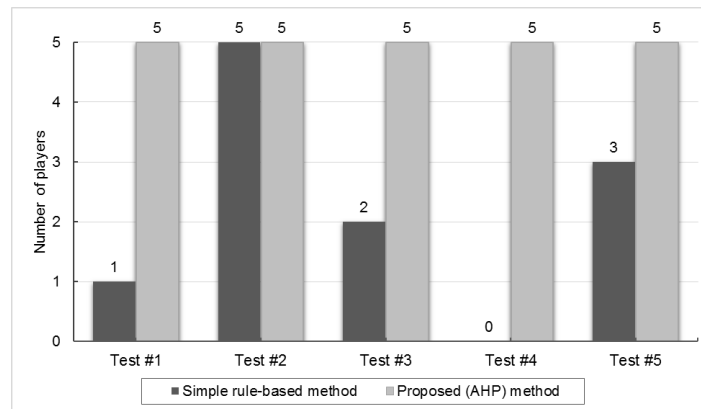


Fig. 3 Comparison of experiments on both methods

### CONCLUSION

We have investigated on the performance of the Analytic Hierarchy Process applying to the case of Multiplayer Online Games. With the advantages of AHP, it becomes easy to take both players' skill and personal preferences into account for selecting a suitable team for certain players to the game. By working in contrast to typical server-centric view of operation, our proposed AHP-based mechanism has shown its efficiency and flexibility for coping with different policies as seen in comparative results of our preliminary experiments. Therefore, it can give extreme benefits to the world of MOGs in many cases that may demand the mixed levels of players' skills within a team for some purposes. However, the performance study in a realistic game environment will be needed. This is already scheduled in our future plan.

### REFERENCES

- [1] J. R. Jiang, G. Y. Sung, and J. W. Wu, "LOM: A LEADER ORIENTED MATCHMAKING ALGORITHM FOR MULTIPLAYER ONLINE GAMES," 2015.
- [2] T. Graepel and R. Herbrich, "Ranking and matchmaking," *Game Developer Magazine*, 25–34, 2006.
- [3] Prakannoppakun, N., & Sinthupinyo, S. (2016, June). "Skill rating method in multiplayer online battle arena," *In Electronics, Computers and Artificial Intelligence (ECAI), 8th International Conference on* (pp. 1-6). IEEE, 2016.
- [4] O. Delalleau, E. Contal, E. Thibodeau-Laufer, R. C. Ferrari, Y. Bengio, and F. Zhang, "Beyond skill rating: advanced matchmaking in ghost recon online," *IEEE Trans. on Computational Intelligence and AI in Games*, 4 (3), 167-177, 2012.
- [5] S. Agarwal and J. R. Lorch, "Matchmaking for online games and other latency-sensitive P2P systems," *in Proc. of ACM SIGCOMM Conference on Data Communication*, 315-326, 2009.
- [6] R. Russo, R. Camanho, "Criteria in AHP: a Systematic Review of Literature," *Procedia Computer Science*, 55, pp. 1123-1132, 2015.
- [7] A. Rueangprathum, S. Limsiroratana, and S. Witosurapot, "AHP-based Adaptive Resource Selection for Cognitive Platform in Cloud Gaming Service," *GSTF Journal on Computing (JoC)*, vol. 4, no. 4, 2016.
- [8] E. Lotfi, B. Amine, B. Mohammed, "Application of Analytic Hierarchical Process Method for Video Game Genre Selection," *International Journal of Computer Applications*, vol. 96, no.16, pp. 30-37 2014.
- [9] N. F. Aziz, S. Sorooshian and F. Mahmud, "MCDM-AHP METHOD IN DECISION MAKINGS," *ARNP J. of Engineering and Applied Sciences*, vol.11, no.11, June 2016.



**THE PHOTOCATALYTIC REACTION OF TiO<sub>2</sub>@ SiO<sub>2</sub> NANOCOMPOSITES**

Anchalee Makhin, Chanukorn Tabtimsai, Patcharaporn Pimchan\*

*Department of chemistry, Faculty of Science and Technology, Rajabhat MahaSarakham University,  
MahaSarakham, 44000, Thailand*

*Corresponding email ;Patcharaporn145@gmail.com*

**ABSTRACT**

The nanocomposites of TiO<sub>2</sub> and SiO<sub>2</sub> microporous from sticky rice husk ash were investigated. The effect of synthesis and catalytic efficiency of the nanocomposite were examined by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR) and scanning electron microscope (SEM). The catalytic efficiency of nanocomposite were analyzed by UV-visible spectroscopy (UV-Vis). The XRD patterns confirmed the kind photocatalytic anatase TiO<sub>2</sub> were synthesized. The nanocomposites with varies the ratio of TiO<sub>2</sub> at 5, 10 and 15% by weight (5TS, 10TS and 15TS) were prepared. From SEM of the nanocomposites this sentence revised that SEM results revealed the presence that 10%TiO<sub>2</sub>/SiO<sub>2</sub> nanocomposite by weight, which displayed the high distribution of nano TiO<sub>2</sub> inside the pores of SiO<sub>2</sub>. The TiO<sub>2</sub> nanoparticles are arranged in linear ridges and furrows, and when increase the amount of TiO<sub>2</sub> at 15% by weight the agglomeration of the particles in the pores and remain in the surface. The catalytic property of TiO<sub>2</sub>@SiO<sub>2</sub> nanocomposite was investigated by the reduction of methylene blue (MB). The lower amount of TiO<sub>2</sub> (5%) exhibited the higher photocatalytic, that degenerated the MB at 97.5% at 5 min under UV irradiation. The SiO<sub>2</sub> mesoporous from sticky rice husk ash are the new alternative to use for the template for TiO<sub>2</sub>@SiO<sub>2</sub> nanocomposite.

**KEYWORDS** : Titanium dioxide, Silica, nanoporous, nanocomposite

## INTRODUCTION

TiO<sub>2</sub> is one of the most widely studied photocatalyst for environmental applications due to its nontoxic nature, chemical stability, commercial availability at a low cost and robust, general reactivity [1]. TiO<sub>2</sub> nanoparticles applications and properties depend on the particle size, structure, effective surface area and surface properties [2]. Concerning photocatalysis, the nanosize offers a reduced number of electron-hole recombinations and an increased active surface area that enhances the material performances [3]. The photocatalytic disinfection efficiency is attributed to the oxidative damage mainly induced by reactive oxygen species (ROS), like O<sub>2</sub><sup>•-</sup>, H<sub>2</sub>O<sub>2</sub> and HO<sup>•</sup>. These reactive oxygen species are produced on the surface of TiO<sub>2</sub> when illuminated by photons with energy greater than its band gap, so electron will be excited from valence band to the conduction band thus creating an electron-hole pair [4].

TiO<sub>2</sub>@SiO<sub>2</sub> nanocomposite materials have been used as anti-reflecting coatings, support materials and catalysts because of their superior thermal properties and chemical durability [5]. It is reported that incorporation of SiO<sub>2</sub> into the nano TiO<sub>2</sub> catalysts would increase specific surface area, suppress the nano TiO<sub>2</sub> phase transformation from anatase to rutile and tune the band gap, thus improving its photocatalytic activity [6]. TiO<sub>2</sub> particles are generally being loaded on SiO<sub>2</sub> as potential support due to its high surface area, porous structure and stability [7].

Rice husk (RH) is the outer covering of the rice grain, which is a by-product of the rice milling process. It is an agricultural waste material in all rice-producing countries [8]. Rice husk ash is one of the most silica rich raw materials containing about 90-98% silica (after complete combustion) among the family of other agro-wastes [9]. Rice husk ash is produced by combustion of rice husk at controlled temperature and contains silica with large surface area [10].

In this study, we present a novel process TiO<sub>2</sub>@SiO<sub>2</sub> nanocomposite using rice husk (RH) as template for evaluate the catalytic property on the reduction of MB under UV irradiation and dark.

## MATERIALS AND METHODS

### 1. Materials

Titanium dioxide (TiO<sub>2</sub>) was obtained by Carlo Erba Co., Inc. Methanol (CH<sub>3</sub>OH) was purchased by RCI labs can limited Co., Inc. All the reagents are analytical grade and were used without further purification. Sticky rice husk was collected in Mahasarakham, Thailand

### 2. Preparation of TiO<sub>2</sub> nanoparticles (TiO<sub>2</sub> NPs)

TiO<sub>2</sub> nanoparticles were prepared by titanium dioxide with the method following. During dried the titanium dioxide at 110 °C for 2 h and calcined in a muffle furnace at 600 °C for 3 h

### 3. Preparation of silica nanoporous.

Nanoporous silica from rice husk was prepared by modified method from Jamal Devarpanah and Ali Reza Kiasat (2013) [13]. The sticky rice husk was washed with distilled water three times and dried at 100 °C about 12 h. Then reflux with 1.0 M sulfuric acid for 4 h. It was thoroughly washed with distilled water until the pH of the rinse reached 7.0. The filtrate was dried at 100 °C for 24 h and which burned at 900 °C for 6 h in muffle furnace (Nabertherm GmbH : SN 233159 1100 °C) [11-12].

### 4. Preparation TiO<sub>2</sub>@SiO<sub>2</sub> nanocomposite

TiO<sub>2</sub>@SiO<sub>2</sub> composite were prepared by modified method from Sajjad Ullah et al (2015) [14]. Mesoporous silica from rice husk 0.2 g was dispersed under magnetic stirring in 30 mL iso-propanol for 30 min and sonication for 1 h. 50 mL of iso-propanol were added and left for 5 min. The different amounts of titanium dioxide nanoparticles (TiO<sub>2</sub>NPs) (see Table 1) were quickly added. The mixture was kept under magnetic stirring for 19 h. The mixture was filtered and the precipitate was washed three times with iso-propanol and dried at 100 °C.

**Table 1** Summary of the formulation parameters used for the synthesis of TiO<sub>2</sub>/SiO<sub>2</sub> composite

Sample	Silica (g)	TiO <sub>2</sub> Ns (g)
5%	0.2	0.01
10%	0.2	0.02
15%	0.2	0.03

### 5. Catalytic experiments

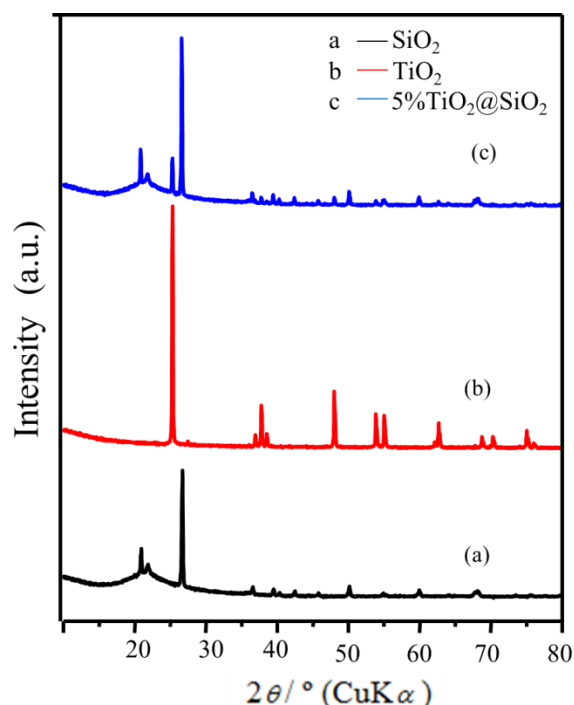
The catalytic property of TiO<sub>2</sub>@SiO<sub>2</sub> nanocomposite was investigated by the reduction of methylene blue (MB). 0.5 g of TiO<sub>2</sub>@SiO<sub>2</sub> nanocomposite was added to 5 mL of MB solution (10<sup>-3</sup> M). The purified TiO<sub>2</sub> and/or SiO<sub>2</sub> microporous was also the same condition and the control was also maintained without addition of TiO<sub>2</sub>@SiO<sub>2</sub> nanocomposite. The reaction suspension was well mixed by being magnetically stirred for 30 min to clearly make the equilibrium of the working solution. After that, the dispersion was put under the sunlight. At specific time intervals, aliquots of 2-3 mL suspension were filtered and used to evaluate the photocatalytic degradation of dye. The absorption spectra of the reaction solution were recorded at room temperature using Perkin-Elmer double beam spectrophotometer in the range of 250-750 nm. The rate constant of the absorbance at 664 nm as a function of time.

### 6. Characterization

Powder X-ray diffraction patterns (XRD) were collected by a Bruker D8 ADVANCE diffractometer using monochromatic Cu K $\alpha$  radiation. Diffuse reflectance spectra were recorded on a Perkin-Elmer double beam spectrophotometer. Infrared spectra were measured by KBr disk method on a Perkin-Elmer Spectrum One FT-IR spectrophotometer. The scanning electron microscopy (SEM) obtained on coax group corporation LTD. Model TM3030 S/N 145045-05.

## RESULTS AND DISCUSSION

**X-ray diffraction (XRD) analysis :** The XRD patterns of silica, titanium dioxide and TiO<sub>2</sub>@SiO<sub>2</sub> nanocomposite are shown in **Figures 1 and 2**.

**Figure 1.** XRD patterns of SiO<sub>2</sub> (a), TiO<sub>2</sub> (b) and 5% (c)

The silica from rice husk was presented the broad peak  $2\theta$  at  $20^\circ$  and the three main peaks  $2\theta$  at  $20.8^\circ$ ,  $21.8^\circ$  and  $26.6^\circ$  which corresponding to 100, 002, and 110 planes, respectively. The pattern of  $\text{SiO}_2$  (Figure 1a.) are well matched to the reference peaks from  $\text{SiO}_2$  JCPDS file no. 18-1169, indicating that the semicrystalline  $\text{SiO}_2$  support can be prepared from the rice husk. The crystalline nature and phase purity of titanium dioxide nanostructures after calcination presented the anatase pattern were observed [15-16] which corresponds to the data listed in JCPDS file no. 77-0441. After composite of titanium dioxide and silica at 5%  $\text{TiO}_2$  by weight (Figure 1c.) the diffraction of the product was mixed between  $\text{SiO}_2$  microporous supports and  $\text{TiO}_2$  anatase, suggesting the composite of  $\text{TiO}_2$  in microporous  $\text{SiO}_2$  and no phase transfer of  $\text{TiO}_2$  and  $\text{SiO}_2$ . From the Figure 2. the pattern of 5%, 10% and 15% revealed the same pattern that higher intensity of  $\text{TiO}_2$  characteristic peaks indicating that the difference % weight of  $\text{TiO}_2$  only increase the ratio of  $\text{TiO}_2$  and  $\text{SiO}_2$ .

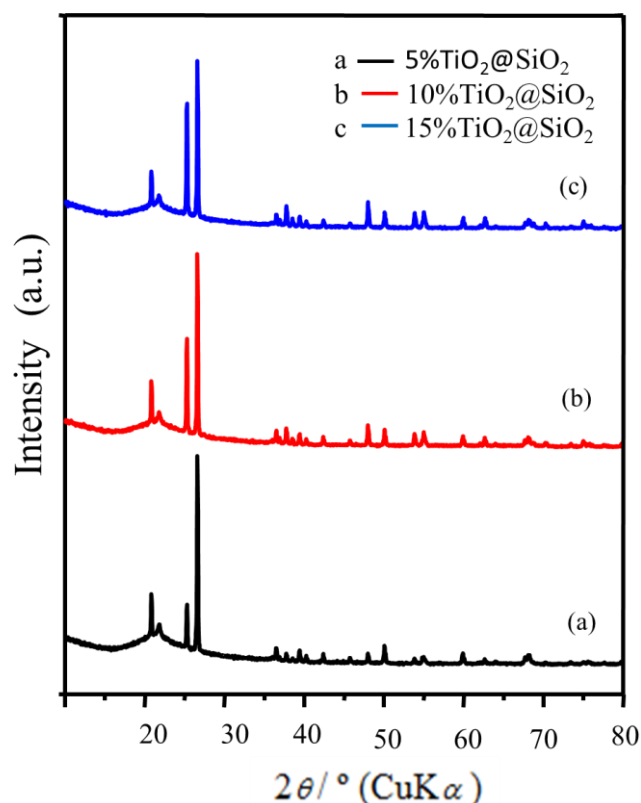
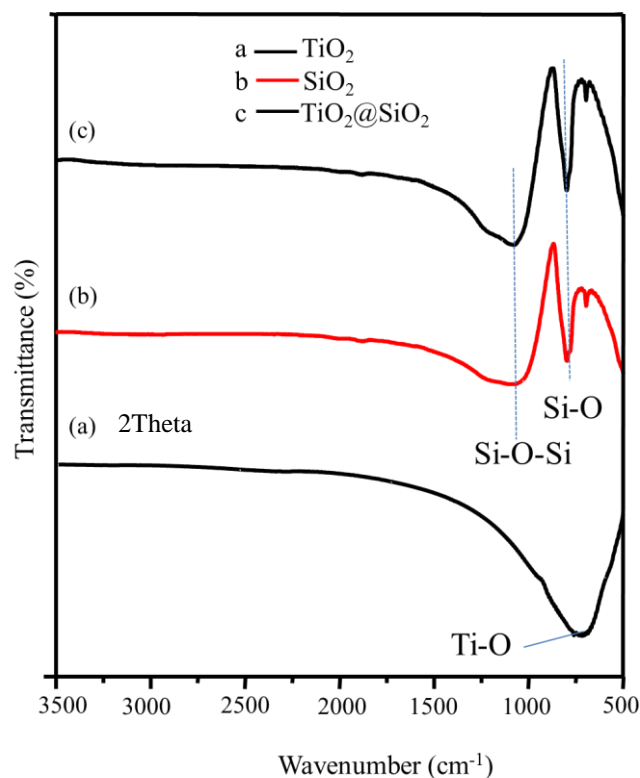
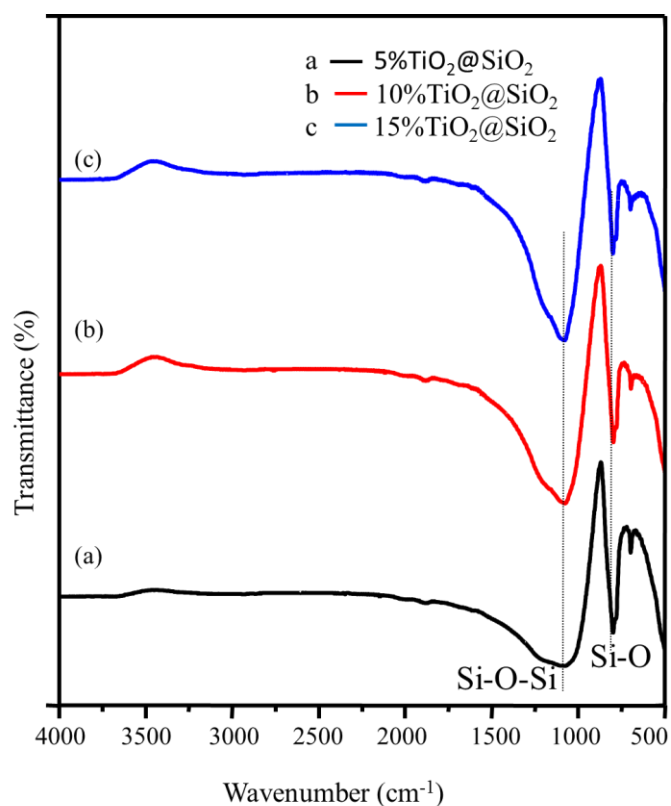


Figure 2. XRD patterns of 5% (a), 10% (b) and 15% (c)

**Fourier transform in frared (FT-IR) spectra analysis :** The FT-IR spectra was record at  $400\text{-}4000\text{ cm}^{-1}$ . The absorption at  $609\text{ cm}^{-1}$  was the characteristic peal for Ti-O stretching (Figure 3a.). The peak observed around  $1092\text{ cm}^{-1}$  was due to Si-O-Si symmetric stretching, the peak appeared at  $801\text{ cm}^{-1}$  corresponding to the bending vibration mode of the Si-O group, and the peak observed at  $464\text{ cm}^{-1}$  suggestting to the rocking mode of the Si-O group (Figure 3b) [16]. The spectra of  $\text{TiO}_2\text{@SiO}_2$  (Figure 3c) was observed the Si-O vibration at  $1092\text{ cm}^{-1}$  confirming the nanocomposite formation. Comparison of the spectra of 5%, 10% and 15% were intensity a decrease and slightly shift to higher frequencies when increase  $\text{TiO}_2$  (Figure 4a-c), demonstating that the form of composite without phase transfer.



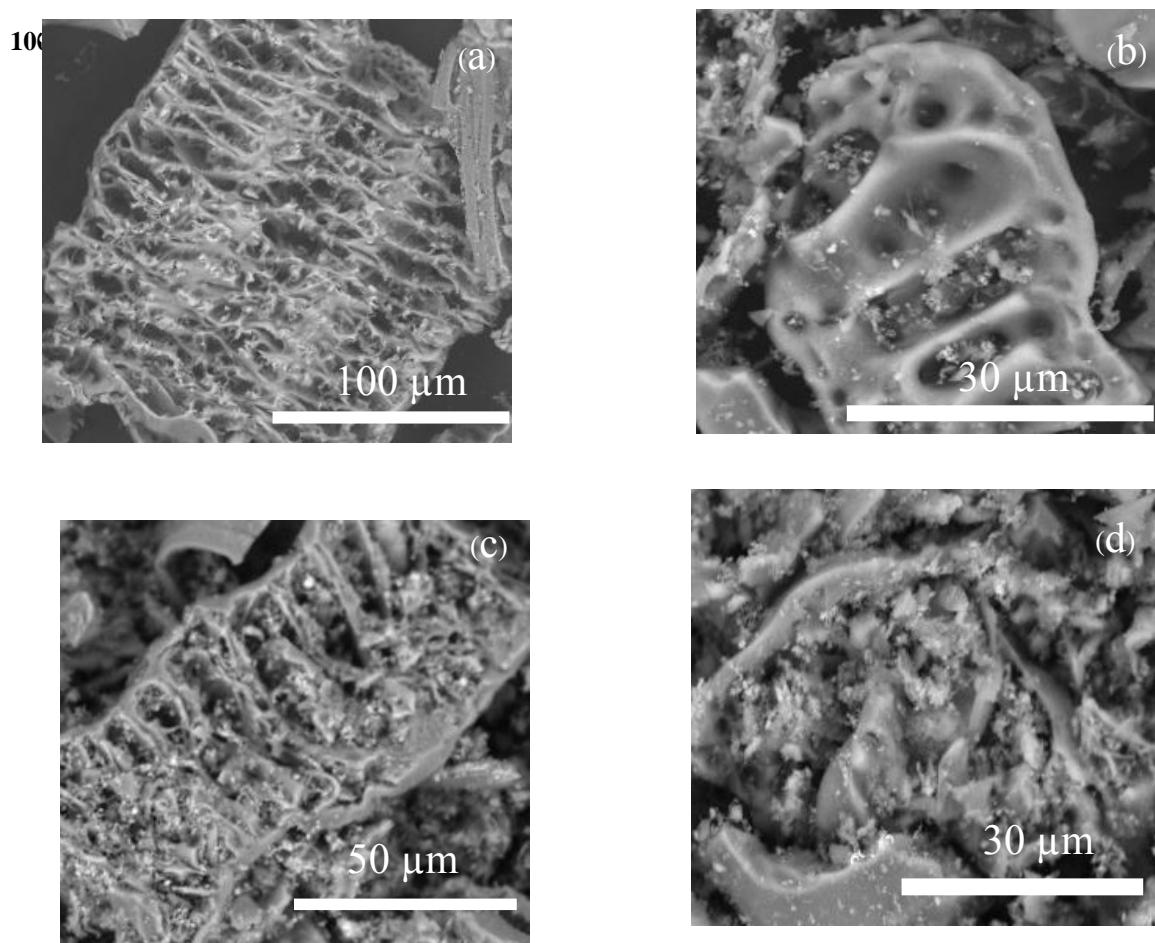
**Figure 3.** FT-IR Spectra of  $\text{TiO}_2$  nanoparticles (a), spectra for  $\text{SiO}_2$  (b), spectra of  $\text{TiO}_2@\text{SiO}_2$  nanocomposite



**Figure 4.** FTIR spectra of spectra of  $\text{TiO}_2@\text{SiO}_2$  nanocomposite : 5% (a), 10% (b) and 15% (c)

**Scanning electron microscope (SEM) analysis :** SEM image of nanoporous silica ( $\text{SiO}_2$ ) and  $\text{TiO}_2@ \text{SiO}_2$  nanocomposite at different amounts of titanium dioxide nanoparticles. The mesoporous  $\text{SiO}_2$  synthesized from rich husk ash was observed to have particle size distribution of 500 nm. The structure of  $\text{SiO}_2$  mesoporous showed the diameter and length was around 3-4 and 6-7  $\mu\text{m}$  respectively (Figure 5a.). The morphology of SEM image associated with  $\text{SiO}_2$  mesoporous remain corresponding in the SEM morphology with Chen Hui, Zhao Lei, Wang Xitang, Li Shujing and Lei Zhongxing (2015) [11].

SEM image in **Figure 5b-Figure 5d** showed the  $\text{TiO}_2@ \text{SiO}_2$  nanocomposite after mixture with different amounts of titanium dioxide at 5% 10% and 15% respectively.  $\text{TiO}_2$  nanoparticles with amount at 5% and 10% can disperse inside porous of  $\text{SiO}_2$  (see fig. band c) when increase amount of  $\text{TiO}_2$  nanoparticles at 15% (Figure 5d) was agglomerates consisting of the surface area due to excessive amount.



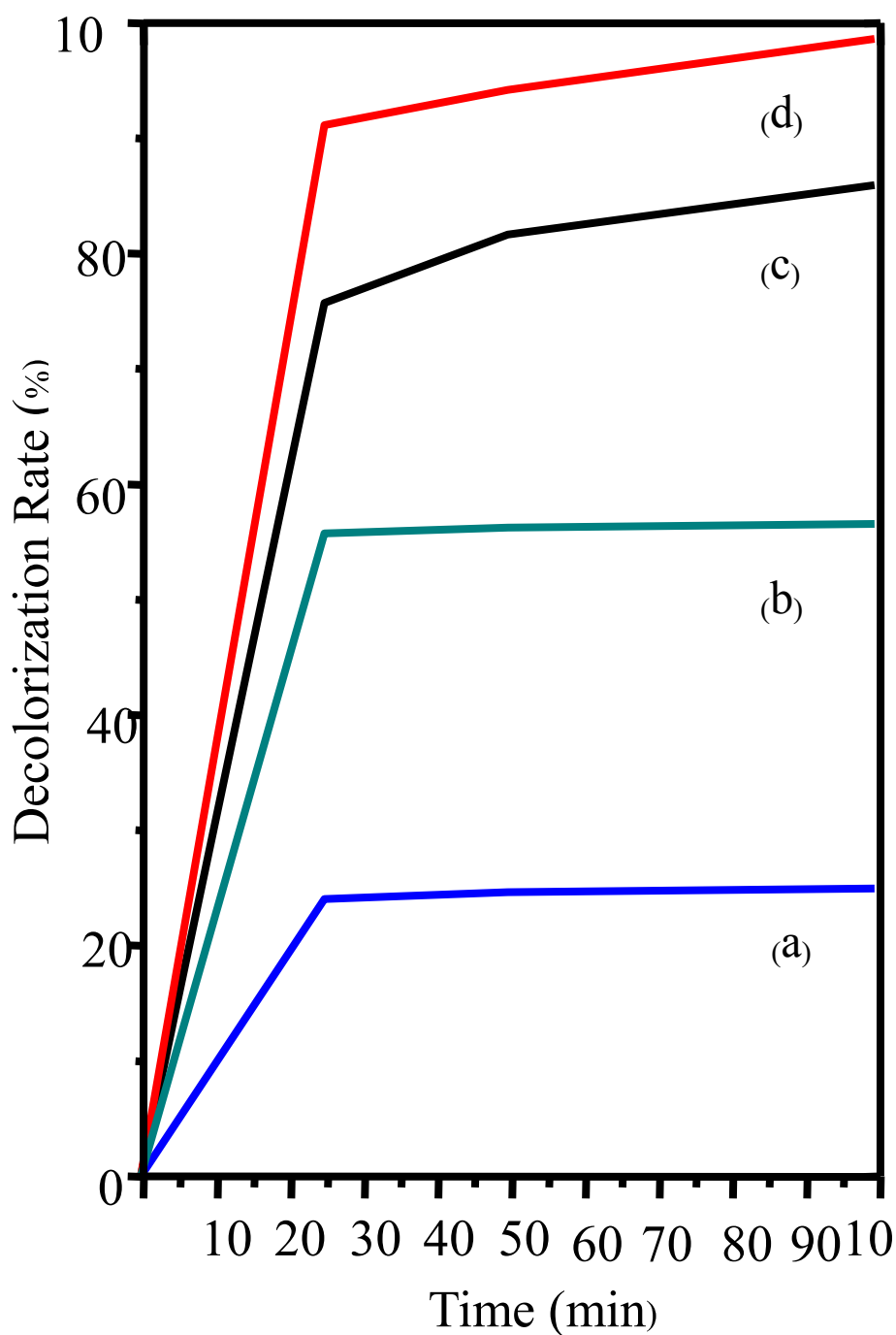
**Figure 5.** SEM images of  $\text{SiO}_2$  (a), 5% (b), 10% (c) and 15% (d)

**Catalytic reduction of MB :** The photocatalytic reduction of MB by 0.01 g  $\text{TiO}_2$ ,  $\text{SiO}_2$  and  $\text{TiO}_2@ \text{SiO}_2$  nanocomposite were determined at 664 nm under UV irradiation and in dark.

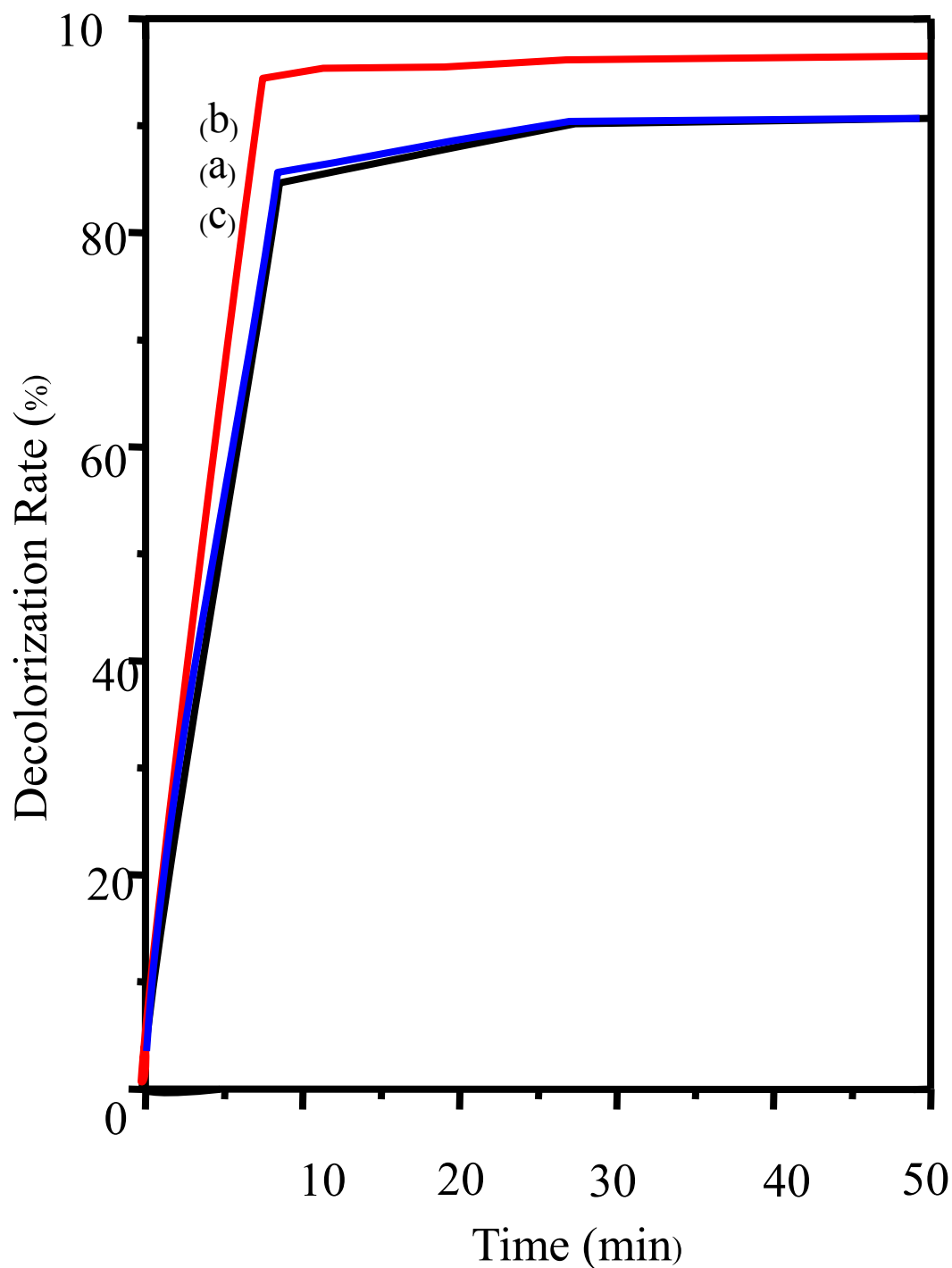
The efficiency of photocatalytic degradation at the initial concentration was 30 ppm of MB under UV irradiation were investigated. The MB was remained to 75.71% and 91.14% in 30 min for  $\text{SiO}_2$  (Figure 6a),  $\text{TiO}_2$  (Figure 6b). The efficiency of photocatalytic degradation in dark found can reach less than under UV irradiation. The degradation efficiency by  $\text{SiO}_2$ ,  $\text{TiO}_2$  can degradation of MB just 31.25% and 58.15% (Figure 6c and 6d) for 0.01 g  $\text{TiO}_2@ \text{SiO}_2$  nanocomposite under UV irradiation can reach 97.5% within 5 min. From Figure 7a-7c show the



resulted that compare to  $\text{TiO}_2$  5%, 10 % and 15 % (w/w) in the  $\text{TiO}_2@\text{SiO}_2$  nanocomposite, which found that clearly result indicating for efficiency catalytic reduction of MB can reach 92.18, 97.5 and 92.80%, respectively. It should be noted that the catalytic reduction of  $\text{TiO}_2$  and  $\text{SiO}_2$  is lower than those of  $\text{TiO}_2@\text{SiO}_2$  nanocomposite. The higher catalytic efficiency may be caused by the larger amount, size of anatase type  $\text{TiO}_2$  and the higher specific surface area. The role of the metal nanoparticles as an electron transfer catalyst may vary with size since its chemistry depends on size. The decrease in the size of the metal nanoparticles favors the increase in the number of the co-ordinate atoms and improves the adsorption of reactants on the catalysts surface and thus improves the reaction rate[11].



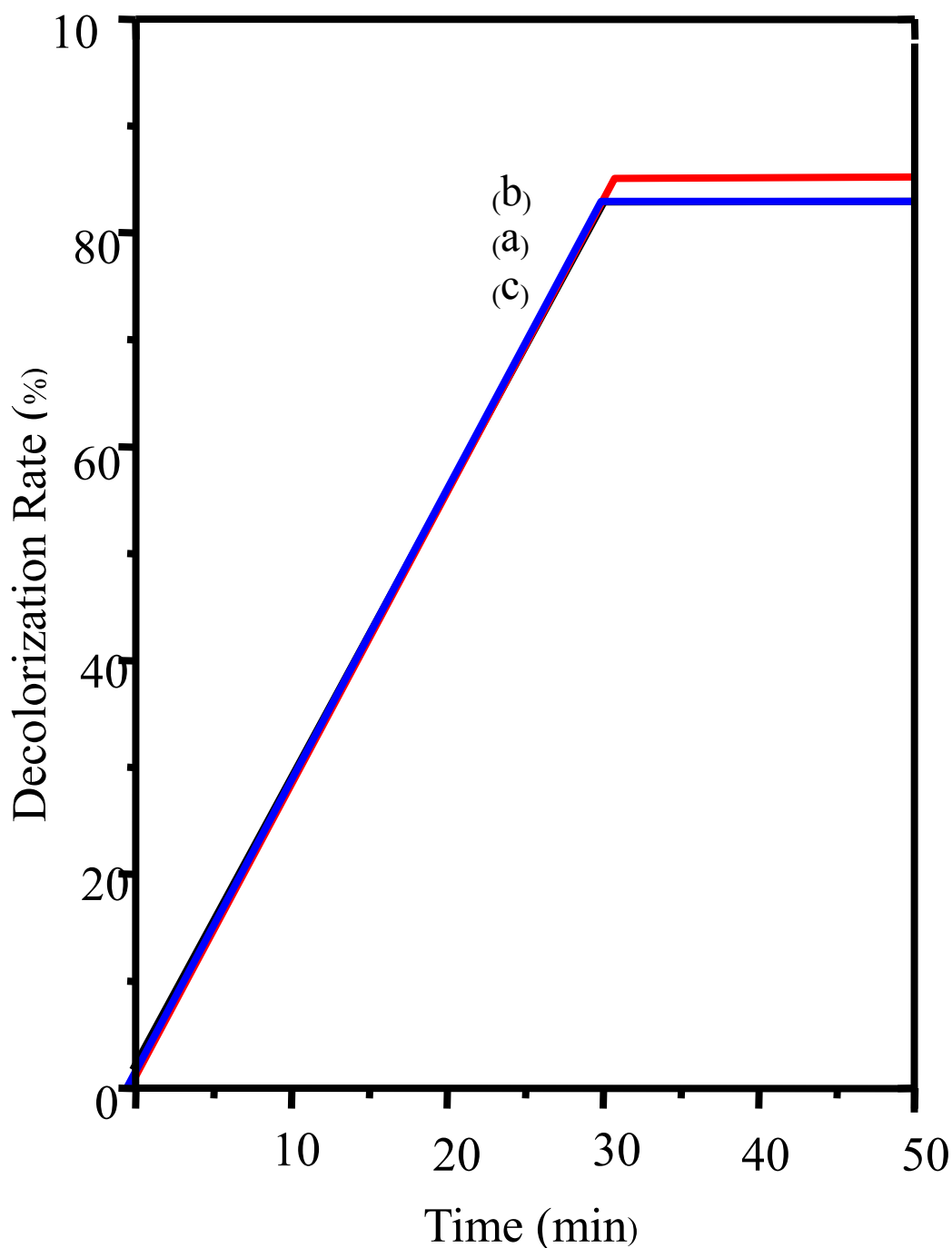
**Figure 6.** Degradation efficiency under dark of  $\text{SiO}_2$  (a) and  $\text{TiO}_2$  (b), under UV irradiation of  $\text{SiO}_2$  (c) and  $\text{TiO}_2$  (d)



**Figure 7.** Degradation efficiency under UV irradiation of 5% (a), 10% (b) and 15% (c)

The efficiency of photocatalytic degradation in dark found can reach less than UV irradiation. The degradation efficiency by  $\text{TiO}_2@\text{SiO}_2$  nanocomposite can degradation of MB can reach 83.49, 87.06 and 83.63% within 30 min it show  $\text{TiO}_2@\text{SiO}_2$  nanocomposite high efficiency may be cause by the smaller particle

size and the higher concentration of catalytically active centers of the anatase nanocrystals in the calcined TiO<sub>2</sub> shell than in the calcined solid TiO<sub>2</sub> sphere [18] and supporting by mesoporous silica from rice husk.



**Figure 8.** Degradation efficiency under dark of 5% (a), 10% (b) and 15% (c)

### CONCLUSIONS

In the paper study the synthesis of TiO<sub>2</sub> nanoparticles and mesoporous SiO<sub>2</sub> from sticky rice husk ash was used as a templated. The surface areas of the TiO<sub>2</sub>@SiO<sub>2</sub> nanocompositesize of nanoporous with a diameter and

length is around 3-4 and 6-7  $\mu\text{m}$  were found to be higher than that of the  $\text{TiO}_2$  nanoparticles due to the high surface area of the  $\text{SiO}_2$  support. The best of  $\text{TiO}_2@/\text{SiO}_2$  nanocomposite is found to be 0.01 g the catalytic efficiency of reduction reaction of MB can reach highest 97.05% within 5 min under UV irradiation with more than in dark. The enhanced photocatalytic activity of UV irradiated  $\text{TiO}_2@/\text{SiO}_2$  is due to the narrowed bandgap aided by production of many  $\text{HO}^\bullet$  free radicals, larger surface area as well as more active sites for dye adsorption of  $\text{TiO}_2@/\text{SiO}_2$ .

## ACKNOWLEDGEMENTS

This research was supported by Department of chemistry, Faculty of Science and Technology and Research and Development Institute, Rajabhat MahaSarakham University, MahaSarakham, Thailand

## REFERENCES

- [1] Pansila, P., Witit-anun, N., Chaiyakun, S. (2011). Influence of sputtering power on structure and photocatalyst properties of DC magnetron sputtered  $\text{TiO}_2$  thin film. *Procedia Engineering*, 32, 862-867.
- [2] Bagher, A.M., Tavakoli, B.Z., Seifi, M., Bagheri, D.S., Veisi, P. (2017). Synthesis of  $\text{TiO}_2$  nanoparticles and decorated multi-wall carbon nanotube (MWCNT) with anatase  $\text{TiO}_2$  nanoparticles and study of optical properties and structural characterization of  $\text{TiO}_2/\text{MWCNT}$  nanocomposite, *Optik-International Journal for Light and Electron Optics*,
- [3] Ilie, G.A., Scarisoareanu, M., Morjan, I., Dutu, E., Badiceanu, M., Mihailescu, I. (2017). Principal component analysis of Raman spectra for  $\text{TiO}_2$  nanoparticle characterization, *Applied surface science*, 417, 93-103.
- [4] Haider, A.J., AL-Anbari, R.H., Kadhim, G.R., Salame C.T. (2017). Exploring potential Environmental applications of  $\text{TiO}_2$  Nanoparticles, *Energy procedia*, 119, 332-345.
- [5] Li, J., Wu, Y., Cao, J., Wei, Z., Guo, Y., Wang, Q., Peng, Q., Li, Y., He, X. (2017). Excellent flexibility of high-temperature  $\text{SiO}_2\text{-TiO}_2$  hybrid fibers and their enhanced luminescence with  $\text{Eu}^{3+}$  doping, *Ceramics International*,
- [6] Chang, W., Yan, L., Liu, B., Sun, R. (2017). Photocatalytic activity of double pore structure  $\text{TiO}_2/\text{SiO}_2$  monoliths, *Ceramics International*, 43, 5881-5886.
- [7] Yener, B.H., Helvacı, S.S. (2015). Effect of synthesis temperature on the structural properties and photocatalytic activity of  $\text{TiO}_2/\text{SiO}_2$  composites synthesized using rice husk ash as a  $\text{SiO}_2$  source, *Separation and Purification Technology*, 140, 84-93.
- [8] Rohani, A., Rosiyah, Y., Seng, N.G. (2015). Production of High Purity Amorphous Silica from Rice Husk, *Procedia Chemistry*, 19, 189-195.
- [9] Bajirao, S.T., Onkar, A.D., Satyajeet, M.D. (2016). Extraction of silica from rice husk, *International Journal of Engineering Research and Development*, 12, 69-74.
- [10] Vinita, V., Ramachandran, D., Anbarasan, N., Arul, M.R. (2016). Studies of rice husk ash nanoparticles on the mechanical and microstructural properties of the concrete, *Proceedings*, 3, 1999-2007.
- [11] Chen, H., Zhao, L., Wang, X., Li, S., Lei, Z. (2015). Preparation of Nanoporous  $\text{TiO}_2/\text{SiO}_2$  Composite with Rice Husk as Template and Its Photocatalytic Property, *Rare Metal Materials and Engineering*, 44 (7), 1607-1611.
- [12] Ahmad, R., Mohsin, M., Ahmad, T., Sardar, M. (2015). Alpha amylase assisted synthesis of  $\text{TiO}_2$  nanoparticles : Structural characterization and application as antibacterial agents, *Journal of Hazardous Materials*, 283, 171-177.
- [13] Davarpanah J, Kiasat A.R, Catalysis Communications.2013;41:6-11.
- [14] Ullah S, Ferreira-Neto E.P, Pasa A.A, Alcantara C.C.J, Acuna J.J.S, Bilmes S.A, Martinez Ricci M.L, Landers R,
- [15] Fermino T.Z, Rodrigues-Filho U.P, Applied Catalysis B: Environmental. 2015;179:333-343.
- [16] Yaseen, M., Shah, Z., Veses, C.R., Dias, L.P.S., Lima, C.E., Reis, S.dos.G., Vaggetti, C.P.J., Alencar, C.D.W., Mehmood, K. (20157). Photocatalytic studies of  $\text{TiO}_2/\text{SiO}_2$  nanocomposite xerogels, *Journal of Analytical & Bioanalytical Techniques*, 8, 1607-1611.

- [17] Huang, F., Cornelius, J.C. (2017). Polyimide-SiO<sub>2</sub>-TiO<sub>2</sub> nanocomposite structural study probing free volume, physical properties, and gas transport, *Journal of Membrane Science*, 542, 110-122
- [18] Nilchi, A., Janitabar-Darzi, S., Mahjoub, A.R., Rasouli-Garmrodi, S. (2010). New TiO<sub>2</sub>/SiO<sub>2</sub> nanocomposites-phase transformations and photocatalytic studies, *Colloids and Surfaces A : Physicochemical and Engineering Aspects*, 361, 25-30.
- [19] Ma, J., Guo, X., Ge, H., Tian, G. Zhang, Q. (2018). Seed-mediated photodeposition route to Ag-decorated SiO<sub>2</sub>@TiO<sub>2</sub> microspheres with ideal core-shell structure and enhanced photocatalytic activity, *Applied Surface Science*, 434, 1007-1014.

**DIVERSITY OF PLANTS PRODUCING OIL AND RESIN IN PU MAT NATIONAL PARK,  
VIETNAM AND STATUS OF EXPLOITATION AND MANAGEMENT**

Dao Thi Minh Chau<sup>\*1</sup> Dau Ba Thin<sup>2</sup>, Tran Thi Ngoc Linh<sup>3</sup>.

*Institute for research and development of new technologies*

*Address 17 Pham Kinh Vy street, Ben Thuy ward, Vinh city, Nghe An province, Country Vietnam*

<sup>1</sup>*Institute of Biochemistry and Environmental Technology, Vinh University.*

<sup>2</sup>*Hong Duc University*

<sup>3</sup>*Nghe An Biological Resources and Environment Center*

*\* Author for correspondence, e-mail: daochau27@gmail.com*

**ABSTRACT**

Pu Mat is considered to be the biggest National Park in Northern Vietnam, the core zone accounting for 94,804.4 hectares, and buffer zone accounting for 86,000 hectares, in which 94% of the area is still covered by forest and about 22% are primary forests. According to the survey results, there were 136 species that produce oil and resin within 96 genera, 43 families of higher plants in Pu Mat National Park. The most critical finding is that 8 rare and precious species listed in the Vietnam Red Data Book (2007) and IUCN Red List being overexploited in Pu Mat National Park for China market. Knowledge of local people about oil and resinous plants' value is limited, they are interested in exploitation without management and conservation. This phenomenon causes many species to become scarce and lead to species exhaustion.

**KEYWORDS:** Pu Mat National Park, oil and resinous plants.



## INTRODUCTION

From past to present, forest resources have always held a very important role in the physical life and spirit of mountain people. Especially ethnic minorities who exploit the trees for building houses, eating, breeding, making clothes, playing, beauty, and medical treatment. Over many generations, the knowledge and experience that they gained in exploitation and using forest products is increasingly rich, distinctive and valuable, particularly in the field of harvesting and using medicinal plants. However, in the 2000s, medicinal plants have begun being purchased in bulk and sold to China, with about 200 tons per year. Many valuable species are currently being depleted, and many rare and precious species are now extinct.

In recent years, there has been much scientific research on the use of forest trees, but they mainly focused on medicinal plants, in particular, there is a great deal of research into the diversity of medicinal plants. Meanwhile, other groups such as edible plants, ornamental plants, plants that produce fibers, tannins, dyes, etc. have not been studied much. Therefore, we have conducted this study to estimate the tree species that produce oil and resin in Pu Mat National Park, particularly valuable species that are being depleted, in order to propose sustainable harvesting solutions in Pu Mat National Park.

## MATERIALS AND METHODS

### 1. Location and research subjects

Pu Mat National Park has a large core zone, bordered by Laos, and its buffer zone stretches over forest stands of three mountainous districts (Con Cuong, Anh Son and Tuong Duong). The entire research area includes the 5 following areas:

- At Cao Veu;
- At Luc Da - Mon Son;
- At Khe Bu;
- At Khe Thoi;
- At Tam Hop.

The population of Pu Mat National Park is over 93,500 people living in 111 villages. Most of the population works in the agricultural sector, while the area of arable land is increasingly limited due to the rapid impoverishment of sloping land areas, climate change, water shortages and drought. On average, people who live in buffer zones can be self-sufficient for only about 2/3 of the cost of living, while the remaining 1/3 relies on the exploitation of forest resources. These people are the direct exploiters, users and traders of forest plants including plants that produce oil and resin. In order to collect data on the current state of exploitation, use and trade of forest plants that produce oil and resin, we interviewed and surveyed 240 households in 8 villages representing 8 communes of 3 districts by using questionnaires.

### 2. Research Methods

- Collecting previous research results on medicinal plants in the research area.
- Collecting plants from main areas, based on the document of Nguyen Nghia Thin 1997 [8].
- Identifying plants based on the document of Nguyen Tien Ban in 1997 [4], Pham Hoang Ho [6], Vo Van Chi [5], the scientific name's revision according to Vietnam plants catalog [2], [7].
- Identifying rare, precious and endangered species according to the Vietnam Red Book [1].
- Interviewing households about exploiting medicinal plants in 3 districts of Pu Mat National Park by survey forms and then tracking statistics on Excel.

## RESULTS

### 1. The diversity in taxa of plants which produce oil and resin.

From the results of the survey, 136 species of higher vascular plants which contain oil and resin (including essential oil, fatty oil, oleoresin and resin). These are high value products in many economic sectors as well as in social life. In 136 species, there are 92 species of oil species belonging to 22 families of vascular plants. The distribution of quantity and percentage of families, genus and species of oil resinous plants in Pu Mat National Park are shown in Table 3.1.

Most of the oil and resin species belong to the Magnoliopsida class, which accounts for 81.16% and the Magnoliophyta, accounting for nearly 94.3%.

Table 1. The distribution of quantity and percentage of taxon in oil resinous plants

Orders		Families		Genus		Species	
		No.	%	No.	%	No.	%
Pinophyta		6	13,95	7	7,29	8	5,83
Magnoliophyta	<i>Magnoliopsida</i>	29	67,44	75	78,13	111	81,15
	<i>Liliopsida</i>	8	18,60	14	14,58	17	13,02
<b>Total</b>		<b>43</b>	<b>100</b>	<b>96</b>	<b>100</b>	<b>136</b>	<b>100</b>

## 2. Diversity of life forms and harvested parts oil and resinous plants.

Plants containing essential oils, resin oils are of different life forms; many of them are wood or shrubs, such as anisetree (*Illicium* sp.); Cinamon (*Cinnamomum* sp.), Orange (*Citrus* sp.), May chang (*Litsea* sp.), and so on. There are also many varieties of herbs, such as ginger (*Zingiber* sp.); galangal (*Alpinia* sp.); lemongrass (*Cymbopogon* sp.). They grow in different habitats. The percentage of species in the group of oil resinous plants in Pu Mat National Park, classified by structure of stem is shown in Chart 3.1. Most of them are woody plants.

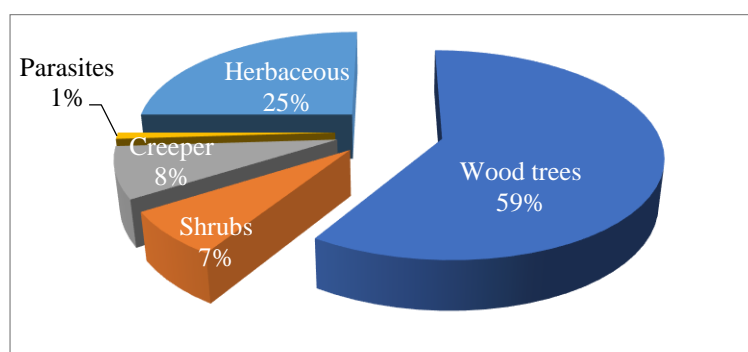


Chart 3.1. The distribution of oil resinous plants based on stems

There are many species which produce oil and essential oil, including the spurge family (*Euphorbiaceae*), the laurel family (*Lauraceae*), grasses (*Poaceae*), the ginger family (*Zingiberaceae*), the mint family (*Lamiaceae*). In the flora of Vietnam, the daisy family (*Asteraceae*) has many species and genera that contain essential oils, but people in the Pu Mat National Park only exploit these species to make medicines, serve as vegetables or ornamental plants. These are also plant families whose biosynthesis and accumulation of essential oils are a common, popular feature of most species (or genera).

Chart 3.2 shows the number of oil and resin species in Pu Mat National Park divided by harvested parts. The most common parts which are harvested to extract resin were seed (39 species), fruit (30 species), shell (28 species) and roots (25 species), leaves (23 species) and stalks (22 species). The least harvested parts for resin are flowers and bulbs.

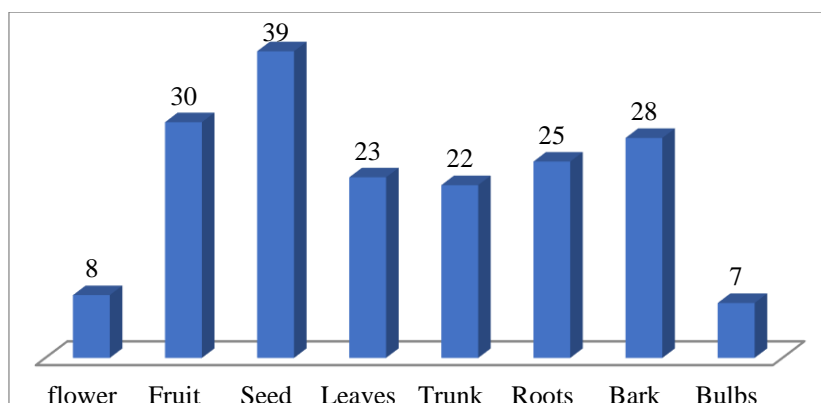


Chart 3.2. Numbers of oil and resin species by harvested parts

### 3. Rare and precious species

There are 8 species of rare higher plants listed in the Red Book of Vietnam, 2007 out of 136 oil and resin species that are exploited in Pu Mat National Park (Table 3.2).

Table 2. The oil and resinous plants in the Vietnam Red Book, 2007

	<i>Scientific name</i>	<i>Vietnamese name</i>	<i>Family</i>	<i>Status</i>
1	<i>Fokieniahodginsii</i> (Dunn) A. Henry & H. H. Thomas)	Pơ mu	Cupressaceae	EN
2	<i>Taxuschinensis</i> (Pilg.) Rehd.	Thôngđỏbắc	Taxaceae	VU
3	<i>Cunninghamiakonishii</i> Hayata	Sa mộc đầu	Taxodiaceae	VU
4	<i>Kibatalialaurifolia</i> (Ridl.) Woods.	Thầnlinhláquế	Apocynaceae	VU
5	<i>Acanthopanaxtrifolius</i> (L.) Voss.	Ngũgiabìgai	Araliaceae	EN
6	<i>Cinnamomumbalansae</i> H. Lecomte	Gù hương	Lauraceae	VU
7	<i>Cinnamomumparthenoxylon</i> (Jack.) Meissn.	Re hương	Lauraceae	CR
8	<i>Aquilariacrassna</i> Pierre ex Lecomte	Trâm hương	Thymelaeaceae	EN

Note: The Vietnam Red Book (2007): EN – Endangered; VU – Vulnerable; CR – Critically Endangered

### 4. The value of oil and resinous plants.

The important plant species that provide oil and resin are usually of families: Pinaceae, Burseraceae, Dipterocarpaceae, Styracaceae, Caesalpiniaceae, Euphorbiaceae. The oil and resinous plants currently receive little attention and research, although this is a source of material with significant demand in the market. Chemically, resin is usually a mixture of terpenoid compounds, sometimes including benzoic and cinnamic acid compounds. Resin distillation produces volatile compounds (such as monoterpenoid, sesquiterpenoid) and non-volatile compounds (such as diterpenoid and triterpenoid).

Fatty oils are present in the living cells of most plant species; however, the concept of oil plants only includes the plants that are capable of accumulating relatively high fat oil content in fruit, seeds or rhizomes. Based on the available information, plants contain fatty oil in Flora of Vietnam is estimated at about 600 species. The families that are richest in fatty oil include: Fabaceae, Euphorbiaceae, Rutaceae, Asteraceae, Cucurbitaceae, Malvaceae, Lamiaceae, Poaceae, Lauraceae, Sapindaceae, Rosaceae, Meliaceae, Solanaceae. Chemically, fatty oil is a natural compound of high molecular weight. It is a mixture of esters of triglycerides and complex fatty acids. Based on molecular structure, they are divided into two groups: saturated fatty acids (saturated fatty acids) and unsaturated fatty acids (unsaturated fatty acids). The composition of the fatty acids contained in the mixture determines the quality of the fatty acid.

Fatty oil is used as food, medicine, and as a valuable source of raw materials in the oil paint, machine oil, oil, printing, soap and detergent industries. Today, vegetable fat (or tallow) is considered to be a promising source of bioenergy (in the trend of "greening" energy sources with biofuel).

Essential oil has stimulating effect, antiseptic, anti-inflammatory, strong antibacterial, therefore, it has been used in the pharmaceutical industry, food processing, cosmetics since a long time ago. In daily life, people often use or are exposed to essential oils and products containing compounds extracted from essential oils (medicines, food, water, toothpaste, aromatic soap, powder washing, perfume, lotion).

Consumers nowadays prefer natural, non-toxic products, especially in terms of food and medicines. Hence, a research on sustainable exploitation of this group of resources for serving food processing is essential. In addition, it is necessary to conduct studies about restoring handicrafts and traditional products that are rich in ecological, human and sustainable values such as yarn, dyed fabrics, brocade weaving, traditional medicine, grilled chicken masala.

## 5. Status of exploitation and management and recommendations for sustainable exploitation

According to the survey on the status of exploitation and use of plants for resin in the area of Pu Mat National Park, local people have been exploiting 38 species of this group to serve their needs. In the core area of Pu Mat National Park, there are still 3 villages. Some people once resided in the buffer zone, but they later still returned to the deep forest areas to make a living due to their dependence on the forest. Livelihoods in these places are completely based on the forest, so they often search and exploit oil, oleoresin and resin for living and daily activities. In recent years, many forest species which contain valuable resin have been harvested by locals and sold to traders to bring to China, many of which have large reserves but due to popularity of purchasing, they are quickly exhausted, such as species in the genus *Alpinia*, *Amomum* or *Homalomena* *occulata*. Many of timber trees which produce oil and resin have been depleted at present, such as *Fokienia hodginsii*, *Cunninghamia konishii*, *Cinnamomum parthenoxylon* and *Aquilari acrasna*. The main reason is the constant exploitation of timber over the past 30 years in tandem with the way local people have exploited them. This situation has made these species more scarce and less likely to regenerate.

*The main issues in the management of exploiting oil and resinous plants are outlined below:*

- The livelihoods of people living in Pu Mat National Park rely heavily on the exploitation of forest resources due to the lack of cultivated land and the habit of exploiting forest resources for a long time.
- Local people's understanding of the value of oil and resinous plants is very limited.
- Local people use inappropriate methods of exploitation, at an improper exploitation season, making the species lose the chance of regeneration.
- Most NTFPs are still considered as "secondary forest products" and "public resources", so they are exploited freely, with little attention to management, conservation and development.
- The demand of the market is very large, the market of small-scale trade scatters outside the distribution channels, so it is difficult to grasp the information and create a healthy market.
- Lack of participatory management of the community, lack of specific policies and effective management activities for the exploitation and trade of oil and resinous forest plants, especially for species listed in the Red Book of Vietnam.

## CONCLUSIONS AND DISCUSSION

### *Proposed solutions for sustainable exploitation and use:*

- + Allocation of forestland management to indigenous peoples and disseminating knowledge about the value of forests, rare and valuable species that need protection, conservation and development;
- + Strengthening support and projects to diversify livelihoods for local people;
- + Encouraging community participation in the protection and management of forest resources, introducing regulations, regulations and rules for sustainable exploitation and use of forests;
- + Introducing specific policies and effective management practices for the exploitation and sale of forest products, especially the ban on exploitation of rare species;
- + Continuing research on species for valuable plastic oil to develop into a raw material area.

## ACKNOWLEDGEMENTS

The authors wish to thank Rajabhat Maha Sarakham University (Thailand) and Affiliation Institute for research and development of new technologies for the giving us the opportunity to attend the conference and publish this article.

## REFERENCES

- [1]. Ministry of Science & Technology - Vietnam Red Book (*The plant*). Science & Technology Publishing House, Ha Noi, 2013.
- [2]. Nguyen Tien Ban - *List of Vietnamese Plant Species*, Volume 2, Volume 3. Agriculture Publisher, Hanoi, 2003.
- [3]. Nguyen Tien Ban – *Handbook lookup and identify angiosperms in Vietnam*. Science and Technology Publishing House, Ha Noi, 1997.
- [4]. Pham Hoang Ho - *Vietnam plants* (3 volumes). Youth Publishing House, HCM City, 1999 – 2000.

- [5]. La Dinh Moi (Editor), Luu Dam Cu, Tran Minh Hoi, Tran Huy Thai, Ninh Khac Ban - *Plant resources in Vietnam* (volume 1, 2). Agricultural Publishing House, Hanoi, 2001, 2002.
- [6]. Nguyen Nghia Thin – *Handbook biodiversity research*. Agriculture Publisher, Ha Noi, 1997.

## INTEGRATING FINANCIAL EDUCATION IN TEACHING THE CONTENT ABOUT LINEAR EQUATION AND LINEAR INEQUALITIES

Pham Sy Nam, Ph.D; Le Thai Son, MA

*Fulcuty of Mathematics - Application, Saigon University, Vietnam*

*Corresponding email : phamsynampbc@gmail.com, lethaison2009@gmail.com*

### ABSTRACT

Financial education has become an important complement to market conduct and prudential regulation and improving individual financial behaviours a long-term policy priority in many countries. However, the actual teaching of mathematics in high schools of Vietnam does not clearly reflect this. There are many difficulties to integrate financial education in teaching. This article shows the importance of designing learning situations which create opportunities for students to propose problems related to finance from the rule of determining the quantity in practice. Using a constructivist approach, our experimental results show that students are able to connect the mathematics they have learned to many practical situations. The results also show improvement in students' mathematical experience by solving problems related to finance.

**KEYWORDS:** linear equation, linear inequality, integrate, financial education



## INTRODUCTION

Nowadays, we have more and more financial forms and instruments such as credit cards, loans, ATM cards which make spending even easier. The more complicated an economy is, the more responsible we have for providing the young generation with financial knowledge so as to ensure that they will be adequately equipped with financial knowledge when they reach adulthood. Teaching this knowledge through Mathematics, establishing a smart spending and saving habits, especially from a young age will help them get rid of financial burdens and be more active in managing their money.

The concept of equation, inequality is one of the most important concepts of Mathematics. Mathematics studies the quantitative relationships and spatial shapes of the objective world. The larger or smaller relation between two numbers, two quantities is a very basic quantitative relation. Knowledge of equations, first-degree inequality is widely applied in daily life, so it is worth conducting integrated instruction to help students gain financial literacy. Therefore, they can solve many problems in life. One drawback of the current textbooks, reference books is lack of practical related exercises. It is therefore necessary to point out ways to build exercises that can be applicable in real life, especially in relation to financial issues. In this article, we focus on the following research questions:

Question 1: What are the directions in financial education for students?

Question 2: How to help students solve as well as design mathematical problems about linear equation and linear inequality related to finance?

## MATERIALS AND METHODS

### 1. Orientation of innovation in education

#### 1.1. Orientation for innovation in the math program

One of the high school math program construction and development standpoints: “*Strengthening the practice and application, teaching Mathematics associated with practice*” [5]. In addition, “*enhance and clarify applied Mathematics and practical application*” [4] is one of the basis conceptions of the current high school Math program in our country. The Mathematics curriculum 2017 project shows that “Math program can help students achieve these goals: Understanding the basis, essential high school Math knowledge and skills; developing the problem-solving skill with inter-course integration between Math and other subjects such as Physics, Chemistry, Biology, Geography, Informatics, Technology,...; creating chances for students to experience, and apply Math into reality.”

#### 1.2. Orientation on evaluation innovation in education

Constructing and focusing on teaching Math problems related to practice in countries around the world as well as the educational evaluation organizations is reflected in exam papers and teaching curriculum presented in some countries' textbooks. Some of the most prominent assessment program using real-life issues in the world are NAEP, NAPLAN, PISA,...

The National Assessment of Educational Progress (NAEP) is a continuous assessment on a national representative sample in order to know what do students in the US know and what can they do in each specific subject. The NAEP was first introduced in 1969, for many subjects, including Mathematics. NAEP assessment is based on the view that, besides knowledge, skills and attitude, US students also need to know how to apply them in solving real-life problems, so in the NAEP survey, many actual situations have been used [1].

NAPLAN is Australia's national assessment program conducted annually in May for all students in grade 3, 5, 7, 9. This assessment also concern about to what extents do students use knowledge, skills and experience acquired to solve problems in real life [2].

PISA (Program for International Student Assessment) is an international student assessment program initiated and directed by the Organization for Economic Cooperation and Development (OECD). PISA was first introduced in 1997 and once every three years to assess the ability to apply knowledge and skills in four major areas: Comprehensive Reading, Math, Science and Problem Solving so as to deal with 15-year old student daily life problems. The most striking feature of PISA is that all of the PISA testing systems are real-life situations. To address these situations, students are required to have a thorough examination through the mobilization of knowledge, skills, attitude and personal experience to solve [8].

### 1.3. The development of society and personal needs in the new society

According to the Ho Chi Minh city Education and Training Department and SCI, students at the age of 13 to 18 start spending money and have a need of using money, but they do not understand the value of labor which leads to lack of consideration in spending. The results of student surveys in seven high schools show that only 17.2% of students said they save their money and spend very little. Up to 8.8% spent most of their money to buy things of their own preference and 12% of them did not know their own spending plan. Therefore, about one third of students feel that they do not have enough money to spend. And when it becomes insufficient, they tend to cut down their own spending (73.5%) rather than finding a job (21.9%) or saving (34.2%). [9].

A series of young people financial issues today are: not understand the value of labor, lack of consideration in spending; lack of effective money management skills; lack of parents's attention, guidance, support for self finance-management... From there, everyone realizes that giving an opportunity for students to access financial education programs, providing them with an understanding of how to earn money, spend money, make a budget saving, borrowing and accessing financial services is essential. At the same time, equipping communication skills between parents and children on financial issues is also essential. Those knowledge not only helps students to understand about the money, the value of the labor, distinguishes between the need and the desire to make the right spending decisions, become wise consumers but also helps them identify their future career goals, be more responsible for their family's financial situation at present and their own financial issue in the future.

## 2. Some Orientations in Financial Education for Students

From the financial situation in life, teaching should educate students the following contents:

- Practice calculating the increase or decrease in percentage value of a commodity or a production or business plan;
- Become familiar with banking transactions;
- Become familiar with taxation and calculating taxes ;
- Plan your own spending ;
- Get familiar with the problem of personal investment (determine the investment capital to achieve the expected interest rate).

## 3. Research design

We need to pay attention to the following factors: design plan, design ideas and design of specific mathematical tasks.

### 3.1. Teachers' Designing plan

#### 3.1.1. Learning content design

In this section, we propose two steps to construct exercises related to finance from the rule of determining the quantity in practice

*Step 1:* Select the formula that represents the relation between the quantities involved in the practice.

*Step 2:* Choose the situation that matches the formula.

The model of this process is

Step 1: Select the model in which the quantities  $y$  and  $x$  are related by the formula system:  $y = ax + b$

Step 2:

*How to create an equation problem:*

Find  $x$  if you know  $y = m$ , then we have the equation  $ax + b = m$

*How to create an inequality problem:*

Find  $x$  so that the value of  $y$  does not exceed  $m$ , then we have an inequality  $ax + b \geq m$

Find  $x$  so that the value of  $y$  is greater than or equal to  $m$ , then we have an inequality  $ax + b \leq m$ .

#### 3.1.2. Learning activities design

In the design of guided learning activities to support concept, Confrey (1991), Nam P. S., Stephens, M (2013) pointed to the following four elements where the teacher:

- Needs to focus on the important key knowledge.
- Needs to have a clear plan on how to respond to students' incorrect answers.
- Should have a long-term plan to consistently develop students' deep understanding of the knowledge.
- Should utilize concrete examples that are familiar and easy for students to understand to help them understand knowledge.

### 3.2. The idea of teaching design

In teaching design, we believe that it is difficult to ask students to suggest examples related to practice from one problem. Therefore, to implement this idea we conduct as follows.

Initially, we asked students to solve exercises related to real life. Then students can be asked to determine, that is, to identify the content of pure mathematics embedded in this exercise and then suggest exercises from related contexts.

This work aims to help students realize components of the exercise containing situations involving practicality such as: the pure mathematical elements of the problem and the factors related to practicality. The combination of these two factors creates exercises related to real life. Solving exercises related to real life usually involves expressing them in mathematical terms and solving the resulting mathematical problems. Creating exercises related to real life can also be implemented by adding some elements of real life to pure mathematical exercises, where the variables are associated with the corresponding practical quantities in problem. This is to help students see that the same mathematical ideas can be expressed in different contexts. Determining mathematical elements in exercises related to real life also helps students to fully understand the exercise.

### 3.3. Design of mathematical tasks.

It is important to design mathematical tasks and activities suitable for students where the tasks:

- actively engage students in mathematical thinking;
- take students' previous mathematical knowledge and experiences into account;
- utilize a wide range of tools to support students' understanding of the mathematical concepts involved.

To obtain data to answer the key research questions, we have designed activities for grade 10 students in the Math class at Le Hong Phong gifted High school:

Question 1. Find the relation between  $a$ ,  $b$ ,  $x$  represent the following situations:

- a) If the original price is  $a$ , the selling price after increasing  $x\%$  is  $b$ ,
- b) If the original price is  $a$ , the selling price after decreasing  $x\%$  is  $b$ .

Question 2.

a) The cost of producing a set of games is 100,000 VND. Initial price is 150,000 VND. After a period, to release inventory and earn a profit of 5,000 VND, the shop discount  $x\%$  for this product. Find the hidden equation  $x$  denoting the above situation.

b) Based on the above relationships and situations, develop a math exercise related to reality.

Question 1, to help students determine the relationship between the original price  $a$ , the selling price  $b$  and the increasing, decreasing percentage  $x\%$ . This is a very familiar relationship in purchase, sale in life. Question 2, to provide opportunities for students to use the above connections to develop financial-related problems.

## RESEARCH RESULTS

In this section, we focus on the following results: The interaction among students, how can teachers support when students are in trouble, teachers' reaction to students with the correct answer, and how can teachers respond to answers where a student gets it wrong (Nam P. S., Stephens, M (2013), (2014) ).

### Interactions among students

In the process of monitoring the work between the groups, we found that the majority of students actively work to work out the result. Each member of the group suggested different solutions, then discussed by the whole group to work out the most feasible result. Discussions among students about the choice of variable or using language to express their ideas.

### Teacher's support to students facing difficulty

During the observation of the group activity, if the student has difficulty answering the questions, the teacher asks more questions or more requests to support the student.

In solving question 1, some students found it difficult. we asked " $x\%$  of  $a$  is how much?", "Identify the new price, initial price and additional price", "The original price is  $a$ , now it is up by  $x\%$ , then what is the new price?".

In solving question 2, some students found it difficult to find a suitable situation, in which case we suggested the following: "Change the form of the exercise by giving the discount percentage, then calculate the selling price"; "Change the form of the exercise: determine the discount percentage so that when the price increases by  $a\%$ , the original price remains unchanged.", "Change the form of the exercise by giving the increasing percentage and the interest, then determine the price of the product".

### Teacher's handling of students' correct results

During the activity, many groups had good results, some of which are beyond our expectation. For correct results, we ask the students to explain in detail to test their understanding.

When implementing question 2, we obtained the following results:

Example 2.1. The cost to produce a set of toys is 100,000 VND. The original price is 150,000 VND. After a period, to release inventory and earn a profit of 5,000 VND, then how many percent does the shop need to discount for this product?

When asked to determine the mathematical model of the problem, the student answered: Let  $x$  (%) be the discount percentage, we have  $150\left(1 - \frac{x}{100}\right) = 105$ .

Replace the profit by 5,000 VND by the profit in percentage (5%), we have a problem:

Example 2.2. The cost to produce a set of toys is 100,000 VND. Its selling price is 150,000 VND. If the shop wants to earn a profit of 5%, how many percent should they discount for this product?

Change the form of the problem we have:

Example 2.3. The cost to produce a set of toys is 100,000 VND. Initial price is 150 thousand Vietnam dong. After a period, to release inventory and want to make a profit not more than 5,000 VND, then how many percent should they discount for this product?

Hint: Let  $x$  be the percent that needs to be reduced, we have:  $150(1 - x) \leq 105 \Leftrightarrow x \geq 30\%$ .

Change the form of the problem by giving the discount percent, calculating the selling price, we have a problem:

Example 2.4. An imported set of toys is sold at 90% of the posted price. The shop's profit is 20%. How much is this set, giving that the shop has imported it for 1,500,000 VND a set?

Hint: Let  $x$  be the price. We have:  $0.9 \cdot x = 1500.12$ .

Change the form of the problem: determine the discount percent so that when increasing the price to  $a\%$ , the original price will remain unchanged.

Example 2.5. The price of a product in a shop is increased by 15%. How many percent should the shop reduce the product's price to return to its original price?

Hint: Suppose the product price is  $P$  and the shop discount  $x\%$ . We have:

$$P = P(1 + 0.15) - P(1 + 0.15) \cdot \frac{x}{100} \Leftrightarrow 1 = 1 + 0.15 - (1 + 0.15) \cdot \frac{x}{100}$$

Change the form of the problem by increasing the price by 5%, then increases by 10%, and finally reduces by 15%.

Example 2.6. An air conditioner store increases the price by 10%, then increases by 10%, finally they increase by 5%. How many percent should the store reduce the product's price to return to its original price?

Hint: Let  $r\%$  be the percentage that the store needs to reduce, and the basis price is  $P$ . We have:

$$P \cdot 1.1 \cdot 1.1 \cdot 1.05 \cdot \left(1 - \frac{r}{100}\right) = P.$$

Change the form of the problem by giving the increasing percentage of the price and the interest, thereby determining product's importing price, we have a problem.

Example 2.7. An old car dealer buys a car and raises its price by 40%. After that the car was sold at 80% of the price raised and the interest is 4800 dollars. What is the price of car which the dealer bought?

Hint: Let  $x$  is the price of car which the dealer bought. We have:  $x \cdot 1.4 \cdot 0.8 - x = 4800$

Change the form of the problem by showing the selling price and percentage of the interest, thereby determining the new price of product, we have a problem

Example 2.8. A store imports a bag for 1,400,000 VND. Then, it is sold at 2,100,000 VND. If the store want to earn a minimal 5% interest, how many percent do they have to discount the current price? Calculate the price of that bag.

Hint: Let  $x$  is percentage the store has to discount, we have:  $1400 \cdot 1.05 = 2100 \left(1 - \frac{x}{100}\right)$ .

### Teachers' responses to students' incorrect results

During the discussion, while many groups gave the correct results, there were some groups that gave the wrong answer. In order to help students recognize their mistakes, we proceed as follows: State their result in front of the class and ask all the groups to verify. Teacher can use the following methods to support the verification of the students:

- The instructor gives a counter-example and asks the student to check and compare with the answer.
- Instructors ask students to do other activities to help them realize their mistakes.
- Teachers ask students to use the knowledge they have learned to check their results.

In activity 2, with question 1 some students make the mistake of determining the relation between  $a$ ,  $b$ ,  $x$ , that is " $b = a + x\%$ ". When asked to explain, they said "because of increasing  $x\%$ , we have to add  $x\%$ ". To help students recognize this mistake, we asked " $x\%$  of  $a$  is how much?", "The original price is  $a$ , now increase  $x\%$  of the original price, what is the new price?"

### CONCLUSIONS AND DISCUSSION

Thus, to acquire correct knowledge students have to go through a process that inevitably involves misconceptions and difficulties. The resolution of these problems requires students to think actively to work out the result under the instruction of teachers through asking them to perform necessary activities necessary to reveal the properties of the object that need researching and to check the correctness of a viewpoint. In explaining the correctness of these ideas, students should be asked to use different mathematical knowledge. A more experimental process generates more lively teaching, helps students see key mathematical content embedded in different practical situations. As high school education curriculum are now approaching to promote student competency, the creation of opportunities for teachers and students to develop practical math problems in class is meaningful job because it allow students to realize "the beauty of mathematics" through its practical applications; Simultaneously, through practical situations, students have the opportunity to solve problems in everyday life.

### REFERENCES

- [1] America Testing Services (2005), *Developing Achievement Levels on the 2005 National Assessment of Educational Progress (NAEP) in Grade Twelve Mathematics*, Process Report.
- [2] Australian Curriculum Assessment and Reporting Authority (2012), *Interpreting NAPLAN results*.



- [3] Confrey, J. (1991). Learning to listen: A students' understanding of powers of ten. In E. Von Glasersfeld (Ed.), *Radical constructivism in Mathematics Education* (pp. 111-138). Dordrecht, The Netherlands: Kluwer Academic Publishers.
- [4] Kim N. B. (2013), *Methods of Teaching Mathematics*. Hanoi: Hanoi Pedagogical University Publishing House.
- [5] Ministry of Education (2006), *The Nationonal School Curriculum* from <https://app.box.com/s/ifwdjurbz59t7ic2cwzv/folder/4604959762>.
- [6] Nam P. S., Stephens, M (2013), *Constructing knowledge of the finite limit of a function: An experiment in senior high school Mathematics*, Proceedings of the 24<sup>th</sup> Biennial Conference of The Australian of Mathematics Teachers Inc, Melbourne, Australia, page 133-141.
- [7] Nam P. S., Stephens, M (2014), *A Teaching Experiments in Constructing the Limit of a Sequence*, Journal of Science and Mathematics Education in Southeast Asia 2014, Vol 37 No. 1, pp.1-20
- [8] OECD (2003), *The PISA 2003 Assessment Framework: Mathematics, Reading, Science and Problem Solving Knowledge and Skills*, PISA, OECD Publishing.
- [9] <http://dantri.com.vn/giao-duc-khuyen-hoc/dua-giao-duc-tai-chinh-vao-chuong-trinh-hoc-chinh-khoa-1371551039.htm>

**A MULTIDIMENSIONAL APPROACH TO POVERTY RESEARCH (PRACTICAL IN THE  
MOUNTAINOUS AREAS OF NGHE AN, VIETNAM)**

Nguyen Thi Trang Thanh, Hoang Phan Hai Yen, Tran Thi Tuyen, Nguyen Thi Hoai<sup>1</sup>

*(1) Faculty of Geography - Resource Management, Vinh University, Vietnam*

*Corresponding author-E-mail address: tt.dhv@gmail.com*

**ABSTRACT**

The mountainous districts of Nghe An, Vietnam have great potential in natural resources, but have high poverty rate. In this paper, a multidimensional approach was applied in order to find the fact of poverty and vulnerable elements of the poor households. By collecting, analyzing and processing the second data, six communes in 10 mountainous districts with 720 poor households in Nghe An province are investigated. The results show that poor households are not only have low-income but also have more difficult to access social services such as education, health, infrastructure. This study also identifies the main causes of poverty in this area, which are lack of capital, lack of land, shortage of labor, low production level. These multidimensional survey findings are an important basis for the development of sustainable poverty reduction policies and solutions. The proposed solutions in this study focus on raising people's knowledge and production levels for farmers rather than monetary subsidies.

**KEYWORDS :** Poverty, Reduce the poverty, Mountainous district of Nghe An

## INTRODUCTION

Poverty and poverty reduction is a global problem that concerned by the international community. In the trend of cooperation and globalization today, the poverty reduction is no longer the responsibility of a country that has become the concern of the whole international community. Traditionally poverty has been measured with one dimension that is income. According to Morduch (1994), the income or consumption outcomes by which poverty status is determined are themselves the results of stochastic as well as deterministic forces. However, as Jalan and Ravallion (1998) , at any point in time, some portion of those observed to be in poverty are only transient, experiencing some type of short-term, unanticipated shock resulting in their income or consumption shortfall, even when their characteristics are such that they would not, under normal conditions, be in poverty. Furthermore, Patrick S.Ward (2016) pointed out “the poor shall never cease out of the land,” economic development may succeed in removing structural or institutional barriers that trap households in chronic or persistent poverty, such as low levels of education, poor health, limited access to capital, economic policies, etc. However, in those cases, non-market goods or institutions are required to provide, such as the access to clean water or education service. The limitations has found in Vietnam. In recent years, the Vietnam government has had great efforts in the cause of hunger eradication and poverty reduction, they have achieved many accomplishments. The method of alleviation of poverty in Vietnam has been changing over the years, from the direct support to create livelihoods for sustainable poverty households. Nghe An mountains covering 10 districts and one town: Ky Son, Tuong Duong, Con Cuong, Anh Son, Thanh Chuong, Que Phong, Quy Chau, Quy Hop, Tan Ky, Nghia Dan and Thai Hoa town, with a total 13749.17 km<sup>2</sup>, accounting for 83.3% of the whole province. Nghe An's mountainous region is rich in natural resources but remains high poverty rate. In addition to low income, poor households face many difficulties in accessing social services such as education, health and infrastructure. Based on the assessment of the poverty situation and find out the causes of poverty, the paper proposes some solutions and models towards sustainable poverty reduction in mountainous areas in Nghe An. From the above issues, the research questions are set out as follows: What are situations where individuals are unable to access information as a result of interrelated social, cultural, educational and economic factors that prevent information access? What are the information skills needed to improve in producing? What are the difficulties in accessing social services and living conditions? What is the cause of poverty? What are the solutions to tackle poverty in this area? These research questions can only be answered with a multi-dimensional poverty approach in practice. The development of methodologies to measure poverty in a multidimensional way has been fostered by the household survey data in the Western of Nghe An.

## MATERIAL AND METHOD

### 1. Material

#### - Secondary data:

The data have collected from the UNDP, the World Bank, ESCAP world. They have deep studies of poverty, including poor access in many aspects: income, living conditions, such as food, clothing, housing, sanitation, health, education, travel and the right to participate in decisions of the community.

- The authors use the poverty statistics, the Department of Labor poor, Invalids and Social Affairs of Nghe An; statistics of the mountainous district of Nghe An province in the period from 2010 to 2015.

- Survey data: The most important source of data is from the survey results in six communes in 10 mountainous districts

## 2. Method

- Collecting, analyzing and processing the document: the authors collected information and documents from trusted sources, then sorting, processing, draw conclusions on the status of poverty in mountains of Nghe An.

- Field surveys: there are three samples for poverty: poor households, nearest poor households and households escape poverty. In the area study, there are six communes in 10 mountainous districts to investigate, including Chau Hoan (Quy Chau district) ; Dong Van (Que Phong) ; Mon Son commune (Con Cuong district) ; Save Kien commune (Tuong Duong district), Na Ngoi Commune, all numbers (Ky Son district). Total survey including 720 poor households votes, 120 votes and 75 votes out of poverty households personnel managers (each commune 120 poor households, 30 households out of poverty, and 15 administrative personnel).

## 3. Results and Discussion

### 3.1. *Characterized of mountains in Nghe An province, Vietnam*

The mountainous district of Nghe An are a large area, accounted for 83.4% of the province. There are three national nature reserves: Pu Huong, Pu Hoat and Pu Mat National Park, where is one of biosphere reserves worldwide in Vietnam. In the forest, the fauna and flora are diversity. This also is home of many ethnic minorities, accounting for 28.4% total population, include: Thai, Hmong, Kho Mu, Tho, Dan Lai. The period 2011 - 2013, the economic growth averaging 6.8%/ year. Per capita income in 2014 reached 15.5 million/person/year, by 63.3% over the average income of Nghe An province.

There have been many improvements compared to previous about rural infrastructure, especially transport, irrigation, power supply, water supply, schools, health centers, markets, community cultural houses, etc. In 2014, there were 213/217 communes have motorways to go to the town center (98%) ; there were 138/217 communes with the basic irrigation (63.6%) ; 199/217 communes with the national power grid to the town center (92%) ; 217/217 commune have health station (100%), 216/217 communes have enough schools and classrooms for preschool, elementary, high school that is built solid and semi-solid, above (99%) ; 47/217 communes have sufficient hygiene water supply, (21.7%) ; 120/217 communes have rural markets. The quality of labors have been raised gradually, to approach to labors market of Nghe An, national and foreign country. In 2014, the proportion of trained workers to reach 32%, including 24% of vocational training. Every year, employment is on 13,500 workers.

The mountains of Nghe An province has great potential for forest, mineral, hydropower, tourism. However, here is still poverty region, low levels of development and difficult development conditions.

### 3.2. **The actual situation of poverty in the mountainous districts of Nghe An province, Vietnam**

Total of poor households in mountainous districts of Nghe An province is 57227 households in 2014, accounting for 20.28% of the mountainous district and occupies 70.32% of that in the province. The number of near-poor households in the mountainous districts is 39921, accounting for 14.15% of all households in the mountainous districts and 44.18% that of the province.

Table 1. Number and percentage of poor households, near-poor households in mountainous districts of Nghe An, Vietnam 2014

No	District	Total households	The number of poor households	Rate (%)	The number of near-poor households	Rate (%)
	<b>Total of province</b>	<b>791.557</b>	<b>81.384</b>	<b>10,28</b>	<b>90.354</b>	<b>11,41</b>
	<b>The mountainous districts</b>	<b>282.121</b>	<b>57.227</b>	<b>20,28</b>	<b>39.921</b>	<b>14,15</b>
1	Thai Hoa town	17.198	608	3,54	571	3,32
2	Thanh Chuong district	59.527	7.146	12,00	10.862	18,25
3	Anh Son district	28.708	3.252	11,33	4.485	15,62
4	Tan Ky district	34.898	4.120	11,81	5.752	16,48
5	Nghia Dan district	32.631	3.785	11,60	4.541	13,92
6	Quy Hop district	30.997	5.720	18,45	4.602	14,85
7	Quy Chau district	14.090	5.583	39,62	2.178	15,46
8	Que Phong district	15.084	5.772	38,27	2.221	14,72
9	Con Cuong district	17.254	5.573	32,30	4.093	23,72
10	Tuong Duong district	17.099	7.761	45,39	2.317	13,55
11	Ky Son district	14.635	7.907	54,03	2.901	19,82

(Source: Department of Labor, Invalids and Social in Nghe An province)

In the mountainous districts of Nghe An, districts with the highest poverty rate is the Ky Son, accounting for 54.03% of the total poor households; followed Tuong Duong district (45.39%).

#### ***The income and livelihoods of poor people***

The survey results of six communes in mountainous districts of Nghe An, Vietnam showed that, the poor are minority ethnics. In which, Thais ethnic is largest proportion (76.0%), followed by Hmong, Kho Mu. Other minority ethnics are negligible proportion.

Table 2. Number of investigation poor distributed to minority ethnics of 6 mountainous commune of Nghe An, Vietnam

Name of communes	Thai ethnic		Hmong ethnic		Kho Mu ethnic		Other minority ethnics	
	Number (people)	Rate (%)	Number (people)	Rate (%)	Number (people)	Rate (%)	Number (people)	Rate (%)
Dong Van	120	100,0	0	0	0	0	0	0
Chau Hoan	120	100,0	0	0	0	0	0	0
Mon Son	120	100,0	0	0	0	0	0	0
Luu Kien	105	87,5	15	12,5	0	0	0	0
Na Ngoi	35	29,2	85	70,8	0	0	0	0
Ta Ca	47	39,2	18	15,0	55	45,8	0	0
Total	547	76,0	118	16,4	55	7,6	0	0

(Source: Survey data 2015)

There are from 4-6 demographic per poor households, that accounting for 86%, from 7 or more demographic accounted for 6% and from 3 demographic and less accounted for 8%. In general, the size of demographic per poor households was reduced with implementation to the population - family planning policy. However, in recent years, the poverty rate has third child was rise.

Productive resources of poor households is limited. The mainly production of poor households is agricultural, but the area of agricultural land (particularly annual crops) is not much. The average the area of land for agricultural production per household is about 200m<sup>2</sup> in Mon Son commune. Total natural land of Luu Kien commune is 13,979.63 hectares, but only 100.9 hectares of rice, 222 hectares of upland rice and about 330 hectares for other short term crops (produce land area accounts for only 4.7% natural land area of the commune). There are only 39 hectares for wet rice, cultivation land area was spontaneous by people in Ta Ca commune. Poor households aged 20-30 years old that are by separating household, the new household did not divide land by communal, because the communal land is limited, parents' land is not much to split for them, so almost poor are landless for production. The area of forest land, perennial tree land of mountainous district are large. However, this resources have not been exploited much for economic development locally by households.

Poor households have little pet, only about 23.4% of poor households have one cow, that was mainly financed by projects and poverty alleviation programs allocated. Pig farming households also not much, around 39.2% of the households that have from 1 to 2 pigs. The number of poultry in farming poverty is negligible, just to serve exigency in their family.

There are average of 1-3 employees in every poor household. In all of the households that were surveyed, the number of households with two labors/households accounted for the largest proportion of 53.6%; one labor/households accounted for 12.3%; the number of households with 3 or more employees accounted for 18.7% and the number of households without employees accounted for 15.4%. Most of the labor in the poor households only graduated secondary school or lower. A small portion of workers with vocational training, but there are not much of that labor have to seek employment and income growth.

The average income of the poor household is between VND 300,000 - 370,000 VND/ person/month (equivalent 14-18 USD). The main manufacture of households is agriculture with small-scale, fragmented, dispersed traditional, mostly is self-sufficient. The main income source of poor households is rely on agriculture, forestry those are affected the difficult farming production conditions, not proactive irrigation, small land of agricultural production. In the production of poor households, they have not a long-term plan or the production of goods, which mostly practices by the old way: basically farming to ensure food and feed some animals to serve the essential activities such as wedding, or to serve as a work of faith, spirituality.

In some communes, the poor households invest in production, such as seeds, fertilizers, but mainly in the lowland communes as Mon Son, Luu Kien. As for upland communes, the majority of poor households still produce by way of shifting cultivation. Therefore, production of the households depend entirely on nature, there are many cases of crop failure due to drought. Nearly 40% of poor households still lack of food on the days between harvests. Some poor households based primarily on exploiting the forest to live as families in Mon Son commune, Chau Hoan (firewood and non-timber forest products (rattan, bamboo, bamboo shoots,...)). The poor households newly separated have not or very little land for production, so their mainly income belong to the forest. In the process of living, the poor almost no ability to accumulate, in the meantime, the many demands of life: children grow up, go to school, sick, so every vicious poverty in family of poor households.

### ***The housing and living conditions***

Along with policies about removal dilapidated thatched houses, support the poor people build houses, some temporary houses of the poor were also much reduced. Through the survey, there are 57.4% of poor households live in the semi-permanent houses, 16.5% of poor households live in the permanent houses, those households are



mainly live in hydropower resettlement areas. The number of households live in temporary housing accounted for 21.5% of all households, have no house accounted for 4.6%. The medium housing area of the poor households is from 60-80 m<sup>2</sup>. All poor households use firewood for cooking. The majority of them using electricity, except for some of the Hoan Chau, Na Ngoi and Ta Ca. Particularly, Ta Ca is far from Muong Xen town about 3 km, but there are 4 villages where have not national grid.

There are not much things which service the life of poor households, around 75% of the surveyed households have bicycles; 36.4% of households have a rice cooker, 43.2% of households have a television, and the number of households with motorcycles accounting for about 5.7% of the surveyed households.

Regarding living water sources, the majority of poor households have used nature water that is flowing from mountainous. In general, the quality of water is relatively assured. For sanitation, 90% of the households who were surveyed have simple toilet, almost no septic toilet and the remaining households have no toilet, especially for highland households.

#### ***Access to health care***

All of the poor households are granted health insurance for the poor by the social insurance policy. However, the use of health insurance is different. 45% of them said that health insurance is very important for them, all of them use health insurance when they sick. However, the remaining number of them said that they use hardly it, many of them are not interested in what they had been granted medical insurance or not. Most of them are self-treatment by forest leaves at home when they illness.

#### ***Access to education***

Through the survey of poor households in 6 communes of the mountainous, the level of education for all adults are finished junior high school (accounting for 78.2% of them), the number who finished high school is only 5.4%. All of them want their children to go to school and 100% of them have children from 6-15 years old to go to school. However, the number of children attend high school or higher is not much, only about 25.7% of the surveyed households. The main cause is far from schools and households need labor, and many households thought that the opportunity to learn and to find another job is hard (12.6% of all surveyed households).

#### ***Access to information***

According to our survey data, around 43.2% of households have television, 36.7% of households have radios, and number of households use fixed telephone and mobile very little. The information they received regular from the village head, especially in the village where there is no power yet. Therefore, the role of village head is important in enhancing education and awareness of the people.

#### ***The social assistance***

In recent years, along with the State's policy, Nghe An province has many economic policies to support the poor. The specific support programs for the poor including preferential lend from credit funds with an average loan norms from 7-30 million/household; supported crop varieties and livestock; Support electricity, festival, rice, free of notebooks for primary school children. In the period 2011 - 2015, the mountainous districts have implemented policies to help, assist the poor from 2-3 household/year by some organizations, enterprises. This policy has been remarkably effective in improving infrastructure and generating productive assets to the poor of mountainous communes in recent years.

*Accessing the media:* According to survey data, the media being used household as follows: 43.2% of the television, radio 36.7%, landline and mobile phones are used very little. Information that households receive

regular from the village head, especially in the no electric. Therefore, the role of the village head is important in enhancing education and awareness of the people.

*Social assistance:* In recent years, the government has promulgated many policies. Nghe An province also has some specific economic support programs for the poor households, such as: concessional lending (average 7-3assigned0 million/household) ; varieties and livestock, electricity, Tet festival, food supporting; None tuition for primary school pupils. In the period 2011 - 2015, the mountainous districts have implemented the policies that assigned a number of units assist 2-3 poor household per year. The policy has been remarkably effective in improving infrastructure and production materials to the poor in the mountainous communes.

### *Causes of poverty*

The causes of the poor households in mountainous areas of Nghe An province were investigated. The results are as follows table 3.

Table 3. Causes of poor mountainous communes in Nghe An

		Unit: Households						
order	Causes	Dong Van	Chau Hoan	Mon Son	Luu Kien	Na Ngoi	Ta Ca	Sum
1	Lack of production capital	12	10	18	11	15	13	79
2	Lack of arable land	32	25	37	26	12	41	173
3	Lack of means of production	8	7	10	9	6	8	48
4	Lack of labor	14	12	5	12	23	11	77
5	Many dependents	15	11	9	7	17	12	71
6	Lack of job	12	16	13	15	9	6	71
7	Lack of skill	13	12	10	14	8	6	63
8	Serious illness	11	21	13	18	22	12	97
9	Social evils	2	4	3	5	5	7	26
10	Lazy workers	1	2	2	2	3	4	14
11	Other cause	0	0	0	1	0	0	1
	<b>Sum</b>	120	120	120	120	120	120	720

In the causes of poverty, households lacking production land (paddy land and food crops) is the largest number. Due to poor households mainly produce self-sufficient, grow food to serve consumer demand, while food crop land in the mountains is not much, mostly perennial crop land and forest land. According to the survey data, there are 173 households lacking production land, accounting for 24% of the households surveyed. Currently, in the mountains of Nghe An, there are a lot of small and medium hydropower projects under construction. This has a positive impact on improving the living standards for ethnic minorities. However, hydropower projects take a lot of arable land. In the resettlement areas, people are less productive land. On the other hand, the cultivation of poor households still under shifting cultivation, depending on the nature, the land produced not more frequently. The district is mainly mountainous forest land and perennial crops, but not exploited.

The next cause is poor households lack capital for production. Most poor families are supported concessional loans, but with less capital (up only 30 million VND), while borrowing short (from 1 to 3 years), is not enough farmers to reinvest produce. Some loans to households for house and used to fix other things, do not re-invest in production. Many households borrow to invest in production, but not enough livestock to create cumulative time has come due. Some loans to households, but do not know to use capital efficiently. Most poor

families do not know how to do business calculations and so the cumulative expenditure for reinvestment production fails, the lack of capital for production and business. The ability of poor households accumulated almost no, difficult to cope with the risks (natural disasters, illness).

Poor households lack of knowledge, lack of technical expertise to the scientific approach and techniques in the life of spot-limited production, low labor productivity.

The number of poor households with many children, crowded eat, lack of jobs. There is another division of household labor lazy, suffer from social evils such as drug addiction, alcoholism, gambling, sick. Nomadic status, freedom unauthorized migrants, especially ethnic Hmong western region limiting performance of state policy and poverty reduction targets in the province.

Poor households still expect thought, rely on state assistance. The poverty reduction policies are now focused on supporting the needs of the poor. Means seeing what the poor lack the level such as pigs, chickens, ducks, cattle, rice, maize. If any household knows how to care for and support, applications selling point, said it accumulated be true to the wishes of leaders at all levels. But the actual number of such households do less, even some households are not developed.

On objective conditions: the mountainous commune of Nghe An complex terrain, land less agricultural production, farming difficulties, irrigation is not active. The vast majority of ethnic minorities, familiar with production practices subsistence, educational level is limited. Technical facilities and infrastructure has made progress, but still not meet the requirements for production and daily life of the people. Investment resources of the state are limited, some direct support policies do not encourage the efforts of the poor rise.

In recent years, the province has issued many policies to support the poor. The province's policy has largely focused on to solve the pressing problems of immediate nature in the daily life, such as life support, support small-scale production for the poor, poorer regions... Not focused strategic investments basic goods for each district and each region; not pull more strongly on regional business hub for linking production and consumption of goods for farmers such as sugar, tea, dairy, business investment in agro-processing production large scale in the West are very few and these also appear in the midlands, low mountains, while high mountainous areas, ethnic minority areas, there is almost no business.

The policies of the past and current policies only solve urgent demands of the life, service of the self-sufficiency, poverty alleviation, are allocated drip policy indicators through each work, each year, for each beneficiary regions; not a factor creating stronger links to the production of goods is crucial for economic development western region of Nghe An. Through investigation management personnel, 73.5% of staff management policies that have the most impact on poverty reduction in mountainous areas as infrastructure investment and allocation of land and forestland. In localities are investing in infrastructure, people's lives change much, the goods can be exchanged with other places and people will change habits production towards market access. Business cooperation programs and projects more as a superficial, lacking unity and synchronization. Specifically, the combination is not the transfer of science and technology, instructions on how to do business on the poor and developing production investment, specifically credit policy for the poor combined with extension work, forestry and fisheries. Vocational training for poor people linked to employment policies. Some models are built extension but no policy of buying the products, or to find outlets for farmers' products. So it reduces the effectiveness of the program.

### **3.3. Some solutions for sustainable poverty reduction in mountainous communes in Nghe An province.**

Improving the educational level, quality of labor resources for mountain people

One of the underlying causes and cross-cutting leads to poverty in the mountainous commune literacy levels are limited and do not meet the requirements set forth. That is the cause of causes of poverty and also as a consequence of poverty. Nghe An mountainous have good qualities but humanity was not enough capacity needed to be willing to attack poverty as Kinh. This is the main reason leading to the poverty reduction programs and projects to be with people and little if any down, the efficiency achieved is also lower than expected.

First of all, the province must focus on improving literacy levels, it is the main condition for poverty reduction from the breakthrough of sustainable new poor. On that basis, promote communication activities to create unity of perception to every conscious people escape poverty and legitimate wealth, avoid ideological dependence. Improving the quality of human resources is a decisive factor to the existence and development. Labor quality is low, workers have no workplace skills will have little chance of employment, income, leading to poverty. In recent years, the district has made vocational training courses, however, are not effective because many trained workers without a job done again. So, training must be linked to job creation is to be effective by learning from the experiences of economic development typical in the community. This is the best delivery channel experiences between people to people, probably by a very ordinary mutual learning should be very effective and very spread out. However, there is no one model of poverty reduction "ideal" or "single" to indicate which elements have positive implications for poverty reduction by households. Poverty reduction capacity restriction order can be considered as one of the significant obstacles of poverty reduction in mountainous ethnic Nghe An. To enhance the active participation of the people and actively in all the steps of the programs, projects and poverty alleviation, the survey collected information poor, poverty reduction planning and monitoring, evaluation results of poverty reduction plan. Should make poverty the poor realize their own work, overcoming moral hazard, look to the State, to make them from a passive to an active transfer of poverty.

On the other hand, production development is needed to focus. Change the way to support poor households, avoiding split budget support, makes the funding support for the poor investment fragmented difficult to manufacture. For poor households majeure will find stable funding ongoing support for these households. Incremental funding support to poor households has the potential to poor households to invest in production, sustainable poverty reduction, then will move to the capital for the next poor producers to reinvest. In each village, there will be the production model fit locally.

In addition, the role of the head is very important in the reduction of poverty. So, training the village head is the typical bright spots in the economic development of the publication. Besides, the government needs to promote the focus of the convention to be the consensus of the people in the village. In fact, the economic model of the past year households in mountainous communes have limited capital, the level of production and access to the market economy, should not bring the desired effect. In terms of price instability, extreme climatic conditions, the need to restructure agricultural production towards overcoming monocultures, human toxicity, harmoniously combining a variety of crops, livestock together to income diversification, overcome risks in production, in line with educational level and farming techniques are limited by the people. Mountainous region has many advantages for the development of agricultural products, but the most difficult of the farmers is to find outlets for the product. With knowledge of the market is limited, the market orientation is not clear, households mainly produced by the

movement. In many places, the demolished plant new trees. Therefore, need to reorganize production in particular for poor and rural households in mountainous areas. To be able to produce sustainable goods, households will gather in groups, linked to the business responsible for the output of the household. Construction of processing facilities, combined with concentrated production zones. Need to create a value chain of agricultural commodities have the link between businesses and farmers. This is a practical solution to help reduce poverty sustainably, as well as to exploit the strengths and advantages of mountainous areas in Nghe An.

Diversify livelihoods to poor drainage of the mountains households Nghe An. Livelihood diversification towards households solve their economic objectives of the specific conditions. However, agriculture and forestry remain the main livelihood of the poor. The livelihoods of the poor in recent years, but has been improved, but the accessibility, choice of livelihood strategies are very different. For poor households should be the preferred choice of livelihood models based on indigenous knowledge of ethnic minorities under the motto "every village an outstanding product."

Strengthening science and technology transfer to poor households mountains Nghe An. The majority of households produce only empirically, depending on the nature, so the production efficiency is not high. Communes and extension centers should have technical training how a practical and effective way, consistent with the practices of each nation and village. Increased investment to build infrastructure to serve the development of production. Over the years, the allocation of capital and poverty reduction in mountainous areas in Nghe An are seriously investing in infrastructure (electricity, roads, schools, electricity, water) without adequate attention to the direct investment for the development of production (reclamation, irrigation, agricultural, forestry). Capital investment and science and technology to exploit land for perennial crops and forest lands for the people in the mountains of Nghe An. Currently, due to the impact of free migration, migrant organizations in the planning and development of hydropower, mining many communes, villages were split, disruption and change, so need to deploy large-scale allocation of forest land to farmers to use and manage on the basis of inherited customs and traditional forms of progress and compliance with the law of land. This has many advantages: tradition inherited the management and protection of forest lands; keep the forest; creating employment opportunities for local people; redress the sale, transfer of land has been going on; lack of land to reduce the pressure of the people; contributing to the re-establishment of environmental and living conditions are familiar; return ownership to land, forests, overcoming the psychological loss of land, loss of forest people. The allocation of land and forests to households should be implemented on the basis of the model replicated made and on the basis of the investigation, studied cultural characteristics, habits and needs of the people, with the specific terms of the rights and responsibilities of subjects assigned land and forests.

Moreover, some social solutions are very important. Reviewing the poor households, classified by the capacity of poor households to have direct policy support to the poor by increasing "conditional support" and "support recovery" to promote active rise of the poor. Implementing a policy of direct support in the form of "support integration projects" in each commune, each village, to ensure coordination of resources, clarify the roles and responsibilities of stakeholders, which moved from supporting individual by sector to support interdisciplinary, moving from one-time assistance to support in the process in order to achieve sustainable efficiency. Strengthen the capacity to implement community functions, economic and social and support services benefit the poor and vulnerable groups, in order to promote participation and capacity empowerment, creating a foundation for progress sustainable poverty reduction in these communities and villages.

## CONCLUSION

With resources are available, poor households may generate different levels of capabilities and functioning across diverse difficulties. In addition to low income, poor households face many difficulties in accessing social services such as education, health, infrastructure. From sorting capacity of poor households, we know the causes of poverty, thus the government decides to invest something in the poor, for that reason, they know who would be first invested, who will be next, accompanied by responsibility and conditions. As the result, we avoid spreading investment, shared equally, so improving the efficiency of investment. For sustainable poverty reduction in mountainous Nghe An province should implement synchronization solutions. One of the priority measures that are formed agricultural value chain for mountainous areas in Nghe An that is the core business, the poor is a link in this value chain. Using capital efficiently, avoid spreading funding, by concentrating investment and rolling, forming the producer group to the economic development cooperation. To develop the value chain with participation of the poor, the province should have policies to attract, incentives for agricultural enterprises to invest in the mountainous regions. There is thus a new poverty reduction and sustainability ensure high efficiency.

## REFERENCES

- [1]. CPCs Ta Ca, Na Ngoi, Luu Kien, Mon Son, Dong Van, Chau Hoan. (2015). *Report on poverty reduction, economic development - local society on communal cell stage from 2010 to 2014*.
- [2]. DPCs Quy Chau, Que Phong, Con Cuong, Tuong Duong, Ky Son. (2015). *Report on poverty reduction in 2010 and 2014*.
- [3]. Ministry of Labour, Invalids and Social Affairs. (2015). *Scheme Phase multidimensional poverty from 2016 to 2020*.
- [4]. J. Morduch, Poverty and vulnerability, The American Economic Review, Vol.84 (2) (1994), pp. 221-225.
- [5]. J. Jalan, M. Ravallion. *Is transient poverty different? Evidence for rural China*. The Journal of Development Studies. 36 (6) (2000). pp. 82-99.
- [6]. Patrick S.Ward (2016), Transient Poverty, Poverty Dynamics, and Vulnerability to Poverty: *An Empirical Analysis Using a Balanced Panel from Rural China*. World Development, Volume 78, February 2016, Pages 541-553.
- [7]. The Department of Labour, Invalids and Social Affairs in Nghe An. (2015). *Summary of Investigation poor, near-poor households communes, wards and towns in 2014*.
- [8]. The People's Committee of Nghe An. (2015). *The conference summed poverty reduction period 2011 to 2015 and western help poor communes in Nghe An province*.
- [9]. Science and Technology Department of Nghe An. (2014). *Scientific Conference Assessing the effectiveness of poverty reduction policies in the western districts of Nghe An*
- [10]. W. Naudé, A. Santos-Paulino, M. McGillivray Measuring vulnerability: *An overview and introduction*. Oxford Development Studies. 37 (3) (2009). pp. 183-191.



**FILM CELLULOSE FROM CATTAIL (*Typha angustifolia* L.) IN SALINE SOIL**

A-roonrat Uthaiku, Pornpimol Ponkham, Patcharaporn Pimchan\*

*Department of Chemistry, Faculty of Science and Technology, Rajabhat Maha Sarakham  
University, Maha Sarakham, 44000, Thailand.*

*\* Corresponding author Tel. 6686-2197-717; Fax: 043-742620*

*E-mail address: Patcharaporn145@gmail.com*

**ABSTRACT**

The aims of this study were extraction, characterization cellulose and preparation film cellulose from Cattail (*Typha angustifolia* L.). The sample was collected from saline soil at Borabue distict Maha Sarakham and purified by using the chemical alkali extraction. The cellulose was extracted by acid hydrolysis (H<sub>2</sub>SO<sub>4</sub>). Cellulose of Cattail (*Typha angustifolia* L.) was determined according to TAPPI standards, that showed the amount of  $\alpha$ -cellulose at 63.94%. The extracted fibers characterized by Fourier transform infrared spectroscopy (FT-IR) and X-ray diffraction (XRD). The films cellulose from Cattail (*Typha angustifolia* L.) in saline soil were prepared by using ionic liquids 1-Butyl-3-methylimidazolium chloride [Bmin]Cl and ZnCl<sub>2</sub>. This work provides a simple and highly efficient way to achieve film cellulose it was the new choice to low cost application to synthesized film cellulose.

**KEYWORDS:** Cellulose; Film-cellulose; Cattail

## INTRODUCTION

The market for bio-based materials is increasing steadily. The demands of products made from renewable and sustainable resources that are biodegradable [1]. The processes environmentally and materials compatible obtained from renewable sources were more interested [2]. The demand of products that have environmental and health safety by consumers increasing [1]. Cellulose, a natural hydrophilic polymer composed of poly unit [3] is one of the most abundant and ubiquitous polymers on hemp, cotton, wood and other plant [4]. The cellulose of these fibers depends on their biological origin and age likewise the extraction method [5]. The Characteristics of cellulose which mainly appears as a white odorless tasteless and were crystalline powder. Cellulose and its derivative have been extensively use in the plastic industries, cosmetic, food and pharmaceutical [6], etc. Thus plastic industry is constantly looking for new alternatives. Films and coatings have been widely studied for packaging applications, mostly due to their excellent mechanical strength and oxygen barrier properties [1]. Regenerated cellulose films prepared using obtained cellulose from ligno-cellulosic biomass and room temperature ionic liquids have gained increasing interests in the past few years as they possess outstanding properties such as transparency, non-toxic nature and mechanical properties excellent [7], and biocompatibility [8]. Currently conservation. In this regard, great efforts are being focused on inorganic salts. They are simple to use and easily recyclable, non-toxic, environmental friendly and inexpensive. Therefore, the variety application of cellulose were depend on the chemical composition of original fibres, so that the study in genesis and kind of plant are important to property and nature of micro-cellulose. In the main objectives of the present work were extract and characterization cellulose from Cattail in saline soil and prepare film cellulose, that the new choice to low cost application to synthesized film cellulose.

## MATERIALS AND METHODS

### Materials

Cattail (*Typha angustifolia* L.) collected from Borabue distict Maha Sarakham that the saline soil. 1-Butyl-3-methylimidazolium chloride [Bmin] Cl HPLC grades was purchased from Sigma-aldrich cheme Switzerland. Sulphuric acid (>95 wt%), was purchased from carlo erea reagent. Zinc Chloride, Sodium chlorite, sodium hydroxide were obtained by lobal chemie laboratoly reagents. All chemical were used without further purification.

### METHODS

*Chemical characterization of Cattail:* The Cattail (*Typha angustifolia* L.) samples were ground and selected at 60 mesh fraction. The  $\alpha$ -cellulose was determined by TAPPI T203 om-93 method, followed by the extractive free fiber about 5 g oven-dry in spaimen. Lace the test specimen in a 300 mL tall-form beaker and add 75 mL of 17.5% NaOH reagent, adjusted previously to  $25^{\circ} \pm 0.2^{\circ}\text{C}$ . Stired the pulp with the apparatus until it is completely dispersed. When the pulp is dispersed, rinse the stirrer with 25 mL of 17.5% NaOH reagent, adding it to the beaker, so that exactly 100 mL of the reagent have been added to the pulp. Stired the pulp suspension with a rod and place in a bath at  $25^{\circ} \pm 0.2^{\circ}\text{C}$ . After a period of 30 min from the first addition of the NaOH reagent, and 100 mL of distilled water at  $25^{\circ} \pm 0.2^{\circ}\text{C}$  to the pulp suspension and stired thoroughly with a rod. At the end of the 60 min period, stired the pulp suspension with a rod and transfer to a filtering funnel. Discard the first 10 to 20 mL of the filtrate, then collect about 100 mL of the filtrate in a clean and dry filtration flask.[9].

**Preparation of cellulose from Cattail (*Typha angustifolia* L.) :** The ground fibers with sieved under 60 mesh were solvent extraction in a soxhlet apparatus the mixture of ethanol/benzene for 6 h with a 1:2. Then dispersed in an acid solution (0.2 wt% of acetic acid) of 0.27 wt % sodium chlorite and 0.7 wt % sodium hydroxide. The system was kept at 70 °C and stirred until the product become white for removed the lignin and minerals. The sample was treated in 6 wt % potassium hydroxide over night at room temperature and then at the same concentration at 80 °C for 2 h in order to leach hemicelluloses [10]. The dissolved cellulose was regenerated by adding an excess amount of double distilled water (~1000 mL). The regenerated cellulose was separated by centrifugation at 3000 rpm for 10 min and washed with distilled water until pH 7 [11]. The white powder of bulk cellulose were obtained and then hydrolyzed by 3% sulfuric acid at 20 mL/g of acid-to-cellulose ratio at 45 °C for 30 min. Acid hydrolysis was stopped by diluting with 10-fold ice water. The resulting cellulose gel was washed once, centrifuged at 3000 rpm for 10 min and washed with distilled water until pH 7. The regenerated cellulose suspended in distilled water and ultrasonicated at 10 °C for 5 min. The suspension was freeze-dried and kept at 4 °C.

**Preparation of cellulose from Cattail film:** Typical procedure for the dissolution of cellulose. Cellulose were dried 90 °C prior to cellulose dissolved. In the procedure cellulose (0.1 g) and [Bmin]Cl (2.0 g) were mixed and then heated at 100 °C with stirring for 10 min to form a homogeneous and transparent solution. After the reaction was completed pour into plate. Then spread evenly at room temperature. When cold, peel off the film in a desiccator [12]. Then pour it into a plate waiting to be cooled in desiccator. Dissolution in the highly concentrated salt system was achieved by dissolving the desired amount of cellulose (1.0 g) in a 68 wt % ZnCl<sub>2</sub>/H<sub>2</sub>O solution at 80 °C, mixed and then heated at 100 °C with stirring for 30 min to form a homogeneous [13]. Then pour it into a plate waiting to be cooled in desiccator.

**Characterization of Cellulose from Cattail:** The overall crystalline phases of sample were determined by X-ray diffraction patterns (XRD, Bruker D8 ADVANCE diffractometer). Fourier transform infrared (FTIR) spectra of cellulose were collected using FTIR spectroscopy (Perkin-Elmer Spectrum-One).

## RESULTS

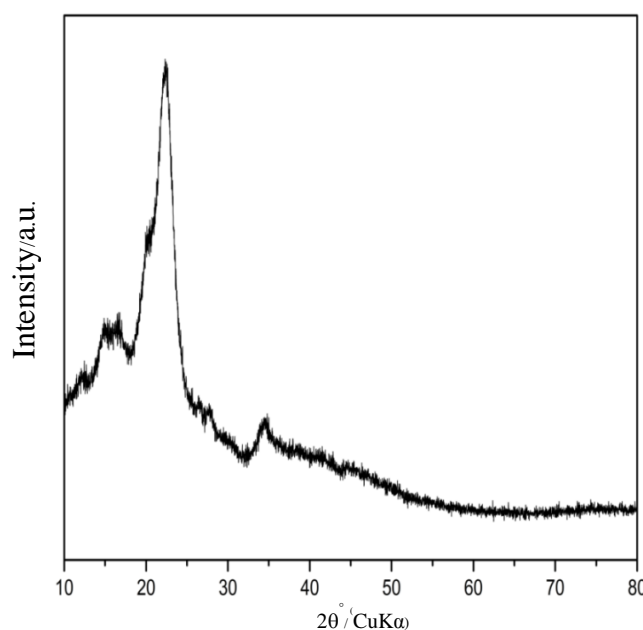
In this study, we successfully extracted cellulose from Cattail (*Typha angustifolia* L.) that collection from saline soil. The content of  $\alpha$ -cellulose was 63.94 %. The fiber plant such as cotton revealed at the content of cellulose 43.8% [13]. The higher  $\alpha$ -cellulose indicating that the Cattail can be use in fibers plant.

From the Cattail fibers, the cellulose was prepared by hydrolyzed with 3% sulfuric acid at 45 °C for 30 min. After stopped the reaction, dispersed the suspended in distilled water and ultrasonicated at 10 °C for 5 min. The powder of cellulose received after freeze-dried and kept at 4 °C. The physical appearance of cellulose from Cattail (*Typha angustifolia* L.) was showed in Figure 1 From the high content of cellulose of Cattail and the physical in Figure 1 that remove white nano fibers indicating the Cattail are the fiber plant.



**Figure 1.** The physical appearance of Cellulose powder from Cattail (*Typha angustifolia* L.).

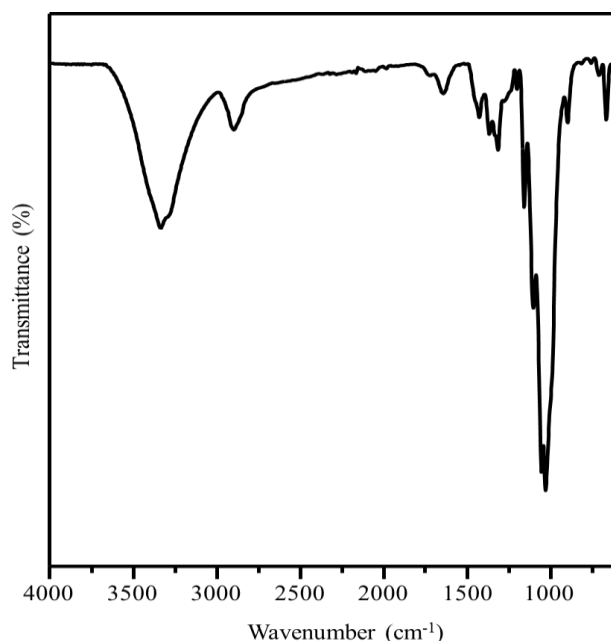
The crystallinity of cellulose from Cattail (*Typha angustifolia* L.) were characterized by XRD that the results showed in Figure 2. The cellulose exhibited its characteristic crystalline peak around  $2\theta$  at 16.4, 22.7 and 34.6. The pattern of the product corresponding to the 110, 200 and 004 planes, respectively, indicating that the cellulose crystalline structure was successfully extraction [11]. The crystalline of the product can be according to the high purity of cellulose and low hemicellulose and lignin were remained in the product.



**Figure 2.** The XRD pattern of MCC from Cattail.

The morphology of fiber extracted cellulose were analyzed by FTIR spectroscopy and the corresponding spectra are shown in Figure 3. The FTIR confirming its chemical structure to be cellulose. From the literature

review it is apparent that, the band at around  $3300\text{ cm}^{-1}$  corresponding to the O-H stretching vibration the peak at  $2900\text{ cm}^{-1}$  assigning to the C-H stretching vibration the absorption in the  $1400\text{--}1200\text{ cm}^{-1}$  and  $900\text{--}600\text{ cm}^{-1}$  designating to the bending of  $\text{CH}_2$  and wagging or twisting modes of  $\text{CH}_2$  respectively. The FTIR spectrum showed peak at  $1000\text{ cm}^{-1}$  suggesting to the C-O stretching vibration [14]. From the FTIR spectrum confirming the cellulose were extracted from Cattail.

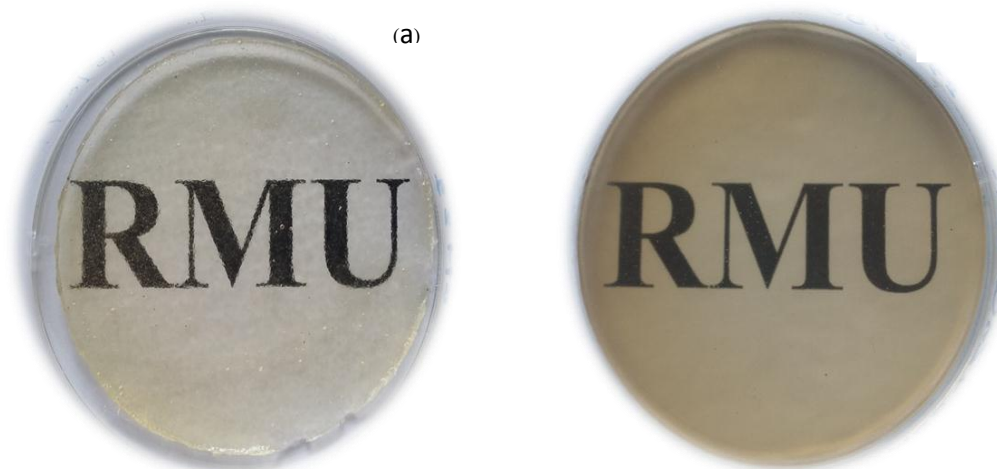


**Figure 3.** The FTIR spectrum of MCC from Cattail.

#### **Film cellulose from Cattail (*Typha angustifolia* L.) in saline soil.**

In this work, cellulose was hydrolyzed in  $[\text{BMIN}]\text{Cl}$ . It can be observed that the white solution was formed when 0.1 g of cellulose dissolved in  $[\text{BMIN}]\text{Cl}$ , the mixture solution was transparent after heating at  $100\text{ }^{\circ}\text{C}$  with stirring for 10 min. The film were hand casted on a plastic plate ( $\text{Ø}110\text{ mm.}$ ) showed in Figure 4a.

Dissolution in the highly concentrated salt system was achieved by dissolving the desired amount of cellulose 1.0 g in a 68 wt%  $\text{ZnCl}_2/\text{H}_2\text{O}$  solution at  $80\text{ }^{\circ}\text{C}$ . The transparent and homogeneous cellulose solutions. was formed of ther heated at  $100\text{ }^{\circ}\text{C}$  with stirring for 30 min.



**Figure 4.** Film cellulose dissolution of [BMIN]Cl (a) and  $\text{ZnCl}_2$  (b)

The film cellulose hydrolyzed in [BMIN]Cl presented the white transparent film while the film cellulose hydrolyzed in  $\text{ZnCl}_2$  demonstrate the brown transparent film (Figure 4a and 4b), indicating that the solvent were effected to the film characteristic. However, It is a well-established fact that the insoluble characteristics of cellulose are mainly derived from its strong intra- and inter-sheet hydrogen bonding network arrangements. Thus, it appears that upon the addition of cellulose to the  $\text{ZnCl}_2$  solution, the  $\text{Zn}^{2+}$  ions disperse through the cellulose matrix and permeate between the sheets, and compete for strong interactions with the hydroxyl groups  $\text{O}_2\text{H}$ ,  $\text{O}_3\text{H}$  and  $\text{O}_6\text{H}$ . Consequently, the intra- and inter-sheet hydrogen bonds are broken leading to cellulose solubility [15]. This study achieves a full use weed cellulose-based films, and thus provides a new choice to replace the traditional high-grade dissolving pulp with the low-value Cattail (*Typha angustifolia* L.).

### CONCLUSIONS AND DISCUSSION

The Cattail in saline soil are the fibers plant, that have the  $\alpha$ -cellulose at 63.94 %. the cellulose, that insoluble and difficult to chang the stractare was succesfully prepared the flim cellulose by using [BMIN]Cl and  $\text{ZnCl}_2$  to hydrolyses. This study showed the new choice to simple synthesized film cellulose.

### ACKNOWLEDGEMENTS

The authors gratefully acknowledge the Science Center, Department of Chemistry, Faculty of Science and Technology, and Research and Development Institute, Rajabhat Maha Sarakham University for the facilities provided.



## REFERENCES

- [1] Shankar, S. and Rhin, J-W. (2016). Preparation of nanocellulose from micro-crystalline cellulose: The effect on the performance and properties of agar-based composite films. *Journal of carbohydrate polymers*, 135, 18-26.
- [2] Kallel F., Bettaieb F., Khiari R., García A., Bras J. and Chaabouni S.E. (2016). Isolation and structural characterization of cellulose nanocrystals extracted from garlic straw residues. *Journal of Industrial Crops and Products*, 87, 287–296.
- [3] Habibi Y., Lucia, L. A. and Rojas, O. J. (2010). Cellulose Nanocrystals: Chemistry, Self-Assembly, and Application. *Chemical Reviews*, 110, 3479–3500.
- [4] Maiti, S., Jayaramudu, J., Das, K., Reddy, S. M., Sadiku, R., Ray, S. S. and Lui D. (2013). Preparation and characterization of nanocellulose with new shape from different precursor. *Journal of Carbohydrate*, 98, 562–567.
- [5] Espino E., Méliisa C., Domenek S., Román-Gutiérrez A. D., Belgacem N. and Bras J. (2014). Isolation and characterization of cellulose nanocrystals from industrial by-products of Agave tequilana and barley. *Journal of Industrial Crops and Products*, 62, 552–559.
- [6] Okwonna O-O. (2013). The effect of pulping concentration treatment on the properties to microcrystalline cellulose powder obtained from waste paper. *Carbohydrate Polymers*, 98, 721–725.
- [7] Obi Reddy, K., Uma Mahaswari, C., Dhlamini, M.S., Mothudi, B.M., Jinming Z., Jun, Z. Nagarajan, R and Varada Rajulu, A. (2017). Preparation and characterization of regenerated cellulose films using borassus fruit fibers and an ionic liquid. *Journal of carbohydrate polymers*, 160, 203-211.
- [8] Xu, J., Lui, B. Hu, J. and Hou, H. (2017). Ionic liquid mediated technology for fabrication of cellulose film using gutta percha as an additive. *Journal Industrial Crops & Products*, 108, 140-148.
- [9] T 203 om-93, Alpha-, beta- and gamma-cellulose in plup. TAPPI Method.
- [10] Kentaro A., Shinichiro I. and Hiroyuki Y. (2007). Obtaining cellylose nanofibers with a uniform width of 15 nm from wood. *Biomacromolecules*, 8, 3276–3278.
- [11] Browing B.L. (1963). *Method in Wood Chemistry*, Interscience Publishers, 389–407.
- [12] Yuan, Y., Wang, J., Fu, N. and Zang, S. (2016). Hydrolysis of cellulose in 1-allyl-3-methylimidazolium chloride catalyzed by methyltrioxorhenium. *Journal of Catalysis Communications*, 76, 46-49.
- [13] Ververis C., Georghiou K., Christodoulakis N., Santas P. and Santas R. (2004). Fiber dimensions, lignin and cellulose content of various plant materials and their suitability for paper production. *Industrial Crops and Products*, 19, 245-254.
- [14] Qin, X., Chen, C., Katelyn, R., Tianming, Y. and Srinivas, J. (2016). A facile route to prepare cellulose-based films. *Journal of carbohydrate polymers*, 149, 274-281.
- [15] Lu P. and Hsieh Y.-L. (2012). Cellulose isolation and core-shell nanostructures of cellulose nanocrystals from chardonnay grape skins. *Carbohydrate Polymer*, 87, 2546–2553

## PHYSICOCHEMICAL PROPERTIES AND ANTIOXIDANT ACTIVITY OF FRUIT YOGURTS

Sunan Butsat\*, Thanitnan Boonsrichana, Yanisa Porutso and Wanida Suttipapha  
*Faculty of Agricultural Technology, Rajabhat Maha Sarakham University*  
*, Mahasarakham, Thailand*

*\* Author for correspondence, e-mail sbutsat@hotmail.com Fax 043-725439*

### ABSTRACT

This research study on the affecting of three fruits including papaya, mak mao and dragon fruit on physicochemical properties and antioxidant activity of yogurts compare with plain yogurt (control). Texture analyzer was used to measure tension against flow of yogurt samples indicating on viscosity. Changing in syneresis percentage, soluble solid content, pH and acidity of yogurt samples stored at 5°C during 13 days were investigated. The total phenolic and flavonoid contents as well as antioxidant activity were determined in fresh samples. Results found that the pH and total soluble solid of all yogurt samples decreased, but syneresis percentage, viscosity and acidity of all yogurt samples increased during storage period at 5°C. Adding each fruit yams resulted in fruit yogurts showed higher viscosity and total soluble solid than those in plain yogurt. Plain yogurt showed the lower pH and acidity than three fruit yogurts. Sensory evaluation showed the overall acceptance score of all yogurt samples was not different ( $p > .05$ ). Total phenolic and flavonoid contents of fruit yogurts were higher compared to plain yogurt. In addition, mak mao yogurt gave the highest total phenolic content and DPPH radical scavenging activity, while the highest flavonoid content found in dragon fruit yogurt.

**KEYWORDS :** fruits yogurt, phenolic, flavonoid, anthocyanin, antioxidant activity

## INTRODUCTION

Yogurt is fermented milk produced by *Streptococcus thermophilus* and *Lactobacillus delbrueckii subsp.* In present the yogurt is considered a healthy food due to improving the intestinal environment and enhancing the body immunity (Michael et al., 2015). Due to customer demand on yogurts with natural additives has been intensely increased. Fruits and vegetables are source of natural antioxidants (Dimitrios, 2006) and are rich source of dietary fiber which added to yogurt act as prebiotics fibers (Allgeyer et al., 2010). Some researchers used fruits and vegetable to improve the flavor and nutritional value of yogurt (Mehriz et al., 2013).

Papaya is a source of antioxidant nutrients such as carotenes, flavonoids and vitamin C as well as vitamin B. It is also a good source of fiber and magnesium (Aravind et al., 2013). Mak mao is a wild fruit categorized in berry family and its red and purple color contains anthocyanin acts as a powerful antioxidants reducing the chance of cancer (Jurjong et al., 2015). Dragon fruit is a low calorie fruit and give a high amount of fiber and vitamin C. It contains lycopene, which is a natural antioxidant helps protect against cancer and heart disease (Zainoldin and Baba, 2009). The purpose of this work was to use papaya, mak mao and dragon fruit to improve the flavor and nutritional value of yogurt. Physicochemical properties and antioxidant activity were determined. Sensory acceptability of the flavored yogurt was also evaluated.

## MATERIALS AND METHODS

### Materials

Fully ripe papaya (*Carica papaya*), mak mao (*Antidesma thwaitesianum*) and dragon fruit (*Hylocereus polyrhizus*) were purchased from the local market. Starter culture in the form of freeze dried-direct vat set (FD-DVS), YC 380 (Chr Hansen, Denmark) was purchased from Sigma-Aldrich Inc. 1,1-diphenyl-2-picrylhydrazyl radical (DPPH), Gallic acid and Folin-Ciocalteu phenol reagent were purchased from Fluka Chemical Co. Other chemicals and reagents were purchased from Merck (Damstadt, Germany)

### Preparation of fruits jams

Peeled papaya, mak mao and dragon fruit were washed and cut into small pieces mixed with the same weight of sugar (1:1) and homogenized with blender then were cooked at 90°C for 30 min. Prepared jams were kept at 5 °C until used.

### Preparation of starter culture

Cow's milk (500 mL) was pasteurized at  $75 \pm 5$  °C for 15 min and cooled down until 45 °C, a yogurt starter FD-DVS YC-380 (0.2 g) was mixed thoroughly with pasteurized milk followed by incubation at 42 °C for 12 hours. The yogurt formed was stored at 5°C and used as starter culture within 14 days.

### Preparation of plain and fruit yogurts

Pasteurized Cow's milk was divided into four equal portions (150 g for each replicates of portions). Three replicates of yogurt portions were manufactured and analyzed. The first portion was kept without any additions. Jams of three fruits (12 g) were added separately to the three portions of cow's milk (150 g). All milk portions were heated at 85 °C for 15 min, then cooled to 42 °C and inoculated with 2% (w/w) starter culture under aseptic

conditions. Yogurt was sampled in 150 g plastic cups and incubated at  $42 \pm 2$  °C for 5 h, then transferred to a refrigerator at 5 °C to be kept for 13 days.

**Analysis:** The yogurt samples were measured physical and chemical properties in fresh samples (0 day), after 4, 7, 10 and 13 days of cold storage. Three replicates of flavored yogurt were manufactured and analyzed. The pH was measured using a laboratory pH meter. Viscosity was measured resistant flow force using Texture analyzer, TA.XT with A/BE 35 probe. Syneresis was carried out according to the method of Tseng and Zhao (2013). Total phenolic and flavonoid content were determined following to Singelton et al. (1999). Monomeric anthocyanin content was determined using the pH differential (Wallace and Giusti, 2008). The antioxidant activity using 1,1-diphenyl-2-picrylhydrazyl radical (DPPH) inhibition was determined by an assay modified from Zainoldin and Baba (2009). Sensory evaluation was assessed by a panel consisting of 30 untrained members as student of food technology department, Rajabhat Mahasarakham University, Thailand ages 18 to 22 years old, but ever ate yogurt. The results were statistically analysis by ANOVA using SPSS software.

### **Sample yogurt extraction**

Each yogurt sample (5 g) was extracted with 20 mL of 1% acidified ethanol and shaken with 200 rpm in incubator shaker at 37 °C for 1 h. The mixture was filtered using vacuum Buchner then supernatant was transfer into a 50 ml vial. The residue was re-extracted under identical conditions. Supernatants were combined and used for antioxidant activity, total phenolic, total flavonoid and total anthocyanin determinations.

### **Determination of total phenolic content**

Total phenolic content (TPC) was determined according to the method of Singelton et al. (1999) with slight modification. Yogurt extracts (0.2 mL) were mixed with 1.0 mL of Folin-Ciocalteu's reagent (diluted 10:1 times with water) and allowed to stand at room temperature for 5 min, then 1.8 mL of sodium carbonate (10% w/v) was added and adjusted to 5 mL with distilled water. After incubation for 60 min at room temperature, absorbance was measured at 765 nm using spectrophotometer. A standard calibration curve was prepared using gallic acid. TPC was expressed in gallic acid equivalents, GAE in mg per g of fresh samples.

### **Determination of total flavonoid content**

Total flavonoid content (TFC) was determined followed by Ratsewo et al. (2016) with minor modifications. Briefly, 0.5 mL of yogurt extracts was mixed with 0.3 mL of 5% (w/v) of sodium nitrite solution. After 5 min, 0.3 mL of 10% aluminum trichloride solution was added and allowed to stand for 5 min before 1.0 mL of 1M sodium hydroxide was added. The mixture was adjusted to 5 ml with distilled water and mixed by vortex mixer and the absorbance was measured immediately at 510 nm using spectrophotometer. Results were expressed as mg catechin equivalents in 1 g of fresh yogurts

### **Determination of total anthocyanin content**

The content of total anthocyanin in yogurt was determined using the pH differential method (Wallace and Giusti, 2008). Spectrophotometer was used for spectral measurements at 520 and 700 nm with 1 cm cuvette. Anthocyanin content was calculated as cyaniding-3-glucoside, using a molecular weight of 449.3 and an extinction coefficient of  $26,900 \text{ L cm}^{-1}\text{mg}^{-1}$ .

### Antioxidant activity using free radical scavenging activity

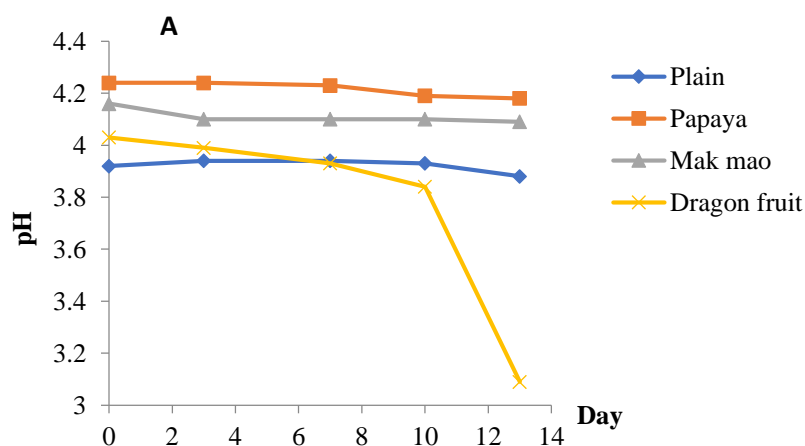
Free radical scavenging activity (%RSA) was determined according to the method of Zainoldin and Baba (2009), with slight modification. Yogurt samples extract (0.2 mL) was added to 2.8 mL of 0.06 mM DPPH in ethanol. Absorbance of solution was measured at 517 nm against a blank assay after stand in dark room for 30 min. The inhibition percentage was calculated as the absorbance of the sample divided by that of DPPH control at the same time multiplied by 100.

## RESULTS AND DISCUSSION

### Physicochemical properties:

pH value, acidity and total soluble solid:

The samples of plain and three fruit yogurts were determined physicochemical properties including pH value, acidity and total soluble solid expressed in Fig. 1. The result showed that the pH was slightly decreased whereas the acidity was increased during storage periods at 5 °C. The changes in pH and acidity of yogurts during storage period due to the post process fermentation. These results were agreement with previously report in yogurt flavored with black carrot, pumpkin and strawberry (Mehriz et al., 2013). Addition, the pH of dragon fruit yogurt was the lowest at 13 days (3.09). Adding fruit jam increased total soluble solid (TSS) of yogurt, in which dragon fruit yogurt had the highest of 14.03 °Brix, while it was 9.03 °Brix in plain yogurt. These results reveal that the sugar in fruit jams increasing total soluble solid in fruit yogurts.



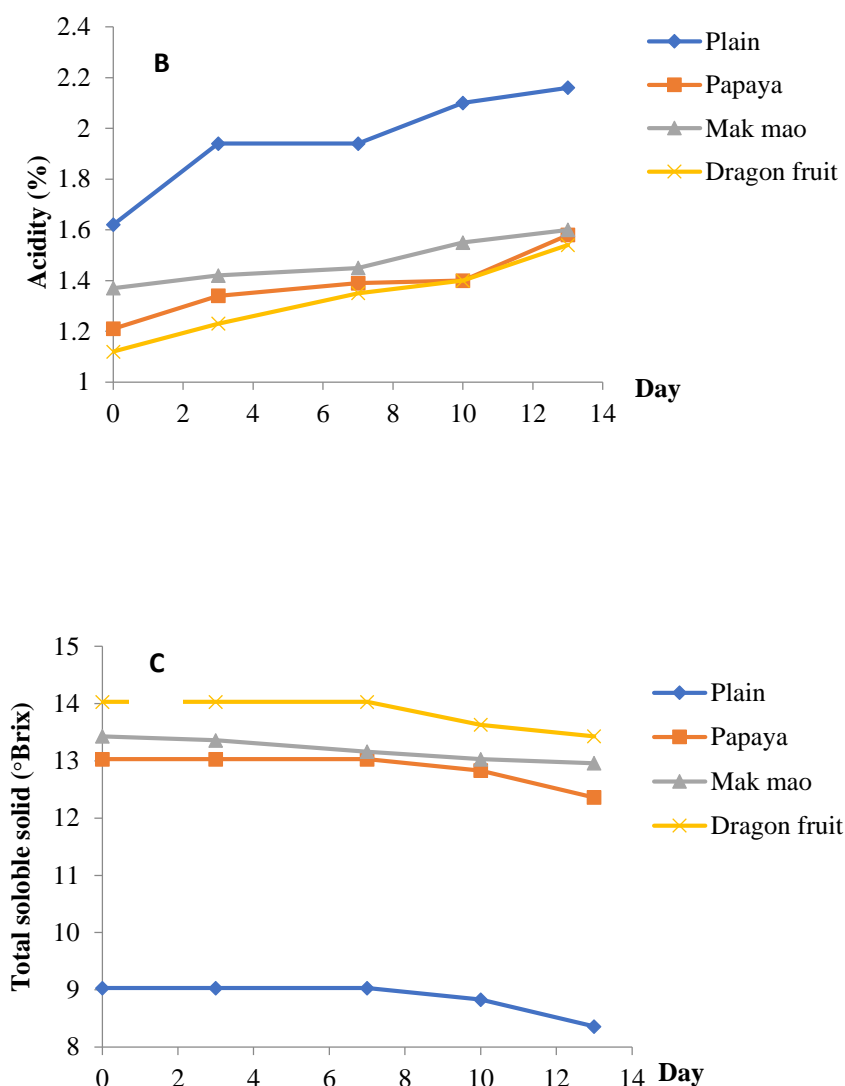


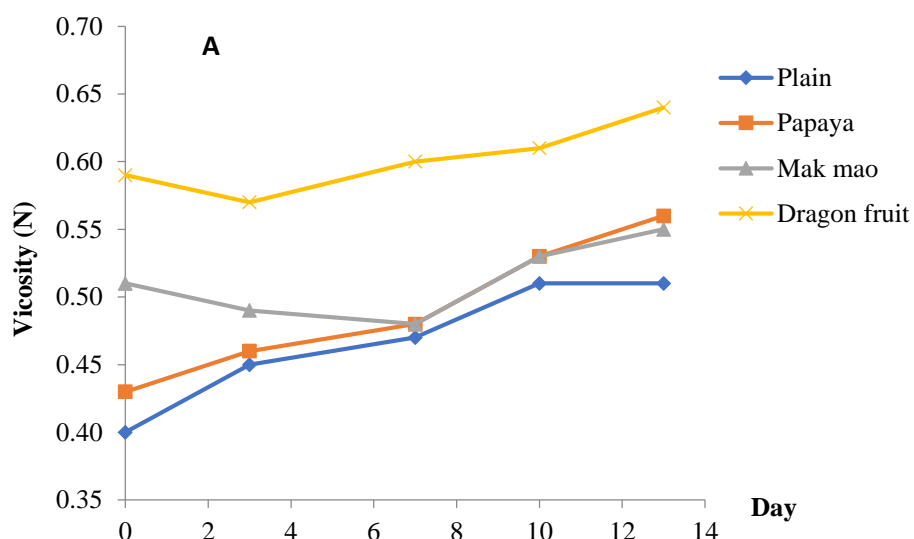
Fig. 1 pH value (A), acidity (B) and total soluble solid (C) of plain and three fruits yogurts during storage at 5 °C

Syneresis and viscosity:

Yogurt is visco-elastic gel, thus its properties can be characterized using both the viscous and elastic components. The physical attributes of yogurts, including syneresis and perceived viscosity, are crucial aspects of the quality and overall sensory consumer acceptance of yogurts (Lee and Lucey, 2010). Viscosity indicates the magnitude of energy lost as viscous dissipation per cycle of deformation and reflects the liquid-like properties. Viscosity is defined as the resistance that a liquid offers to an applied shearing force. Syneresis is related to the instability of the gel network and its poor ability to entrap all the serum phase (Lacey and Singh, 1998).



The results of syneresis and viscosity of plain and three fruit yogurts during 13 days of storage at 5 °C are reported in Fig. 2. The result found that the initially syneresis of mak mao and dragon fruit yogurts had lower than that of plain yogurt. Whereas, the papaya yogurt had higher syneresis compared to the plain yogurt. After 3 days, syneresis of all yogurt increased trend. Lucey and Singh (1998) reported that syneresis can be prevented by increasing the total solid of milk in set yogurt. Adding fruit jams increased viscosity of yogurt, in which the dragon fruit yogurt had the highest viscosity value of 0.59 N followed by mak mao, papaya and plain yogurt, respectively. Probably due to the increased solids content in fruit yogurt as a result of fortification of jam fruits. These results are in agreement with Barakat and Hassan (2017) revealed that addition of pumpkin increases in viscosity values of stirred yogurt. During the storage period, the increased viscosity of yogurt samples was observed may be due to dietary fiber fraction of fruits. The result was correspond with reported by Mehriz et al. (2013) that the addition of pumpkin increased viscosity of yogurt after ten days. Tseng and Zhao (2013) found that yogurt fortified with wine grape pomace increasing viscosity during 3 weeks of storage.



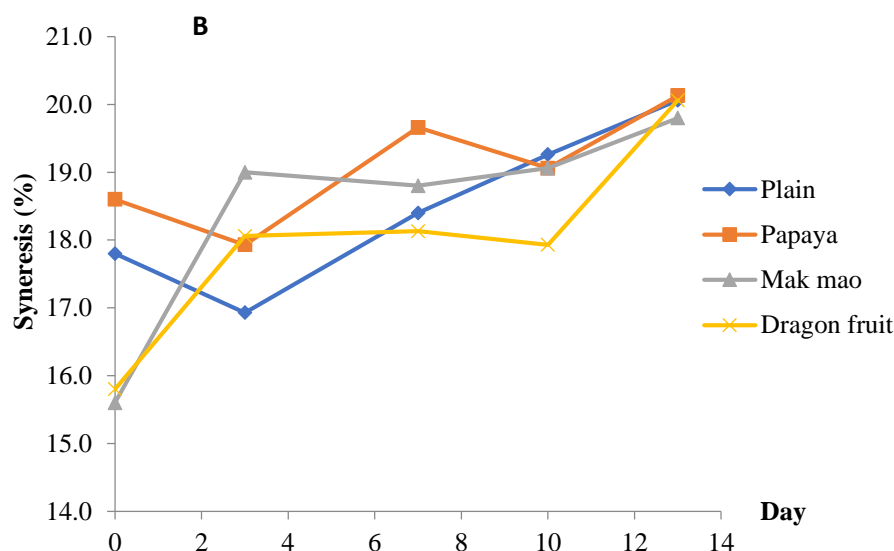


Fig. 2 Viscosity (A) and syneresis (B) of plain and three fruits yogurts during storage at 5 °C

#### Total phenolic, flavonoid, and anthocyanin contents and antioxidant activity:

There was significant difference ( $p < 0.05$ ) in phenolic, flavonoid and anthocyanin contents among all the yogurt samples (Table 1). The phenolic content in mamao and papaya yogurts was higher than that in plain and dragon fruit yogurts. The highest concentration of phenolic content was found in mak mao yogurt (1.40 mg GAE/g) follow by that in papaya, plain and dragon fruit yogurts, respectively. Similarly the flavonoid content of fruit yogurts was higher compared to plain yogurt. But there was no difference ( $p > 0.05$ ) on flavonoid content of mak mao and dragon fruit yogurts. However, the flavonoid content in three fruit yogurts was higher than that in plain yogurt. For the anthocyanin content found the highest in mak mao yogurt followed by dragon fruit, plain and papaya yogurts, respectively. Probably because the bioactive compounds present in mak mao had higher than those of papaya and dragon fruit.

Table 1 Phenolic, flavonoid and anthocyanin contents and radical scavenging activity of plain and fruits yogurts

Treatments	Phenolic content (mg GAE/g fresh weight)	Flavonoid content (mg CE/g fresh weight)	Anthocyanin content (mg cy-3-glu/g fresh weight)	%RSA
Plain	0.78 ± 0.01c	1.22 ± 0.03c	0.12 ± 0.01b	44.07 ± 0.87 b
Papaya	0.91 ± 0.01b	2.25 ± 0.03b	0.05 ± 0.01c	43.82 ± 0.79 b
Mak mao	1.40 ± 0.03a	2.64 ± 0.05a	0.33 ± 0.06a	52.08 ± 0.63 a
Dragon fruit	0.37 ± 0.03d	2.76 ± 0.01a	0.14 ± 0.06b	37.08 ± 0.88 c

The different letter (a-d) in the same column is significantly different at 0.05 level of probability.

For the antioxidant activity of the yogurts expressed as DPPH radical scavenging activity (%RSA) was shown in Table 1. This assay measures the ability of a sample to donate hydrogen to DPPH radical. The

presence amount of antioxidant in yogurt extracts is responsible for the increased reduction of the DPPH solution. The results indicated that mak mao yogurt showed the highest RSA (52.08%) while yogurt containing dragon fruit showed the lowest %RSA (37.08%). The results are in agreement with those given by Mehriz et al. (2013) who observed that yogurt containing strawberries jam have shown the highest antioxidant activity among flavored yogurts containing with black carrot and pumpkin jam. This is in agreement with Prior et al. (1998) who showed a linear relationship between total antioxidant capacity and phenolic content.

Table 2 Sensory evaluation score of plain and three fruit yogurts

Treatments	Color <sup>ns</sup>	Flavor <sup>ns</sup>	Taste <sup>ns</sup>	Texture <sup>ns</sup>	Viscosity <sup>ns</sup>	Overall <sup>ns</sup>
Plain	7.06 ± 1.28 ns	6.70 ± 1.29	6.30 ± 1.41	7.36 ± 0.99	7.10 ± 1.09	7.13 ± 1.16
Papaya	7.20 ± 0.88 ns	7.10 ± 1.02	6.86 ± 1.47	7.26 ± 0.98	7.06 ± 1.04	7.13 ± 1.35
Mak mao	7.50 ± 1.10 ns	6.90 ± 1.29	6.20 ± 0.27	6.90 ± 1.47	6.83 ± 1.28	7.23 ± 1.30
Dragon fruit	7.06 ± 1.04 ns	7.19 ± 0.21	6.76 ± 1.27	7.16 ± 0.87	7.33 ± 0.84	7.20 ± 1.44

Scale from 9 to 1. For liking attributes, 9 = like extremely and 1 = dislike extremely; Results are the mean of 30 replicates ± SD, Mean followed by the same letter (ns) in the same column was not significantly different (p> 0.05).

Sensory evaluation consumer acceptability of yogurts was studied after 1 day of storage at 5 C. A panel consisting of 30 members as student of food technology department, Rajabhat Mahasarakham University, Thailand ages 18 to 22 years old, evaluated by the yogurt samples presented in coded cups in individual booths at room temperature. They had to score texture, appearance, flavor and overall acceptability on a 9-point hedonic scale.

Results investigated in Table 2 revealed that the scored of fruit yogurt samples were not differently with plain yogurt (p> 0.05). However, the color scores of yogurt fortifying mak mao had higher than that of other yogurts. The dragon fruit yogurt showed the highest flavor and viscosity score, while the papaya yogurt was the highest texture score.

## CONCLUSIONS

Physical and chemical properties of yogurt supplemented with three fruits jam revealed that the total acidity expressed as lactic acid increased during storage periods conversely with pH. The total phenolic and anthocyanin contents showed the highest value in yogurt containing mak mao jam. The flavonoid content was the highest found in dragon fruit yogurt. Antioxidant activity of yogurt containing with mak mao was significantly higher than that of the plain yogurt and other fruit yogurts. The overall acceptability of all yogurts was not significant difference. Therefore, the addition of fruit jam to yogurt was favorable for phenolic content and antioxidant activity, increasing the protection of the consumer against diseases related to oxidative stress.

## ACKNOWLEDGEMENTS

We would like to thank the Institute of Research and Development and Rajabhat Maha Sarakham University for their financial supporting to this study.

## REFERENCES

- [1] Michale, M., R.K.Phebus and K.A Schmidt. (2015). Plant extract enhances the viability of *Lactobacillus delbrueckii subsp. Bulgaricus* and *Lactobacillus acidophilus* in probiotic nonfat yogurt. *Food Science and Nutrition*, 3 (1), 48-55.
- [2] Dimitrios, B. (2006). Sources of natural phenolic antioxidants. *Trends Food Science Technology*, 17, 505-512.
- [3] Allgeyer, L.C., M.J. Miller and S.Y. Lee. (2010). Sensory and microbiological quality of yogurt drinks with prebiotics and probiotics. *Journal of Dairy Science*, 93, 4471-4479.
- [4] Mehriz, A.M., S.A. Abou Dawood and E.H. Hebeishy. (2013). Properties and antioxidant activity of probiotic yoghurt flavored with black carrot, pumpkin and strawberry. *International Journal of Dairy Science*, 8 (2), 48-57.
- [5] Aravind, G., B. Debjit., S. Duraivel and G. Harish. (2013). Traditional and medicinal uses of *Carica papaya*. *Journal of Medicinal Plants Studies*, 1 (1), 7-15.
- [6] Jorjong, S., L. Butkhup and S. Samappito. (2015). Phytochemicals and antioxidant capacities of Mao-Luang (*Antidesma bunius* L.) cultivars from Northeastern Thailand. *Food Chemistry*, 18 (1), 248-255.
- [7] Zainoldin, K.H. and A.S.Baba (2009). The effect of *Hylocereus polyrhizus* and *Hylocereus undatus* on physicochemical, proteolysis and antioxidant activity in yogurt. *World Academy of Science, Engineering and Technology*, 3, 12-27.
- [8] Tseng, A. and Y. Zhao. (2013). Wine grape pomace as antioxidant dietary fibre for enhancing nutritional value and improving storability of yogurt and salad dressing. *Food Chemistry*, 138, 356-365.
- [9] Singleton, V.L., R. Orthofer and R.M. Lamuela-Raventos. (1999). Analysis of total phenols and other oxidation substrates and antioxidants by means of Folin-ciocalteu reagent. *Methods Enzymol.* 299, 152-178.
- [10] Wallace, T.C. and M.M. Giusti. (2008). Determination of color, pigment and phenolic stability in yogurt systems colored with nonacylated anthocyanins from *Berberis boliviana* L. as compared to other natural/synthetic colorants. *Journal of Food Science*, 73 (4), 241-248.
- [11] Ratseewo, J., E. Tangkhawanit., N. Meeso., N. Kaewseejan and S. Siriamornpun. (2016). Change in antioxidant properties and volatile compounds of kaffir lime leaf as affected by cooking process. *International Food Research Journal*, 23 (1), 188-196.
- [12] Lee, W. and J. Lucey. (2010). Formation and physical properties of yogurt. *Asian-Australasian Journal of Animal Sciences*, 23, 1127-1136.
- [13] Lucey, J.A. and H. Singh. (1998). Formation and physical properties of acid milk gels: a review. *Food Research International*, 30 (7), 529-542.
- [14] Barakat, H. and M.F.Y. Hassan. (2017). Chemical, nutritional, rheological, and organoleptical characterizations of stirred pumpkin-yogurt. *Food and Nutrition Sciences*, 8 (7), 746-759.
- [15] Prior, R.L., G. Cao, A. Martin, E. Sofic and J. McEwen et al. (1998). Antioxidant capacity as influenced by total phenolic and anthocyanin content, maturity and variety of *Vaccinium* species. *Journal of Agriculture and Food Chemistry*, 46, 2686-2693.

**EXPERIMENTAL STUDY ON THE HEATING PERFORMANCE  
OF R32 HEAT PUMP USING NATURAL COLD SOURCE**

Hoang Thanh Dat, Xu Shuxue, Ma Guoyuan,

College of Environmental and Energy Engineering, Beijing University of Technology, Beijing 100124, China

**ABSTRACT**

The compression heat pump has high exhaust temperature when evaporation temperature is low, which seriously affects the stability of the operation of the unit, especially the R32 engineering quality. This paper presented a method to improve the thermal performance of low temperature and established the experimental table. In this paper, the compression heat pump refrigerant is R32. The heat pump was studied under sub-cooling and normal conditions, exhaust temperature, heat production, the change rule of the parameters such as heat COP.

**KEYWORDS :** Heat pump; Sub-cooling; R32; COP

## INTRODUCTION

Energy is an important material foundation for the survival and development of human society<sup>[1]</sup>. Global economic growth and population growth have led to a growing demand for energy. Heat pump technology is a new energy technology that has attracted worldwide attention in recent years. The heat pump technology can save a great deal of high grade energy. Air conditioning is an indispensable part of human life and work environment. According to the literature, global average building energy consumption accounts for about 37% of the total energy consumption<sup>[2]</sup>, and China's building energy consumption is about 40%<sup>[3]</sup> of total energy consumption<sup>[4]</sup>. In total energy consumption, air conditioning system consumes the largest proportion. In order to improve the efficiency of refrigeration and thermal energy efficiency, the over-cooling technology is widely used in the steam compression refrigeration system in low-temperature fields<sup>[5]</sup>. There are several main types of cold weather: cooling of the environment, cooling of the suction pipe and the use of external mechanical cooling<sup>[6-7]</sup>. According to the national conditions of China, an R32 refrigerant alternative is proposed, but the excessive exhaust temperature restricts its promotion, especially in the field of heating. In this paper, the heat pump system with R32 is adopted to improve the thermal performance of heat pump, and its theoretical analysis and experimental research are carried out. Experimental results presentation, in evaporation temperature  $-20^{\circ}\text{C} \sim 5^{\circ}\text{C}$  respectively and the sub-cooling flow mass increase  $0.005\text{m}^3/\text{h}$ . In the evaporation temperature is  $-20^{\circ}\text{C} \sim 5^{\circ}\text{C}$ , sub-cooling flow mass increase  $0.005\text{m}^3/\text{h}$  each protection the heat flow average 2.5% lower. At the same evaporation temperature, the heating COP decreases with the increase of the sub-cooling flow mass.

## MATERIALS AND METHODS

### How the system works

The working principle of heat pump system using natural cold source is shown in figure 1. Compared with the single stage, the cooling device is added, and the cold source is from the low temperature environment. When it is cold running, it is used to introduce some cold source medium from the low temperature environment to improve the heat making, especially in low ambient temperature.

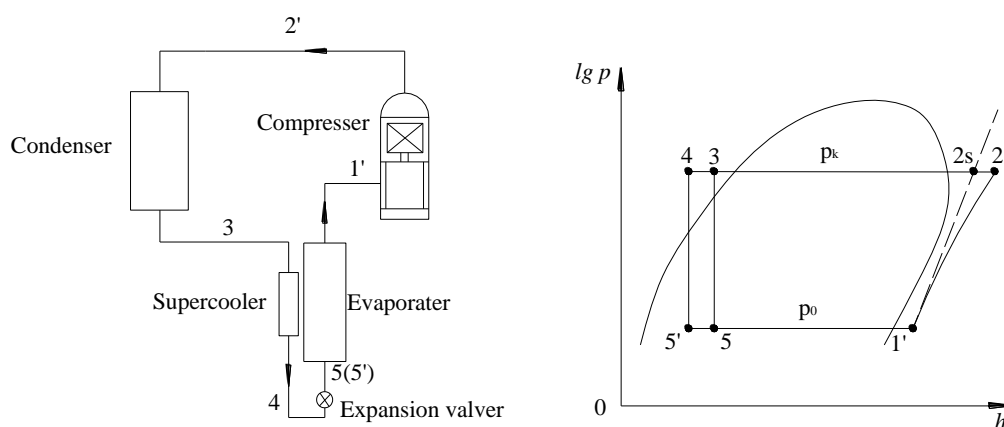


Figure 1. Sub-cooling cycle and  $\lg p$ - $h$  diagram



## Calculation model

Calculation process conditions:

- 1) the system works under steady state conditions;
- 2) condensation temperature 40°C, the Evaporating temperature range - 20 ~ 0 °C;
- 3) the degree of superheat 0 ~ 10 °C;
- 4) indicate the efficiency of 0.8;

Fig. 1 shows the  $\lg p-h$  diagram of the sub - cooling cycle 1'-2s -3-4-5'-1'. Process's 3-4 in order to liquid refrigerant the temperature of the throttle super cooler, 4-5' for throttling process.

- 1) No sub - cooling cycle

Unit quality refrigerating quantity

$$q_0 = h_1 - h_5 = h_1 - h_3 \quad (1)$$

Unit volume refrigerating capacity

$$q_{zv} = (h_1 - h_5) / v_{1'} = q_0 / v_{1'} \quad (2)$$

Theory than work

$$W_0 = h_{2s} - h_1 \quad (3)$$

Indicating specific work

$$W_i = W_0 / \eta_i \quad (4)$$

Unit heat load of condenser

$$q_k = h_{2s} - h_3 \quad (5)$$

Performance coefficients of the refrigeration cycle

The theoretical value

$$COP_0 = \frac{q_0}{W_0} = \frac{h_1 - h_5}{h_{2s} - h_1} \quad (6)$$

Indicated value

$$COP_i = \frac{q_0}{W_i} \quad (7)$$

The heating

$$Q_{heat} = cm\Delta t = c\rho v\Delta t \quad (8)$$

Type in the:

$c$  —The specific heat of water, J/ (kg.K) ;

$\rho$  —The density of water, kg/m<sup>3</sup> ;

$v$  —Volume flow in water unit time, m<sup>3</sup>/s

$\Delta t$  —The temperature difference of the cooling water

$$\Delta t = t_{m-out} - t_{m-in} \quad (9)$$

$t_{m-in}$  —Average temperature of cooling water inlet, °C ;

$t_{m-out}$  —Average temperature of cooling water outlet, °C.

The performance coefficient of the heat cycle of the heating  $COP_{heat}$

$$COP_{heat} = \frac{Q_{heat}}{W_i} \quad (10)$$

- 2) the heat pump cycle that is sub - cooling

Unit quality refrigerating quantity

$$q_{0-sub} = h_1 - h_{5'} = h_1 - h_4 \quad (11)$$

Unit volume refrigerating capacity

$$q_{zv} = (h_1 - h_{5'}) / v_{1'} = q_{0-sub} / v_{1'} \quad (12)$$

Theory than work

$$W_{sub} = W_0 = h_{2s} - h_1$$

Instructions than work

$$W_i = W_{sub} / \eta_i \quad (14)$$

Unit heat load of condenser

$$q_{k-sub} = h_2 - h_3 \quad (15)$$

The thermal load of the coolers

$$q_{gl} = h_3 - h_4 \quad (16)$$

The performance coefficient of the loop

The theoretical value

$$COP_{sub} = \frac{q_{0-sub}}{W_{sub}} = \frac{h_1 - h_5}{h_2 - h_1} \quad (17)$$

The heating  $Q_{subheat}$

$$Q_{subheat} = cm\Delta t = c\rho v\Delta t \quad (19)$$

The performance coefficient of the hot  $COP_{subheat}$  cycle

$$COP_{subheat} = \frac{Q_{subheat}}{W_{sub}} \quad (20)$$

Fig. 2 shows the change of the exhaust temperature with the degree of sub-cooling. It can be seen from figure 2 that the lower the temperature of the exhaust temperature, the lower the temperature of evaporation and the higher the exhaust temperature. In the evaporation temperature at 0°C, -10°C and -20°C, every increase 1°C degree of sub-cooling, exhaust temperature drop an average of 1.19°C. The effect of sub-cooling on the exhaust temperature is more obvious when the evaporation temperature is lower.

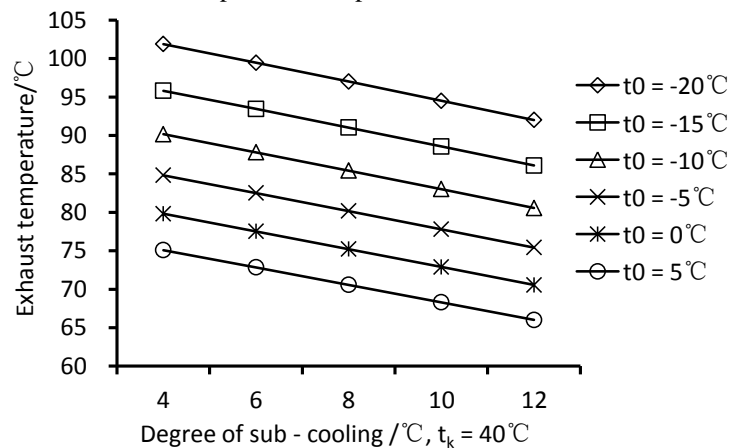


Figure 2. The variation of discharge temperature with Sub-cooling of suction vapor

Fig. 3 shows the change of the thermal  $COP_{subheat}$  with evaporation temperature. Can be seen from figure 3, the evaporating temperature increased when heating  $COP_{subheat}$ , evaporation temperature when -20°C ~ 0°C with super-cooling degree is 8°C when heating  $COP_{subheat}$  increased by an average of 53.8%.

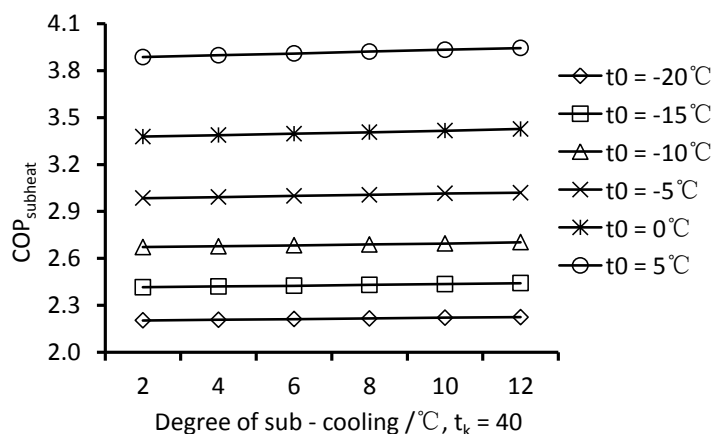


Figure 3. The heat COP with of sub-cooling system

### Experimental study

Fig. 4 shows a diagram of the experimental installation of a sub-cooling heat pump system using natural cold source. System includes: 1 - the scroll compressor, 2 - oil separator, 3 - condenser, 4 - depending on the liquid mirror, 5 - dry filters, 6 - super cooler, 7 - expansion valve, 8 - evaporator, 9 - chilled water flow meter, 10 - freezer water tank, 11 - 14 and electric heater, 12 - cooling water pump, 13 - condenser cooling water tank, 15 - cooling water pump, 16 - cooling water flow meter. When the system is running, the cold circulation can be achieved by introducing a portion of chilled water from the freezing water to refrigerant liquid.

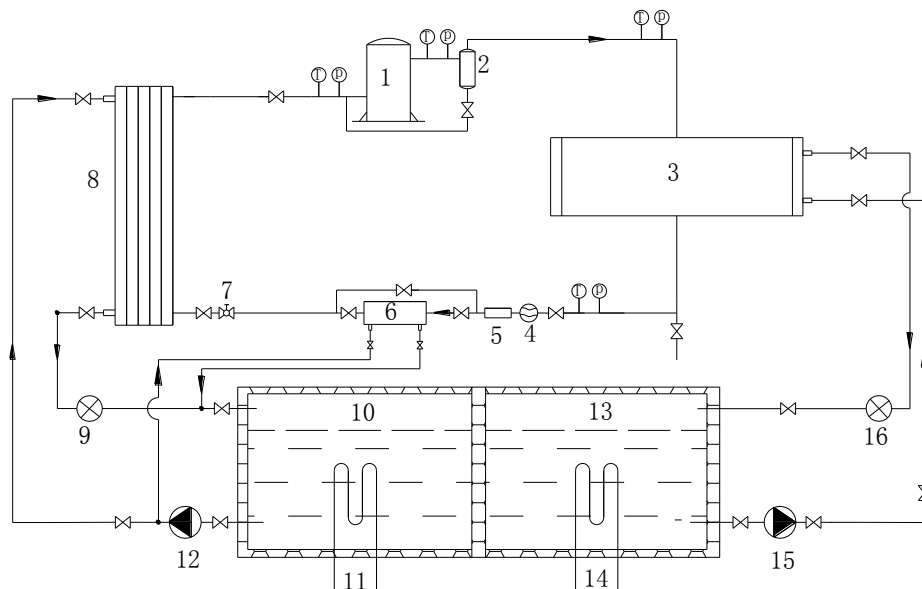


Figure 4. Experimental testing bench

In this paper, R32 is used to study the experiment and compare the performance of the single-stage mode with the cold mode. In order to better evaluate the performance of the prototype system, the instrument was calibrated. The boot process is as follows: firstly, connect the power of the control cabinet, start and adjust the cooling water system, and open the compressor when the water system is adjusted, and open the data acquisition system. During the experiment, the single-stage compression cycle experiment was carried out after a period of stable working condition. After the unit has been stable for a period of time under the experimental setting conditions, it has been turned on separately. Need to direct measurement parameters include: suction temperature, pressure, exhaust temperature, pressure, condenser import and export, import and export temperature and pressure, cooling water temperature, cooling water flow, sub-cooling temperature and pressure, compressor power. To the amount of indirect measurement for:  $\Delta t$  import and export of cooling water temperature difference and heat  $Q$ , heating COP.

## RESULTS AND DISCUSSIONS

Fig. 5 shows the change of the exhaust temperature with the sub-cooling flow mass. It can be seen from figure 5 that under the same evaporation temperature, the sub-cooling flow mass increases and the exhaust temperature decreases. The evaporation temperature lower, the more obvious the decreasing trend of the sub-cooling flow. In evaporation temperature  $-20^{\circ}\text{C} \sim 5^{\circ}\text{C}$  respectively and the sub-cooling flow mass increase  $0.005\text{m}^3/\text{h}$ . Average reduce exhaust temperature corresponding  $1.7^{\circ}\text{C}$  to  $3^{\circ}\text{C}$ .

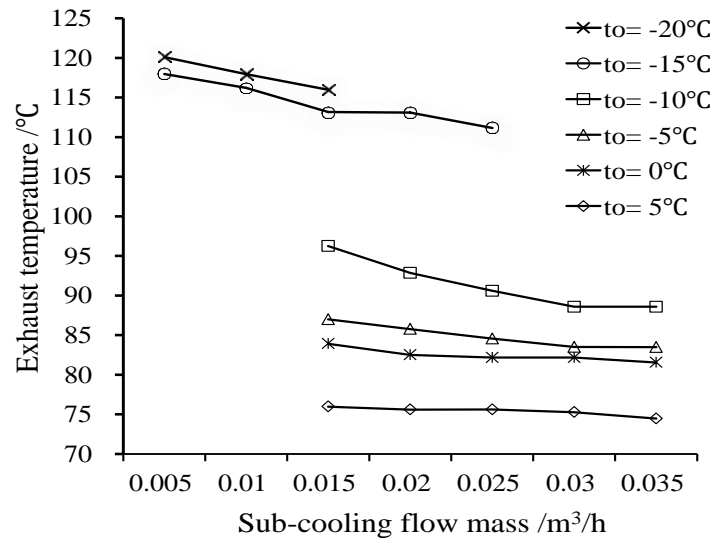


Figure 5. The variation of discharge temperature with sub-cooling flow mass

Fig. 6 shows the variation of heat flow with sub-cooling flow mass. It can be seen from figure 6 that, under the same evaporation temperature, the increase of sub-cooling flow mass will decrease the heat production. In the evaporation temperature is  $-20^{\circ}\text{C} \sim 5^{\circ}\text{C}$ , sub-cooling flow mass increase  $0.005\text{m}^3/\text{h}$  each protection the heat flow average 2.5% lower. In the evaporation temperature for  $-10^{\circ}\text{C}$ , sub-cooling flow mass increase of the heating flow mass to most reduce. Evaporation temperature within the range  $-10^{\circ}\text{C} \sim 5^{\circ}\text{C}$ , the best sub-cooling flow mass is  $0.015\text{m}^3/\text{h}$ ; Evaporation temperature in the  $-20^{\circ}\text{C} \sim -15^{\circ}\text{C}$ , the heat flow with the change of sub-cooling flow mass effect is not obvious.

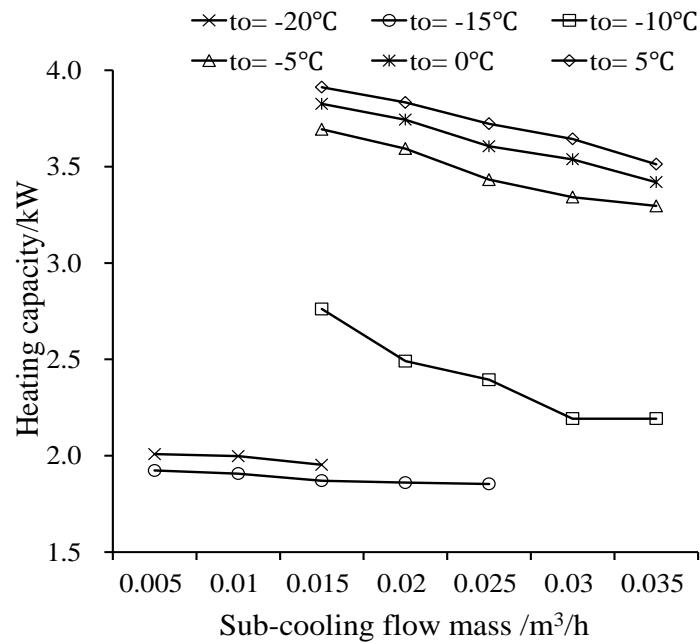


Figure 6. The variation of heating capacity with sub-cooling flow mass

Fig. 7 shows the change in the sub-cooling flow mass of the heating COP. It can be seen from figure 7 that the change trend of COP is basically in line with the change trend of heat production. At the same evaporation temperature, the heating COP decreases with the increase of the sub-cooling flow mass. In evaporation temperature at  $-10^{\circ}\text{C}$ , the increase of the sub-cooling flow mass to reduce impact on the heating COP, the largest in the evaporation temperature is  $-20^{\circ}\text{C}$  to  $-15^{\circ}\text{C}$  and sub-cooling flow mass when the heating COP of minimal impact. In the evaporation temperature for  $-10^{\circ}\text{C} \sim -5^{\circ}\text{C}$  condition, best too sub-cooling flow mass is  $0.015\text{m}^3/\text{h}$ , at  $-15^{\circ}\text{C}$  and  $-20^{\circ}\text{C}$  condition, heating COP does not change significantly with the too sub-cooling flow mass. The reason is that the sub-cooling flow mass increases, the liquid sub-cooling increases, but at the same time the condensing pressure decreases, the production heat decreases, the compressor power increases, and the heating COP decreases.

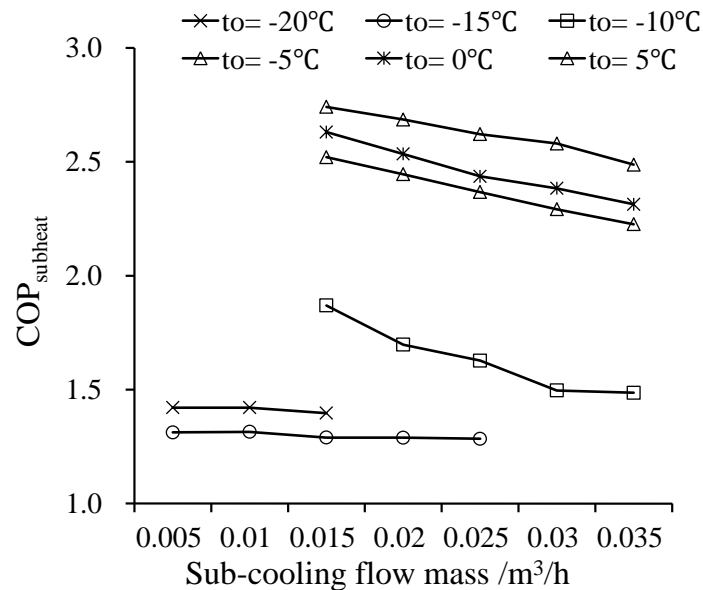


Figure 7. The variation of heating COP with sub-cooling flow mass

Fig. 8 shows the variation of the exhaust temperature with the evaporation temperature. The figure 8 shows that the evaporation temperature is lower exhaust temperature higher, when the low evaporation temperature below  $-20^{\circ}\text{C}$ , single stage compressor system and overheating exhaust temperature is too high, the system run deterioration can't even run, only in extreme sub-cooling system mode to the safe operation, and after sub-cooling exhaust temperature of  $120.6^{\circ}\text{C}$ . In the evaporation temperature of  $-15^{\circ}\text{C} \sim 5^{\circ}\text{C}$ , sub-cooling system of exhaust temperature than ordinary single-stage run by  $4^{\circ}\text{C} \sim 6^{\circ}\text{C}$ , the evaporating temperature  $5^{\circ}\text{C}$ , sub-cooling system of exhaust gas temperature most decrease, the most obvious exhaust temperature is  $68^{\circ}\text{C}$  only. After the condenser has been added, it has obvious effect on the high exhaust temperature when the system is running at low temperature.

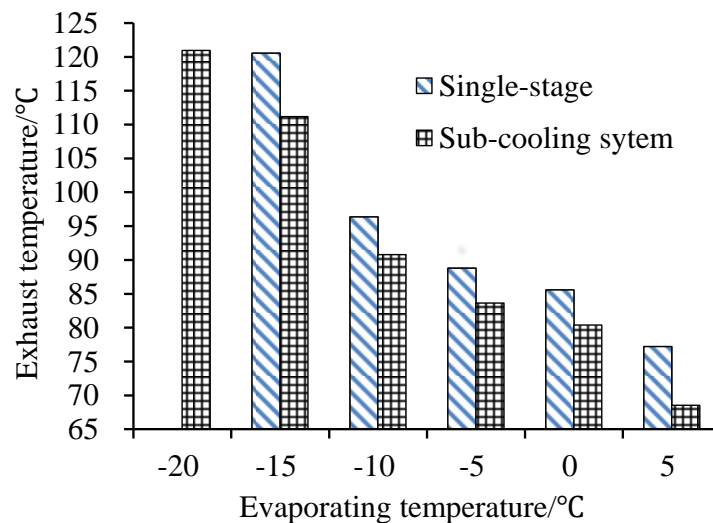


Figure 8. The variation of discharge temperature with evaporating temperature

Fig. 9 shows the change rule of heat control with evaporation temperature. It can be seen from figure 9 that in the same operation mode, the heat production increases with the increase of evaporation temperature. However, when the system is in sub-cooling operation mode, compared with ordinary single-stage operation mode at different evaporative temperatures, the heat production is reduced. In evaporation temperature  $-15^{\circ}\text{C} \sim 5^{\circ}\text{C}$ , sub-cooling of heating is the average 5%. When the evaporation temperature  $-10$  and  $-15^{\circ}\text{C}$ , sub-cooling of heating is the average decreases correspondingly 6.6%, 12%.

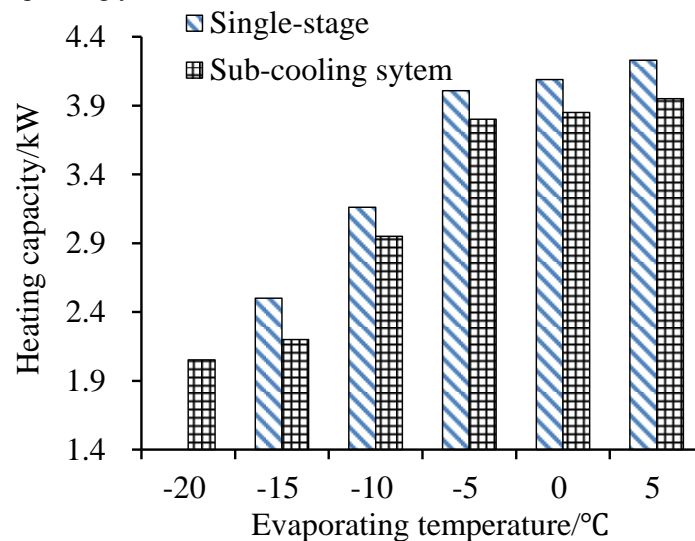


Figure 9. The variation of heating capacity with evaporating temperature

Fig. 10 shows the change rule of the heat COP with evaporation temperature. It can be seen from figure 10 that, with the increase of evaporation temperature, the single-stage operation and the sub-cooling running system heat COP is on the rise. But compared with single-stage operation, the sub-cooling running mode is heat COP lower. In the evaporation temperature of  $-15^{\circ}\text{C} \sim 5^{\circ}\text{C}$ , after sub-cooling heating COP decrease average 3.2%. when the evaporation temperature  $-10$  and  $-15^{\circ}\text{C}$ , sub-cooling of heating COP is the average decreases correspondingly 7.3%, 10.6%.



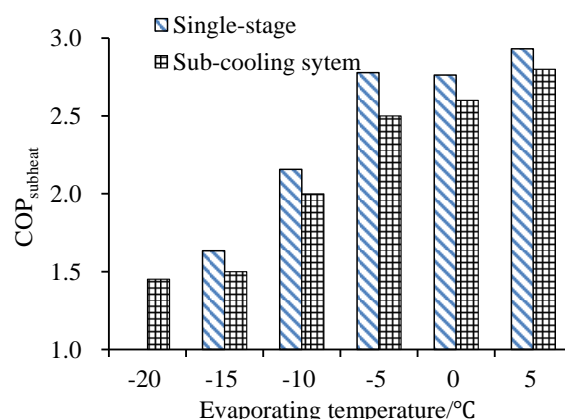


Figure 10. The variation of heating COP with evaporating temperature

## CONCLUSION

In this paper, the thermal performance of heat pump using natural cold source is studied. The results are as follows:

1) It is obvious that the exhaust temperature of the system is lower than that of the sub-cooling system, which is suitable for high exhaust temperature system and operation of the refrigerant such as R32. With the increase of sub-cooling flow mass, the exhaust temperature decrease more and more.

2) The optimal sub-cooling flow mass value of natural cold source is in sub-cooling operation. Evaporation temperature within the range -10°C ~ 5°C, sub-cooling flow mass is 0.015m<sup>3</sup>/h when the heating and heating COP to obtain the maximum; Evaporation temperature in the -20°C ~ -15°C, the heating and heating COP along with the change of sub-cooling flow mass effect is not obvious.

3) Under the same conditions, the heating and heating COP of the sub-cooling system compared with the single-stage system is slightly reduced. When the evaporation temperature of -15°C to reduce, the most obvious decrease by 12% and 10.6%, respectively.

## REFERENCES

- [1] Leng Tianjiu, Han leitao, Ma huang (2008). Development and utilization of unconventional energy [J]. *Agricultural engineering technology: new energy industry*, (6) :26-29.
- [2] Xie Yingbai (2002). Theoretical analysis and experimental study of total energy system of gas engine heat pump [D]. *Thesis of doctoral dissertation of north China electric power university*.
- [3] Zhang Zhiying (2006). Building energy saving is the only way to achieve sustainable development of the construction industry [J]. *China engineering consulting*, (7) : 18-19.
- [4] Cai Weiguang (2011). Analysis model and empirical study on the influence factors of energy consumption in Chinese buildings [D]. *Chongqing: doctoral dissertation of Chong Qing University*.
- [5] Du Xiaotong (2012). Research on energy efficiency optimization of buildings [D]. *Doctoral dissertation of Shan dongong University*.
- [6] Bilal Ahmed Qureshi B A, Zubair S M (2013) . Mechanical sub- cooling vapor compression systems-current status and future directions. *International Journal of Refrigeration [J]*. 36 (8) : 2097-2110
- [7] Bilal Ahmed Qureshi, Syed M Zubair (2012). The effect of refrigerant combinations on performance of a vapor compression refrigeration system with dedicated mechanical sub-cooling. *International Journal of Refrigeration [J]*. (35) : 47—57.

**A POTENTIAL DIFFICULTIES IN APPYING THE QUALITY FUNCTION DEPLOYMENT (QFD) IN THAILAND**Watchanachai Joompha<sup>a\*</sup> and Nalin Pianthong<sup>b</sup><sup>a</sup> *Ph.D Student in Industrial Engineering, Faculty of Engineering, Ubon Ratchathani University, Ubon Ratchathani, Thailand 34190*<sup>b</sup> *Lecturer in Industrial Engineering, Faculty of Engineering, Ubon Ratchathani University, Ubon Ratchathani, Thailand 34190**\* Corresponding author. Tel : 062-3685163 ; Fax : 045-288378  
E-mail address: watchanachai\_joompha@hotmail.com***ABSTRACT**

The Quality Function Deployment (QFD) technique is widely used for development of product and service. Some organization are successful applying QFD, but some are not. The main problems associated with QFD implementation are important to specify the QFD lack of knowledge. Therefore this paper presents the potential difficulties of applying QFD from researchers or expert in university and industry. The questionnaire is used to collect the data from 47 researchers or experts who applied QFD to product or service. The result shows that parameter design is the highest difficulties of applying QFD application with 3.50 points, followed by (2) competitive comparisons and (3) the collection of customer requirement with 3.26 points, (4) customer requirement analysis, (5) relation evaluation, (6) team work and commitment, (7) knowledge and experience of QFD and (8) size and making matrix with 3.17, 3.16, 3.12, 3.11 and 2.96 points respectively.

**KEYWORDS :** Quality Function Deployment (QFD), Difficulties

## INTRODUCTION

The Free Trade Agreement (FTA) among Thailand and other countries such as ASEAN Economic Community (AEC) results in the highly competitive market. The design and development of product or service to meet the customer requirements is one important factor for organization to survive in the market. Customer requirements are diverse and changed all the time. Therefore the duty of business organization to find out a variety of customer needs and then take acquired information to improve product or service to satisfy the customers. Despite QFD's many benefit, not all of the organization success with QFD practicing [1]. To investigate this issue further, a literature review was conducted on 37 papers of QFD implementation, then the survey was conducted in Thailand. The objective was to conclude the main problem associated with its implementation. The results revealed a considerable lack of knowledge about the technique expressed by respondent from industry and university in Thailand.

Quality Function Deployment (QFD) was originally developed at Shipyard of Mitsubishi, Kobe Province, Japan. It had later become widely known when it was applied by Toyota and subsidiary companies in Japan. Besides, many major companies in US were interested and has succeeded in applying QFD technique resulting in QFD be more widely known. [2, 3]

QFD technique is popular applied after hearing about their tangible benefits which are improve reliability, decrease project change, time and cost. The survey in 2002 showed that, in USA and Japan, QFD was applied and presented in 650 academic papers [4]. In 2008, QFD was applied and presented in 79 academic papers worldwide [5]. The QFD procedure of designing and developing products or services begins from investigating a variety of customer requirements and then evaluating priorities of customer needs. After that, the team of product development, which includes representatives of various related parties in form of a cross-functional teams will collaborate a brainstorm and analysis of the customer needs translated into the technical requirements or improved quality characteristic to respond and satisfy the customers. Then important technical requirements are selected and utilized as data for improving and developing the product. [2, 3]

Generally, QFD has no exact model depending on the purpose of application, necessity, and appropriateness of each case. However, it can be classified into two major models as Matrix of Matrices, popular and traditional model in Japan, which utilizes a lot of tables, nearly 30 tables to cover all activities throughout the organization. Four-Phase Model or Four-Level Model is commonly used in West countries including four matrices i.e. Phase 1 is Product Planning, Phase 2 is Product Design, Phase 3 is Process Planning and Phase 4 is Production Planning [2,3], which are detailed as follows and in Table 1:

(1) Product Planning as Phase 1 of QFD termed House of Quality (HOQ) will start from listening to the Voice of Customers (VCs) or Customer Requirements (CRs) then translated into Technical Requirements (TRs) or Engineering Characteristics (ECs) needing to be improved.

(2) Product Design is Phase 2 of QFD is translating the Technical Requirements (TRs) or Engineering Characteristics (ECs) derived from Phase 1 : Product Planning into the form of Part Characteristics (PCs) or Equipment Characteristics (ECs).

(3) Process Planning is Phase 3 of QFD is translation of the Part Characteristics (PCs) or Equipment Characteristics (ECs) derived from the Phase 2 : Product Design into form of Process Characteristics or Work Instructions (WIs).

(4) Production Planning is Phase 4 of QFD is translation of Process Characteristics or Work Instructions (WIs) derived from Phase 3 : Process Planning into Process Control or Operation Standards (OSs).

**Table 1.** Input and Output data of four-phase QFD

Phase	Input	Output
Product Planning	Customer requirement	Engineering Characteristics
Product Design	Engineering Characteristics	Part Characteristics
Process Planning	Part Characteristics	Process Characteristics
Production Planning	Process Characteristics	Operation Standards

### Related Research

From a literature review of 37 case studies of QFD application form Science Direct, Pro Quest, Springer Link and Thai LIS database search between 2015 and 2016. It was found that problems and difficulties of QFD implementation are the collection of customer requirement, relation evaluation, customer requirement analysis,

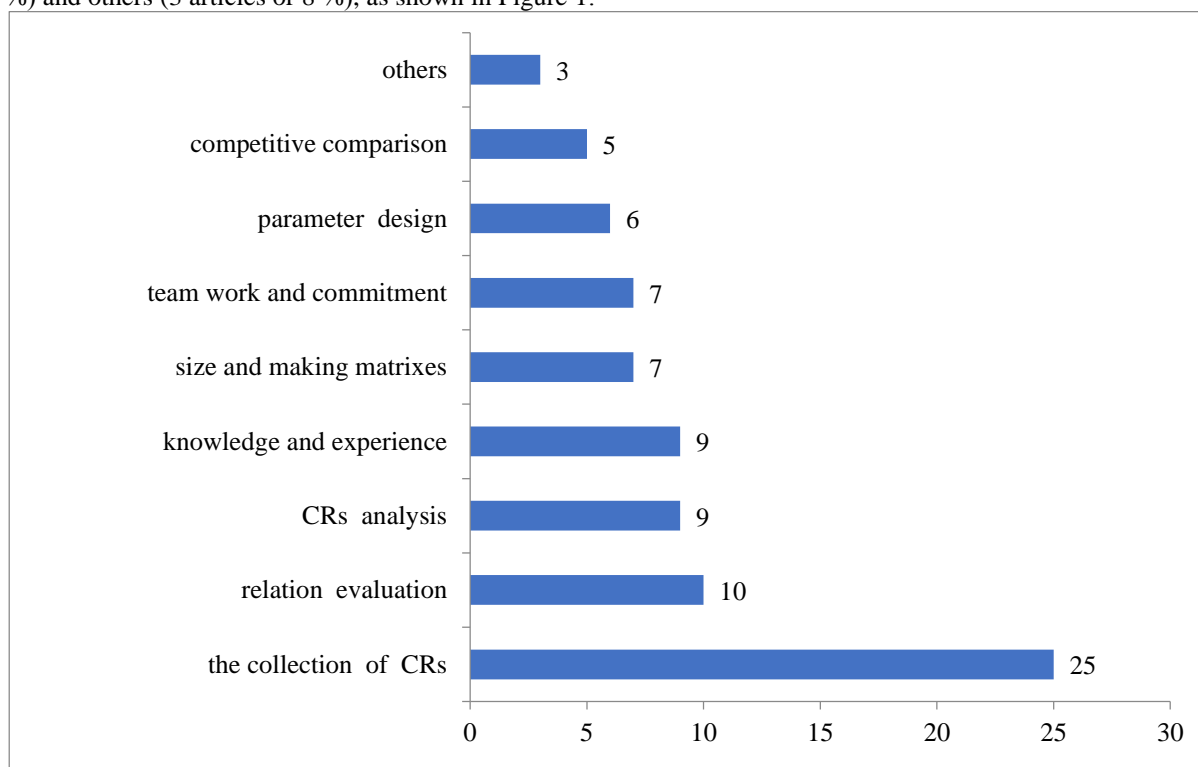
customer requirement analysis, size and making matrixes, team work and commitment and knowledge and experience etc., as shown in Table 2

Table 2. Main problems or difficulties in application of QFD

Reference	Main problems or difficulties							
	the collection of CRs	relation evaluation	CRs analysis	knowledge and experience	size and making matrixes	team work and commitment	parameter design	competitive comparison
Carnevali, J.A. and others, 2010 [5]				●	●	●		●
Amesombun, P., 2012 [6]		●	●	●				●
Apisuphachok, P., 2006 [7]	●							
Buddeejeen, J., 2013 [8]			●					
Carnevali, J.A. and Miguel, P.C., 2008, [9]			●		●			
Chan, L.K and Wu, M.L., 2002-03 [10]		●	●		●		●	
Charoenhongtong, P., 2008 [11]	●							
Chiraboonthanandorn, S., 2008 [12]		●				●		
Chumpa, A., 1998 [13]	●							●
Eaknipitsari, W., 2011 [14]	●			●		●		
Fuknakin, Y., 2008 [15]	●		●					
Govers, C.P.M., 2001 [16]	●	●	●	●	●	●	●	
Jin, J. and others, 2015 [17]	●						●	
Jungsuwadee, W., 2010 [18]	●							
Kasaei, A. Abedian, A. and Milani, A.S., 2013 [19]							●	
Kazemzadeh, R.B. and others, 2009 [20]	●		●				●	
Keawwandee, A., 2002 [21]	●	●		●				
Kitsaran, S., 2000 [22]	●	●						
Lertsuntud, S., 2002 [23]	●						●	
Lima Junior, F.R. and Ribeiro Carpinetti, L.C., 2016[24]	●							
Martins, A. and Aspinwall, E.A., 2001 [25]				●		●		●
Miguel, P.A.C., 2003 [26]	●			●	●	●		●
Mingwattanaboon, R., 2001[27]	●							●
Ngamwuttiwong, H., 2009 [28]	●							
Pinta, A., 2002 [29]	●							●
Poel, I.V.D, 2007 [30]	●	●	●					
Prakongwittaya, S., 2001 [31]	●			●				
Prasad, B.,1998 [32]		●	●		●			
Promsakanasakolnakorn, P., 2002 [33]				●				
Sanguansai, H., 2007 [34]	●							●
SHIN, J.S. and KIM, K.J., 2000 [35]					●			
Suwannamit, S., 2009 [36]	●	●				●		
Tabtimsri, K., 2013 [37]	●							

Main problems or difficulties								
Reference	the collection of CRs	relation evaluation	CRs analysis	knowledge and experience	size and making matrixes	team work and commitment	parameter design	competitive comparison
Thirathammanukul, N., 2014 [38]	●							
Trongpanich, S., 2005 [39]	●							
Yomyart, T., 2006 [40]	●							
Yoshimura, M. and Izui, K., 2002 [41]		●						
Total	25	10	9	9	7	7	6	5

Form Table 2 summaries is Main problems or difficulties in application of QFD, it is found that most of the Main problems or difficulties in application of QFD are the collection of customer requirement (25 articles or 67 %), followed by relation evaluation (10 articles or 27 %), customer requirement analysis (9 articles or 24 %), knowledge and experience (9 articles or 24 %), size and making matrix (7 articles or 19 %), team work and commitment (7 articles or 19 %), parameter design (6 articles or 16 %) competitive comparison (5 articles or 14 %) and others (3 articles or 8 %), as shown in Figure 1.



**Figure 1.** Main problems or in difficulties application of QFD from literature review.

## MATERIAL AND METHODS

The objective of this survey was to collect data of the QFD difficulties experienced by the researchers or expert in university and industry in Thailand. The populations were Thai authors on academic paper related to QFD. A mail survey was chosen for gathering the data.

The questions of survey instrument were developed based on the literature review from case studies of QFD application. The questionnaire consists of 3 sections:

Section1: General data of respondents

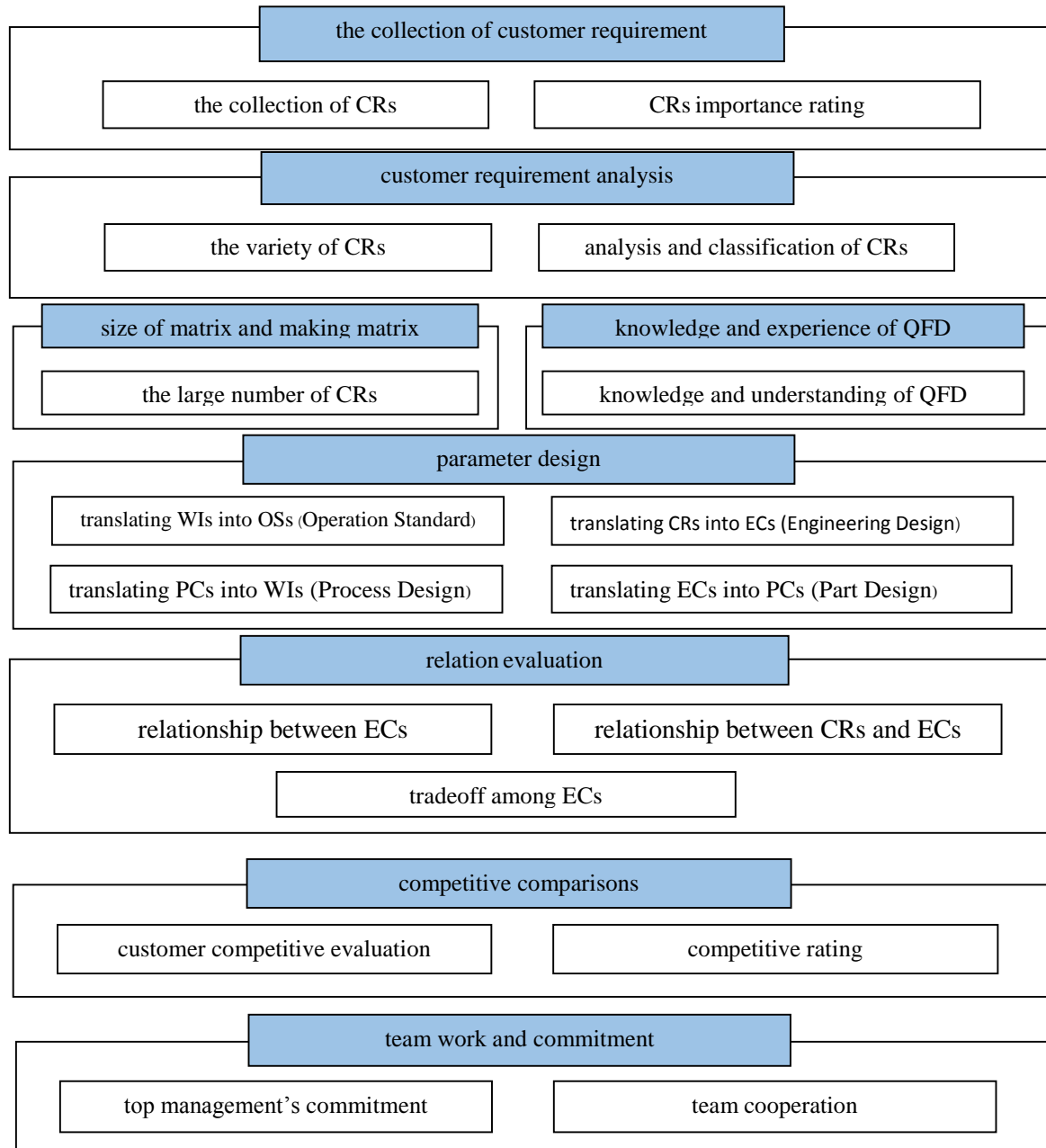
Section2: Problems and difficulties in applying QFD

Section3: Open-ended question.

## RESULTS

### 1. Data grouping

The data grouping of Main problems and difficulties of QFD application form 37 article searched between 2014 and 2015, by affinity diagram, as shown in Figure 2.



**Figure 2.** Data grouping of Main problems and difficulties of QFD application



## 2. General data of the respondents.

Result of collection and analysis of general data of respondents gained from determining frequency and percentage in a statistical technique was summarized in Table 3.

Table 3. General data of respondents

Gender	Frequency	Percentage (%)
<b>Sex</b>		
Male	26	55.32
Female	21	44.68
<b>Age</b>		
20 – 30 years old	6	12.76
31 – 40 years old	17	36.17
41 – 50 years old	17	36.17
> 51 years old	7	14.89
<b>Education</b>		
Bachelor's degree	2	4.25
Master's degree	16	34.04
Doctoral degree	29	61.70
<b>Academic rank</b>		
Lecturer	12	25.53
Assist. professor	14	29.79
Assoc. professor	14	29.79
Other	7	14.89
<b>Job experience of using QFD*</b>		
Instructor	25	53.19
Advisor	27	57.45
Researcher	21	44.68
Lecturer	5	10.64
<b>Total</b>	<b>47</b>	<b>100</b>

\* Respondents can choose more than one answer

Most of respondents are male, 31-40 and 41– 50 years old, Doctoral degree followed by Master degree, with associate professor and assistant professor. Most of respondents experienced QFD as an advisors of QFD research. The survey result is shown that QFD is mostly applied for design and development of product, followed by Improvement of curriculum/training, improvement of service, and Quality management as shown in table 4.

Table 4. Reasons for QFD implementation

Reasons	Frequency	Percentage (%)
Design & development of product	27	57.45
Improvement of curriculum/training	11	23.40
Improvement of service	9	19.15
Quality management	8	17.02
<b>Total</b>	<b>47</b>	<b>100</b>

\* Respondents can choose more than one answer.

Table 5 summaries the techniques used with QFD. The survey results showed that QFD was mostly used without other technique as 31.91 percent which is one third of the result. The most frequent tools used with QFD were Design of Experiment (DOE). The survey showed that KANO, AHP, FMEA and TRIZ were also used in conjunction with QFD as shown in table 5.

Table 5. Tools used with QFD

Tools used with QFD	Frequency	Percentage (%)
QFD	15	31.91
QFD & DOE	6	12.76
QFD & KANO	4	8.51
QFD & AHP	4	8.51
QFD & FMEA	4	8.51
QFD & AHP & FMEA	4	8.51
QFD & TRIZ	3	6.38
QFD & KANO & AHP	3	6.38
QFD & OTHER TOOLS	7	14.89
Total	47	

\* Respondents can choose more than one answer.

### 3. Problems and difficulties of QFD application

The survey result from expert or adviser opinions involving the problem and difficulty of QFD application is represented in Figure 3.



Figure 3. Main problems and difficulties of QFD application in Thailand

From Figure 3, it is found that most of the respondents mostly agree that problems and difficulties of QFD applications are parameter design with 3.50 point, followed by competitive comparisons and the collection of customer requirement with 3.26 point, customer requirement analysis, relation evaluation, team work and commitment, knowledge and experience of QFD and size and making matrix with 3.17, 3.16, 3.12, 3.11 and 2.96 points respectively.

Parameter design is a specific link identify from critical customer attributes. This step is the fundamental difficulty of QFD. There are several alternative solving methods such as the use of focus groups with brainstorming, using a cause and effect diagram and using the Kano model. Another QFD problem is the collection of customer

requirements (CRs) which is the first area that must be understood. The methods to obtain CRs are direct and personal interview with customer, meeting with customers, and using customer complaints. For the QFD problem of size and making matrix, the method to reduce the matrix size is choosing the main CRs as the part of the matrix.

### CONCLUSIONS AND DISCUSSION

From studying the problems and difficulties of QFD application by surveying the opinions of respondents who are 47 experts or professionals with experience in QFD application through questionnaires. The study result shows that the problem and difficulty of the most QFD application is parameter design with 3.50 points, followed by competitive comparisons and the collection of customer requirement with 3.26 points, customer requirement analysis with 3.17 points and relation evaluation with 3.16, team work and commitment with 3.12, knowledge and experience of QFD with 3.11 and size and making matrix with 2.96. Result of translation of work instruction into performance standard as phase 4 of implementation is Working Standard or Process Control Plan. To be accurate and complete, working standard is needed to be performed by people with knowledge and experience in such work. The most respondents who are the instructors of various universities both public and private sectors may not understand the documentation process due to lack of knowledge of variables or factors affecting on the process. Moreover, It is also found that QFD application in Thailand is not complete in all four phases, i.e. applying only phase 1 of Product Planning, phase 2 of Product Design. Because QFD technique has not exact model, application QFD is depended on the organization and the purpose.

### ACKNOWLEDGEMENTS

The authors are thankful to Department of Industrial Engineering, Faculty of Engineering, Ubon Ratchathani University, Ubon Ratchathani, Thailand, for supporting to this article.

### REFERENCES

- [1] Theppithak, T. (2015). Threat and opportunity of the free trade area in the Asean +3 and Asean +6 groups". <http://www.freightmaxad.com/magazine/?p=8687>. Logistics Max. 21 Nov., 2016.
- [2] Sasananan, M. (2009). Product Design to Innovation and Reverse Engineering. Thammasat University Press.
- [3] Boonkanit, P. and Apikajornsins, (2009). A. Industrial Product Design. Electrical and Electronics Institute.
- [4] Chan, L.K. and Wu, M.L. (2002). Quality function deployment : A literature review". European Journal of Operation Research. pp. 463-497.
- [5] Carnevali, J.A. and Miguel, C.P. (2008). Review, analysis and classification of the literature on QFD- Types of research, difficulties and benefits. International Journal Production Economics, pp. 737-754.
- [6] Amesombun, P. (2012). An Application of Quality Function Deployment for New product development in Product Planning and Design Deployment. Master of thesis: King Mongkut's University of Technology Nork Bangkok. 91 p.
- [7] Apisuphachok, P. (2006). Service Quality Improvement of Higher Education Library by Integration of Libqual<sup>TM</sup> and Kano's Model into QFD. Master of Thesis: Chulalongkorn University, 253 p.
- [8] Buddeejeen, J. (2013). The Sustainable Eco Packaging Design Approach and Process Evaluation in Hard Disk Drive Industry. Master of thesis: King Mongkut's University of Technology Nork Bangkok. 185 p.
- [9] Carnevali, J.A., Miguel, P.A. C. and Calarge, F.A. (2010). Axiomatic design application for minimizing the difficulties of QFD usage. International Journal Production Economics, pp.1-12.
- [10] Chan, L.K. and Wu, M.L. (2002-03). Quality Function Deployment: A Comprehensive Review of Its Concepts and Methods. Journal of Quality Engineering, pp. 23-35.
- [11] Charoenhongtong, P. (2008). Design and Process Planning of Showcase Freezers by Applying QFD and DFMEA Techniques. Master Thesis: Chulalongkorn University, 173 p.
- [12] Chiraboonthanandorn, S. (2008). Application of QFD and PFMEA Techniques for design and Trial Production of Automotive Condensers. Master of Thesis: Chulalongkorn University, 157 p.
- [13] Chumpa, A. (1998). An Application of Quality Function Deployment for sales improvement: A case study of Polyethylene pipe factory. Master of thesis: Chulalongkorn University, 166 p.

- [14] Eaknipitsari, W. (2011). Competency Training System Development for Production Operators in Automotive Press Part Industry. Master of thesis: Chulalongkorn University, 187 p.
- [15] Fuknakin, Y. (2008). Service Quality Improvement in Car Service Center using Quality Function Deployment Technique. Master of thesis: Chulalongkorn University, 246 p.
- [16] Govers, C.P.M. (2001). QFD not just a tool but a Way of quality management. International Journal Production Economics, pp.151-159.
- [17] Jin, J. et al. (2015). Translating online customer opinions into engineering characteristics in QFD : A probabilistic language analysis approach. Engineering Applications of Artificial Intelligence, pp.115-127.
- [18] Jungsuwadee, W. (2010). Applying Quality Function Deployment for Quality Improvement of Educational Administration planning of Setsatian School. Master of thesis: Srinakharinwirot University, 151 p.
- [19] Kasaei, A., Abedian A. and Milani, A.S. (2014). An application of Quality Function Deployment method in Engineering materials selection. Materials and Design, pp. 912-920.
- [20] Kazemzadeh, R.B. et al. (2009). Integration of marketing research techniques into house of quality and product family design. International Journal Advanced Manufacturing Technology, pp.1019-1033.
- [21] Keawwandee, A. (2002). An Application of Quality Function Deployment technique for the design and development of leather products. Master of thesis: Chulalongkorn University, 187 p.
- [22] Kitsaran, S. (2000). Application of Quality Function Deployment Technique for SAP R/3 Plant Maintenance Improvement. Master of Thesis: Chulalongkorn University, 287 p.
- [23] Lertsuntud, S. (2002). An integrated Web-Based information system on intranet Based on service Quality Characteristics. Master of thesis: Chulalongkorn University, 202 p.
- [24] Limajunior, F.R. and Ribeiro Carpinetti, L.C. (2016). A multicriteria approach based on fuzzy QFD for choosing criteria for supplier selection. Computers & Industrial Engineering, pp.269-285.
- [25] Martins, A and Aspinwall, E.A. (2001). Quality function deployment: an empirical study in the UK. Total Quality Management, pp. 575-588.
- [26] Miquel, P.A.C. (2003). The Stat-of-the-art of the Brazilian QFD applications at the top 500 Companies. The International Journal of Quality & Reliability Management, pp.74-89.
- [27] Mingwattanaboon, R. (2001). The application QFD technique for product and service improvement in sale division of petroleum: A Case Study. Master of thesis: Chulalongkorn University, 212 p.
- [28] Ngamwuttiwong, H. (2009). Product Quality Improvement for Kitchen Knock-Down Furniture. Master of Thesis: Chulalongkorn University, 193 p.
- [29] Pinta, A. (2002). The Improvement of Product by using Quality Function Deployment (QFD) Technique: A case Study of an Education Wood Toy Factory. Master of thesis: King Mongkut's Institute of Technology Nork Bangkok. 146 p.
- [30] Poel, I.V. D. (2007). Methodological problems in QFD and directions for future development. Res. Eng. Design, pp. 21-36.
- [31] Prakongwittaya, S. (2001). An Application of Quality Function Deployment technique for designing in Feminine napkin product. Master of thesis: Chulalongkorn University, 180 p.
- [32] Prasad, B. (1998). Review of QFD and Related Deployment Techniques. Journal of Manufacturing Systems, pp.221-234.
- [33] Promsakanasakolnakorn, P. (2002). Design of Engineering and Manufacture Specification of Actuator Magnetic Wire using Quality Function Deployment. Master of Thesis: Chulalongkorn University, 134 p.
- [34] Sanguansai, H. (2007). Quality Improvement and monitoring in house building process applying the concepts of QFD and FMEA. Master of thesis: Chulalongkorn University, 396 p.
- [35] Shin, J.S. and Kim, K.J. (2000). Complexity reduction of a design problem in QFD Using Decomposition. Journal of Intelligent Manufacturing, pp.339-354.
- [36] Suwannamit, S. (2009). Product Quality Improvement of 2 Ton-Truck Using Quality Function Deployment (QFD) Technique. Master of Thesis: Chulalongkorn University, 245 p.
- [37] Tabtimsri, K. (2013). The study of needs in academic administration by Quality Function Deployment of Mattoyom suwitsereeanusron school. Master of thesis: Srinakharinwirot University, 157 p.
- [38] Thirathammanukul, N. (2014). Canteen Quality Improvement in Faculty of Engineering Chulalongkorn University. Master of thesis: Chulalongkorn University, 164 p.
- [39] Trongpanich, S. (2005). The Improvement of Quality in the Service of Logistics Business by using Quality Function Deployment and Hierarchy Process Techniques: A case study of Battery Logistics. Master of thesis: King Mongkut's Institute of Technology Nork Bangkok. 191 p.

- [40] Yomyart, T. (2006). Quality Improvement of Assembly process and design improvement of a Vacuum and gas flushing seal Machine. Master of thesis: Chulalongkorn University, 244 p.
- [41] Yoshimura, M. and Izui, K. (2002). Strategic Product Development Decision-making Based on Optimization Incorporating the QFD Method". Initiatives of Precision Engineering at the Beginning of a Millennium, pp.876-881.

**A STUDY OF LEARNING ACHIEVEMENT WITH PRACTICE SKILLS EXERCISES FOR USING ADOBE FLASH, CASE STUDY OF STUDENTS IN INDUSTRIAL ARTS. 2<sup>ND</sup> CLASS, FACULTY OF EDUCATION, MAHASARAKHAM RAJABHAT UNIVERSITY**

Monthol Vachirakormen, Pramook Boonsilp Thammanoon Padmana,  
*Marudis Vachirakomen, Boonkong Seesen*  
*Industrial Arts, Faculty of Education, Maha sarakham Rajabhat University*  
*Corresponding E-mail : tom.vachirakomen@gmail.com*

**ABSTRACT**

This research aims to: 1) Del develop and find effective learning for Adobe Flash programs with practice skills exercise for using Adobe Flash of Students in Industrial Arts, 2<sup>nd</sup> class, Faculty of Education, Maha sarakham Rajabhat University, academic year 2015, 2) Del compare the learning achievement of Adobe Flash Program using practice skills exercise for Adobe Flash of Students in Industrial Arts, 2<sup>nd</sup> class, Faculty of Education, Maha sarakham Rajabhat University, academic year 2015, Statistics used in this research are mean and standard deviation. The results are as follows.

1. The development and effectiveness of Adobe Flash learning using practice skills exercise have with E1 =67.9% and results of E2 = 81.74%

2. The comparison of Student Achievement in Industrial Arts, 2<sup>nd</sup> Class, Faculty of Education, Maha sarakham Rajabhat University, was found that the learning achievement of Adobe Flash program using the Pretest and Posttest were statistically significant differences at.01 level.

**KEYWORDS :** Learning Achievement with Practice Skills Exercises



## INTRODUCTION

The National Education Act 1999, Category 4, Section 22 states that "Educational management must adhere to the principle that all learners have the ability to learn and develop themselves, and the learner is the most important". Therefore, the educational process must encourage students to develop naturally and fully. Section 24 discusses the process of learning that "It is important to adhere to the principles of content and activities in accordance with the interests and aptitudes of the learner, taking into account the difference between person, the process of learning in a variety of ways such as the process of thinking skills, the graph of the application of knowledge, practice can be made and stimulate the learning continuously by mixing knowledge in a balanced way. The students can learn anywhere, anytime, according to the potential of learners. In the learning process, there has evolved continuously with student as learning center". In Category 9, Section 64, states: "The state must promote and encourage the production and development of textbooks, academic books, printed media, and other educational materials, equipment and technology for education". Section 66 states that "the learner is entitled to the development of the ability to use educational technology at the earliest opportunity to achieve the knowledge and sufficient skills to apply technology for the pursuit of self-knowledge continuously throughout life" (Media Thailand, 2012, website)

The teaching and learning activities will not be fully effective if they are not trained in the skill and understanding, especially in Thai language, because Thai language is a skill subject which is very important part of the learning process of other subjects and daily life as required by the elementary school curriculum 1978 (updated version. 1990). In order to teach Thai language, it is necessary to practice fluency in order to help children develop their language development according to their age and abilities, and one tool to practice language skills is the skills training (Saowaros Aeknarm, 2011: Web site)

The problems encountered of teaching in the subject of computer course for industrial arts teaching is that the students have no basis for using Adobe Flash program, so students have a lot of problems in learning and the skills of using Adobe Flash program of each person is not equal.

Therefore, the researcher is interested in studying the learning achievement with Adobe Flash tutorials, case study of students in the field of industrial arts, 2<sup>nd</sup> Class, Faculty of Education, Maha sarakham Rajabhat University, academic year 2015

## MATERIALS AND METHODS

### Population and sample

The population of this research was 48 students in Industrial Arts, Faculty of Education, Maha sarakham Rajabhat University.

The samples were 23 students in Industrial Arts, Faculty of Education, Maha sarakham Rajabhat University, academic year 2558 by a specific sampling.

### Research Plan

This research was a one-group Pretest-Posttest Design) (Pwuangrat Thaweerat: 2015: 60-61).

Table 3.1 Research Design

Sample	Pretest	Trial	Posttest
RE	T1	X	T2

Symbols used in experimental designs

- RE the sample students in Industrial Arts 2
- T1 Pretest
- X Adobe Flash tutorials by using practice skills exercise
- T2 Posttest

### Tools used to collect data.

The instruments used in this research are 3 types:

1. A questionnaire to assess the effectiveness of practice skills exercises for using Adobe Flash developed by the researcher which will ask 3 experts who will study the practice skills exercises to enhance the use of Adobe Flash and then assessed by criteria or standards of performance evaluation. The researcher defined the criteria of the assessment scale as a Rating Scale of 5 levels; the most appropriate, moderate, medium, less, and minimal as the following (Boonchom Srisaad, 2000: 163)

The maximum	is	5.
Make	is	4
Medium	is	3
Less	is	2
Minimize	is	1

The data obtained from the interpreting were analyzed by means of the application program and the mean value obtained from the data analysis was compared with the following criteria (Boonchom Srisaad, 2000: 163)

Average	Meaning
Average 4.50-5.00	means the highest level of satisfaction.
Average 3.50-4.49	means very satisfied.
Average 2.50-3.49	means moderate satisfaction level.
Average 1.50-2.49	means less satisfaction.
Average 1.00-1.49	means the minimum level of satisfaction.

### 2. Pretest and Posttest on Adobe Flash are 20 multiple choice tests.

Data collection

The researcher collected information from the students in the field of Industrial Arts, Faculty of Education, Maha sarakham Rajabhat University during August, 2015. Students completed 23 Pretests, and 23 sets of Posttest in November, 2015, and self-study satisfaction tests. The results of Pretest and Posttest were rated and analyze data.

## EXPERIMENTAL METHODOLOGY

This research is an experimental research methodology as follows:

1. The sample group in the research was the students in Industrial Arts, 1<sup>st</sup> Class, Faculty of Education, Maha sarakham Rajabhat University, academic year 2015.
2. Prior to learning management, the sample group was tested with Pretest, measure learning achievement of Adobe Flash, and Adobe Flash learning test, and then bring the results of the examination to the scoring.
3. Perform teaching with using of practice skills exercises, before using the exercises to enhance the skills for the students to take the Pretest and then take the exercises with 12 skill sets included (Phanchan Thanawatanasathien: 2013: CD Rom Flash CS6)
  - Object creation with the Line Tool for 1 hour.
  - Object creation with Pen Tool for 1 hour.
  - Object creation with Oval Tool for 1 hour.
  - Object creation with Rectangle Tool for 1 hour.
  - Object creation with Pencil Tool for 1 hour.
  - Object creation with the Brush Tool for 1 hour.
  - The story of a frame-by-frame animation for 1 hour.
  - The story of Shape Tween animation for 1 hour.
  - The story of Motion Tween movie for 1 hour.
  - The story of Rotating motion movie for 1 hour.
  - The story of Zoom-expand animation for 1 hour.
  - The story of Alpha for 1 hour.
  - The story of Guide Film for 1 hour.
  - The story of Mask Layer for 1 hour.

While learning with practice exercises the researcher conducted the sample to perform the practice skills exercises. When doing the exercises, the researcher provided the samples to create an animation piece from the learning tools in the skill practice exercises..

4. At the end of the 14-practice skills exercises, the researcher gave the students a Posttest using the achievement test to see the students' progress.

## RESULTS

1. For the development and finding learning efficiency in Adobe Flash with practice skills exercises for Students of Industrial Arts, 2<sup>nd</sup> class, Faculty of Education, Maha sarakham Rajabhat University, academic year 2015, it was found that E1 = 67.9 and E2 = 81.74

2. For the comparison of Student Achievement in Industrial Arts, 2<sup>nd</sup> class, Faculty of Education, Maha sarakham Rajabhat University, the learning achievement for Adobe Flash using Pretest and Posttest were following table.

Test	N	$\bar{X}$	S.D.	df	Sig. (2-tailed)	T
Pretest	23	3.74	0.751	N-1	.000	3.53 **
Posttest		8.17	0.650			

\*\* statistically significant differences at.01 level.

From the comparison table, of Student Achievement in Industrial Arts, 2<sup>nd</sup> class, Faculty of Education, Maha sarakham Rajabhat University, the learning achievement for Adobe Flash using Pretest and Posttest were statistically significant differences at.01 level.

## CONCLUSIONS AND DISCUSSION

1. For development and finding learning efficiency in Adobe Flash with Enhanced Adobe Flash Player Skills for students in Industrial Arts, 2<sup>nd</sup> class, Faculty of Education, Maha sarakham Rajabhat University, academic year 2015, with E1 =67.9% and results of E2 = 81.74%,in accordance with Patcharee Kaewkarn (2014: Abstract), she has improved the skills of creating graphics and mixed media technology using Adobe Flash CS3 for Mathayomsuksa 3 students of Pra Pathom Witayalai School, Nakhon Pathom Province. The results of the E1 and E2 performance comparison of practice skills exercises on graphic design and multimedia technology were tested by using the Adobe Flash CS3 program of Mathayomsuksa 3 students is in the 80/80 range.

2. The comparison of student achievement in Industrial Arts, 2<sup>nd</sup> class, Faculty of Education, Maha sarakham Rajabhat University was found that the Adobe Flash learning achievement using Pretest and Posttest quizzes was different statistically significant at.01 level. The learning achievement of Adobe Flash program after learning higher than before learning, which was in accordance with research by Patcharee Kaewkiew (2014: Abstract). She studied on development of graphic design skills and multimedia technology with the Adobe Flash CS3 program for Mathayomsuksa 3 students, Phra Pathom Witayalai School, using the skill-building practice on graphic design and multimedia technology with Adobe Flash CS3 program of Mathayomsuksa 3 students has statistically significance at 0.05 level.

## ACKNOWLEDGEMENT

This research was funded by the Research and Development Institute, Maha sarakham Rajabhat University titled: "A Study of Learning Achievement Using Adobe Flash Toolkit: A Case Study of Industrial Art Students, 2<sup>nd</sup> Class, Faculty of Education, Maha sarakham Rajabhat University, academic year 2015", thanks to Assistant Professor Dr. Songsakdi Songsanit and the teacher Chaikorn Somsila, and Ubolwan Kijkun, as a specialist on checking out the practice skills exercises using Adobe Flash CS6. Thank you to the students in Industrial Arts, 2<sup>nd</sup> Class, Faculty of Education, Maha sarakham Rajabhat University, all who cooperate in research and answer the questionnaire as well.

## REFERENCES

- Ashapanee Nonthasut. Development of Reading Exercises for English Reading with Local Content in Kanchanaburi Province for the Development of Reading Comprehension for Mathayomsuksa 4 Students, Srisawat Pittayakom School, Si Sawat District, Kanchanaburi Province, Group of Humanities and Social Sciences, Veridian E-Journal, SU Volume 5 No. 3, September - December 2012
- Patcharee Kaewkiew, Development of graphic design training and multimedia technology with Adobe Flash CS3 program of Mathayomsuksa 3 students at Phra Pathom Witayalai School. Thesis, Nakhon Pathom: Pra Pathom Witayalai School, 2014.
- Sakeenaporsalamou Moohammadtolalkaemalaesumsoosauo. Development of Malay Reading Exercises for Mathayomsuksa 1 Students. Municipal District School 1, Baan Bangsathai, Amphoe Mueang, Pattani Province. 7th National and International Conference, Thursday, 23th June 2013, at the Faculty of Business Administration Building. Hatyai University.
- Saowaros Aeknarm. 2011. **Practice skills exercises**. [http://laosukanfang.blogspot.com/2011/02/blog-post\\_5274.html](http://laosukanfang.blogspot.com/2011/02/blog-post_5274.html) Retrieved on July 21, 2019.
- Sombat Ploysri, **Development of Reading and Composite Skills for Prathomsuksa 1 Students**. Journal of Pathumthani University, Year 3, Volume 2, May - August 2011
- Uthumporn Jamornmarn. Examination: Construction and Development (Test Items: Construction and Development). Bangkok : Funny Publishing Ltd.

## **MATERNAL PREPARATION FOR PREMATURE INFANTS**

Thunyapatt Phaungsriken, Darinee Suwabhabh

*Faculty of Nursing, Roi-Et Rajabhat University,  
113 KohKaew, Selaphum, Roi-Et 45120.*

*Corresponding e-mail: Satjawan2662@gmail.com*

### **ABSTRACT**

Maternal preparation for caring of premature infants is an important nursing action which lead to effective nursing diagnosis and nursing interventions that can serve their actual needs and solve their problems. Maternal preparation has four dimensions: mastery experience, modeling, verbal persuasion, and emotional arousal. This method aim to strengthen mother's knowledge, gain more confidence and skills in caring for their premature babies.

**KEYWORD:** Maternal Preparation, Premature Infants

## INTRODUCTION

Premature birth is a major problem for the Ministry of Public Health in Thailand because of low infant birth-weight. The Department of Health's statistics for 2010 to 2012 showed an incidence rate for neonatal weight under 2,500 grams at 8.3%, 8.3%, and 8.4%,<sup>1</sup> respectively. Premature infants have a high risk for mortality and morbidity because fetal development of body organs and systems is incomplete. Premature infants need to be closely monitored in a neonatal intensive care unit.<sup>2</sup> The environment of the neonatal intensive care unit lacks maternal support for the infants because they need to be separated from their mothers for close nursing care and medical treatment. Mothers have less opportunity to care for their babies. New mothers, for whom this was a first pregnancy, tend to be inexperienced and lack confidence in parenting skills, resulting in poor caregiving.<sup>3</sup> If mothers are given training and taught appropriate information, they will develop confidence in taking care of their babies. Nurses are important in helping mothers increase their self-efficacy in caring for premature infants. In this article, the authors highlight the role of nurses as health care providers to new mothers and to their premature infants. Mothers need to be knowledgeable in caregiving. Nurses can respond to the real needs of new mothers by helping them learn to cope and adjust to what is happening with their premature infants. The guidelines outlined in this article will benefit not only mothers of premature infants in critical care but also newborns with general health problems and illnesses.

## CONTENT

### Definition of maternal preparation of premature infants

**Maternal preparation** refers to promoting maternal self-efficacy in the care of their premature infants.<sup>4</sup> Four of Bandura's<sup>5</sup> methods are used as follows:

**1. Mastery experience.** Successful arrangement of actions means that mothers learn basic knowledge about infants and how to observe their behaviors. It also includes the problems and needs of the infants and how to appropriately meet their physical and emotional needs. As a result, mothers gain confidence in their ability to care for their babies and are more successful.

**2. Modeling.** New mothers observe nurses caring for their babies and learn patterns of caregiving behavior by experience. Mothers are prepared to learn how to care for premature infants. Mothers learn indirectly how similar situations will help shape their own behaviors. They can resolve general issues in basic infant care and activities. The model used is for mothers to observe the daily care of premature infants and with hands-on experience caring for them.

**3. Verbal persuasion.** This refers to the support and guidance by nurses for mothers who lack confidence in their ability to care for their babies.

**4. Emotional arousal.** This means giving the mothers the opportunity to express both positive and negative feelings while giving care. It lets mothers learn from their own physical and mental experiences while providing care. It also helps them to relax, relieve anxiety, and accept these changes.

**Prematurity** means infants who are born less than or equal to 37 weeks (259 full days).<sup>6</sup>

### Self-efficacy concept

Self-efficacy is linked to direct health care behaviors. It may cause changes in behavior. When people have high self-efficacy, their purposeful behaviors lead to greater success than for those with low self-efficacy. In order to encourage people to have more self-efficacy, these dimensions are involved: mastery experiences, modeling, verbal persuasion, emotional arousal, and emotional arousal. It is especially important that mothers focus on experiences of self-accomplishment after receiving regular training to improve their maternal caregiving skills. Mothers will be more confident and aware of their abilities. Therefore, self-efficacy leads to behavior changes.

## CONCLUSION AND DISCUSSION

Promoting the efficacy awareness of mothers of premature babies  
In this article, the authors use Bandura's concept of self-efficacy consisting of four dimensions: mastery experience, modeling, verbal persuasion, and emotional arousal. Results from a review of the literature indicate that when promoting maternal self-efficacy, mothers of newborns are better able to care for their babies. In the case of premature infants in an intensive care unit, the results are less obvious. The authors emphasize maternal



self-efficacy as it relates to premature infants in critical condition. There are two-phases that promote maternal self-efficacy in mothers with premature infants: the pre-visit phase and visitation period and childcare.

### 1. Visitation stage

The visitation stage is the process of establishing a relationship with mothers.

1.1 The stage begins by initially building a relationship with mothers of premature infants. When the mothers are ready to visit the ward, the nurse describes the purpose of infant care and other nursing activities that are provided to infants. This visit provides an opportunity for mothers to develop a trusting relationship with the nurse. The relationship is based on acknowledging the importance and value of the maternal role and the rights of the client. It gives the mothers an impression of service and trust.

Common postpartum symptoms are fatigue and not feeling rested. Most mothers will not have yet visited their infants postpartum. From asking the mothers about visiting their babies, they replied with sentences, such as "I want to take care of my child like other people." "I miss my child, do not want to stay away from my child." "I am feeling uneasy about not having the opportunity to take care of my child closely." These showed that the mothers want to be close to their babies as other mothers do. "I think about my baby and I'm concerned", "I am afraid that my child is in danger or may die". These concerns showed that mothers feel worried and anxious about not being able to take care of their own child. It can be seen that separation from the infant is an important factor for mothers with premature infants. Mothers have difficulty adapting to the separation and acting as a mother. It affects their feelings about themselves as mothers.

1.2 At this time, nurses prepare the mothers before they actually experience caregiving. They guide the mother to understand and adapt to a new situation. Nurses provide an information manual to help mothers prepare for caregiving and about the newborn intensive care unit environment. They explain the medical devices, equipment, and staff that they will see in the intensive care unit. Information also includes visiting procedures and an overview of diseases and common symptoms of babies. Mothers are given information before they visit their babies to help them gain confidence in child care.

### 2. Visitation and Child Care.

This stage involves a visit between mothers and their premature babies. It is needed to consider the situation, the condition of the baby, and the needs and readiness of the mother. This phase consists of:

2.1 Build relationships with mothers by accepting them and creating trusting. The nurses observe the readiness of the mothers and are encouraged to participate in the care, as they are ready.

2.2 Use of persuasion. Nurses provide explanations, give suggestions, use persuasion and encouragement so that the mothers believe that they are capable of succeeding in child care.

2.2.1. Provide suggestions and guidance to mothers in adapting to the postpartum role. Mother undertake activities for their babies that they may not fully understand or for which they have are doubt, as well as activities that mothers still do not correctly according to the problem found.

2.2.2 Encouraging the proper behavior. Nurses encourage and support the mothers to become confident in their abilities related to child care activities, especially those activities are may be difficult or they have never previously performed. Mothers try to learn their baby's behaviors and care for the needs properly and appropriately. They build a relationship with their babies and become familiar with their personalities. Nurses follow up and provide ongoing encouragement. In addition, nurses use motivation by giving compliments to the mothers that emphasize their importance to the child and family.

2.2.3. When mothers experience problems with their maternal role, both mothers and nurses analyze the problems together to find common solutions about what may be inappropriate. It is important to have the involvement and encouragement of family members so that the mothers can feel supported in their maternal role.

2.3 Have mothers observe modeling behaviors from others or have experiences with others to learn that many situations are consistent or similar to their own. When mother observe successful behaviors from others, it will reinforce that they are capable of performing similar behaviors. Nursing should be organized by:

2.3.1. Mothers observe successful experiences in child care through the modelling by more experienced mothers of premature infants in the intensive care units. These experiences may include correct infant posturing for sleep and changing diapers.

2.3.2. Have mothers observe how to care for babies from the nurses. The mothers are shown how to perform caregiving activities by using live demonstrations from the nurses, such as feeding the baby, wiping, positioning for sleep, and touching the baby with stimulating touch.

2.3.3 Symbolic Observation. This can be conducted by having mothers carefully read the manual guide.

2.4 Provide mothers with experiences or accomplishments by themselves. Mothers are given direct experiences in child care. They practice their roles in learning the general characteristics of their babies by observing behavior and understanding the infant needs, as well as correctly responding to their needs correctly. Nursing activities included:

2.4.1 Provide mothers with direct experiences related to child care, such as wiping, cleaning, wrapping of cloth, and changing diapers.

2.4.2 Provide mothers with child care activities that they think they can do. (The above activities are meant to add to the practice of what represents success.)

2.4.3 Re-inforce those caregiving activities that the mothers feel are difficult and that they do not feel confident in doing. The nurses explain the knowledge and demonstrate the procedures, then give the mothers the opportunity to try.

2.4.4 Encourage mothers to practice their caregiving activities with the nurses until they become confident to do so alone.

2.4.5 Conduct self-practice by mothers. The nurses facilitate the first practice sessions of all caregiving activities to ensure the mothers could do them correctly. The nurses emphasize the importance of successful motherhood to children and families. (The above activities are for the mothers to participate in a successful way.)

2.4.6 Assess the beliefs about child care of mothers.

2.4.7 Inquires from mothers about their needs to learn child care activities, such as touching, wiping, feeding, sleep positioning, sensory stimulation, cleaning after excretion and urine, diaper changing, and baby wrapping.

2.4.8 Demonstrate by nurses how to conduct caregiving activities as the mothers want and need to learn.

2.4.9 The mothers then sorted out the difficulty of carrying out caregiving activities and they practiced activities that were easier to do.

(The above activities reduce the number of practice items that mothers need to do.)

2.5 Emotional arousal. It is a step that nurses have the opportunity to explain to the mothers the positive and negative feelings that can occur while giving baby care. This is for the mothers to experience the physical and mental conditions for themselves while providing care. They relax and do what helps them relieve their anxiety. Nursing approaches should be organized by:

2.5.1 Encourage mothers to be familiar with the situation. Mothers are encouraged to interact with their babies immediately at the time of visit. They should observe the characteristic or behavior of the babies by touching. When mother touch the babies, they should comforting the babies by speaking out the name. Also, mothers are introduced and encouraged to participate with nursing staff in child care, such as changing diapers, and wrapping the babies. These also included examining the body, such as checking their limbs, body, arms, and legs. While examining, the mothers gain the opportunity for talking about the baby in imagination comparing to child that is present.

2.5.2. Mothers talk about the characteristics of their babies, such as how they look and similarities in appearance to the parents. This is a first step in solving conflicting ideas about actual appearances and possible expectations. The mothers express their feelings from past experiences.

2.5.3 Nurses provide opportunities for mothers to vent their feelings about the maternal role and what is involved with successful caregiving. Nurses listen and ask for advice, and seek appropriate solutions to reduce their negative emotions.

2.5.4 Nurses advise husbands and family members to support and encourage the mothers so that they can be successful in their maternal role.

2.5.5 Setting the group of premature mothers to talk about the experiences of child care to vent and relieve their stress and to encourage each other.

A sense of security and confidence is achieved from the visit. Activities help mothers to relax and reduce anxieties that can then create a sense of well-being. Some of the mothers said, "At first, it felt awkward. I do not think that I can take care of my baby. After I have talked with you, I feel comfortable and confident to do childcare when I visit my baby."

## SUMMARY

Preparing mothers to care for their premature infants requires practice of caregiving skills. Mothers are able to care for their babies correctly. While visiting the hospital, they learn proper caregiving using a process based on Bandura's self-efficacy concept. The authors focused on giving nurses and other professional personnel important knowledge and a greater understanding about issues affecting new mothers. As a result, the mothers as caregivers were more skilled and confident in caring for their babies. Thus, nurses were able to prepare mothers to care for their premature infants in a critical condition.

## REFERENCES

- [1] Health Promotion Office (2012). Annual Report. Department of Health Promotion, Bangkok: Ministry of Public Health.
- [2] Simmons, L.E., et al. (2010). Seminars in Perinatology Preventing Preterm Birth and Neonatal Mortality: Exploring the Epidemiology, Causes, and Interventions. Volume 34, Issue 6, December, pp 408-415.
- [3] Thera Rangsitkul, N. (2012). Life Experience of Mothers with Premature Babies. Journal of Nursing and Education, 5 (1), 25-39.
- [4] Prasopkittikun, T., & Tilokskulchai, F. (2010). Self-efficacy in infant care : Revision and further psychometric testing. Nursing and Health Sciences, 12, 440-455.
- [5] Bandura, A. (1979). Self-efficacy: The Exercise of Control. New York: W.H. Freeman and Company.
- [6] Jeeraphat, K.; Jeepaphat W. (2008). Assessment of Newborn Health. 2nd edition. Bangkok: Dan Suthat Printing.

## FAMILY DEVELOPMENT TASK IN ELDERLY CARE

Paphatchaya Kucharin, Thunyapatt Phaungsriken

*Faculty of Nursing, Roi-Et Rajabhat University,  
113 KohKaew, Selaphum, Roi-Et 45120.  
Corresponding E-mail: kucharin.1974@hotmail.com*

### ABSTRACT

Family development is divided into 8 stages according to Duvall and Miller. In each stage, the development of the family is different. The purpose of this article is to describe the changes in the life cycle of each family and how they evolved. The theory will guide how to evaluate family development at individual and family levels. Based on elderly population data, Thailand has entered the aging society. This is another important phase of development of family life. It is important for the elderly to plan their health care, how to take care of themselves, and live with their families. Family members need to support the elderly as they learn to deal with their health care tasks.

**KEYWORD:** Family Developmental Task, Elderly care

## INTRODUCTION

Thailand is becoming an aging society. This can be seen from the population projections by the Office of the Development Commission.<sup>1</sup> In 2014, the Thai elderly population was 10.01 million, or 14.9% of the total population. By 2022, these numbers will reach 19.7 million, or 30.2% of the population. Preparation for an aging society will be of great importance to the government of Thailand. Key strategies to develop and strengthen human capital are evident in the 12th National Economic and Social Development Plan (2560 - 2564) and the Second National Plan for the Elderly (2017-2021).

Family dynamics change over the course of a family's development. Thai families have at least one child living with an elderly parent.<sup>2</sup> Most caregivers (81.25%) are their children and other relatives, whereas hired caregivers comprise only 0.3% of households.<sup>3</sup> Changes in family dynamics will affect the future structure and functioning of the family.<sup>4</sup> Each family stage will be expected by the society to function as a "developmental task." The developmental task is responsible for the growth of the family so that the family can live happily.<sup>5</sup> The older family is the last stage of development in family life. The family's developmental success will require the support of all family members as the elderly experience decline in their physical, mental, emotional and social health.

The elderly may experience systemic degenerative diseases and other infirmities. Over half (54.7 %) the elderly requires the use of eyeglasses; 26.6% need dentures; and 14.4% use a walking cane.<sup>6</sup> Many elderly people have additional health problems, including vision (62.1%), memory (48.7%), sleep disorders (48.5%), depression (13.3%), and dementia (21.6%). They rely on their families for living. About 1.0% of the elderly population is highly to totally dependent on others for daily living.<sup>7</sup>

Changing social and economic conditions impact the Thai family role and structure. The family structure is becoming smaller in that the once prevailing extended family is now evolving to a single family. Whereas older people were once head of the households, they now have to bear the burden of raising grandchildren. Families with the elders as child caregivers are found in Bangkok and Northeast Thailand.<sup>8</sup> Yet, the cross-generational family is struggling to live with the elderly who have disabilities. These families, especially in rural areas, are at high risk in that they are struggling with the economy and bear the burden. Families need to adjust their style, size, and culture. The family will have more potential to care for the elderly.<sup>9</sup>

This article emphasizes the role of a family in the elderly age, according to the concept of Duval and Miller. This is a guideline for promoting the development of elderly families into a balanced and happy family.

## CONTENTS

### Developmental Theory and Family Life Cycle

Family development focuses on the pattern of family life that it changes over time. It relates to the structure and function of the family to meet the needs of family members. In each phase of family development, which Duval and Miller<sup>10</sup> proposed, family life span is periodically referred to as family life cycle. This is used to study the family and set the criteria for family categorization taking into account the change of family members. Development of the eldest child and retirement status of father is the main important criteria. Development is divided into 8 stages.

Stage 1: Newly married couples. This starts at the beginning of marriage until the first child is born. The family's developmental task is to create a relationship as a married couple and to combine the individual needs. They develop strategies to resolve conflicts and create a communication style that expresses mutual caring.

Stage 2: Childbearing (Infant families). This occurs from the birth of the first child to 2½ years of age. The family task is adapting to pregnancy and maintaining a loving relationship that expresses concern, understanding, and normal development of the child and baby feeding.

Stage 3: Preschool-aged children. It is the stage when the first child is 2½ - 6 years old. The family's developmental task is to have a better understanding of the growth needs of the child and to adapt to the needs of other children in the family (if any). It is about maintaining a bond that expresses love, concern, and preparation for school children. They may also be prepared to have other children.

Stage 4: School-aged children family. It is when the first child is 6-13 years old. The family's developmental task is to have a good understanding of the physical and emotional changes in the child and to socialize the child into appropriate social roles. The family coordinates school activities and works closely with the school. Parents encourage children to participate in activities of their interests outside the home. The family creates rules, discipline, and enhances roles to promote increasing responsibility in the child. Their relationship still expresses love, concern, and caring.

Stage 5: Teenage children. It is the time when the first child is 13-20 years old. The family's developmental task is to have a better understanding of the maturation of the child into adulthood. Parents encourage youth to develop self-identity but remain involved with family activities. The family plans for the child's future education and work.

Stage 6: Launching the children. This is when the first child becomes independent of the family, having a career, or having a new family. The family's developmental tasks are when a family member moves out of the family or gets a new spouse into the family. The family still maintains the relationship of the spouse and expressions of love. The concern that is commonly found in Thai society at this stage is the cross-generation family. It is when the grandparents are living with their grandchildren while the parents live in another place to make a living.

Stage 7 Middle-aged parents' family. It is when the family is relieved from the burden of raising children. Most or all children separate from the family. The family's task is focused on creating or maintaining the bond of the spouse expressing love and concern to ensure stability in life after retirement. They seek to maintain relationships with relatives.

Stage 8 Aging family. The members range from retirement until the death of a spouse. The family tasks are as follows: 1) Preparing a home for the later years; 2) Adjusting to retirement income by adapting to the lower expenditures; 3) Creating a comfortable lifestyle by establishing new household routines; 4) Nurturing each other as husband and wife; 5) Facing bereavement and widowhood; 6) Caring for elderly relatives; 7) Maintaining a good relationship with children; 8) Keeping interests outside of the family by maintaining relationships with people in the social community; and 9) Finding the meaning of life by meaningful experiences.

### CASE STUDY

A 75-year-old grandfather has hypertension and diabetes mellitus. The 73-year-old grandmother has high blood pressure and breast cancer. Their two children live separately in another house at the edge of the village. The grandfather and grandmother receive medication and treatment at the hospital that is close to their home. Both of them can do their own daily routines.

The late developmental stage of this family is the elderly family. Grandmother and grandfather have a small commercial business. Their children and grandchildren are worried about their health. They ask them to close their shop and take up gardening and farming at home in their own fields. Their income is 1,400 baht per month, and they also receive about 2,000-3,000 baht a month from their children. The home is not cared for by the family. It is a conventional house with an old toilet. When they use the traditional toilet, their legs ache but they do not plan to modernize.

Both take care of the other by watching each other's symptoms for health problems, especially the grandfather who watches the grandmother's symptoms. They range from fatigue, chest pain, and chemotherapy side-effects. Both grandfather and grandmother are prepared for the loss of the spouse. "My age is old and I have many diseases. When exhausted, I will just die." The grandfather said, "If it comes about, I have to admit it's fate." Also, the grandmother has gone many times to the hospital because of a serious illness. Their five children talk to them and understand and accept the plan of health care. "If there is a loss, I will return to live with my daughter." The grandparents have children in the neighborhood who visit them, take care of them in the morning and evening, and sometimes bring food. Grandparents, when they are free, go visit their children at their homes in the village. Children, when available, take the grandparents to the doctor on a regular basis and watch over them at the hospital.

The grandfather is involved in the community and has good self-esteem. He is the president of the chronic illness club. He has been working for 2 years as the representative for the community participating in the events held. The grandmother sometimes attends activities in the community, such as making merit at the temple.



In summary, this family is able to live mostly on its own. Because they like to cook spicy foods, there may be diet suggestions for healthier meals related to their health conditions. Self-care in approaches to enhancing health may be suggested in what can be done when and where it is most appropriate. Care should be closely monitored by other members of the family.

## CONCLUSION AND DISCUSSION

### Limitations in implementing the concept framework

Family developmental theories describe the nature of a nuclear family. The family in Thai society is highly flexible with complex characteristics and lifestyles. The development of Thai families may not conform to current family theories espoused in Western society. For example, in traditional rural Thai society, children live in the parent's household. A daughter and her husband live in the home of her parents, which is called *matrilocal*ity. When the second daughter marries and brings her husband into the house, the eldest daughter moves out, who may be "housed-out" to build another house in the same neighborhood. They may be in the same area as the husband's house, male parents, or may be located in a new home alone in the same village or elsewhere. When the third daughter marries, the second daughter and her husband will do the same. In Thai tradition, when young daughters marry, they bring their husbands into the household. The youngest daughter is responsible for taking care of her elderly parents and will stay with them until their death. At that time, the house will belong to the youngest daughter and her husband.<sup>11</sup>

Family development is based on a nuclear family structure and can be applied to an extended family. When a daughter marries, the family is extended. Then it returns to a single family when the parents die. Thai society is a caring system society. A care system occurs when a married couple has a newborn baby. It will be cared for as it grows throughout all stages. The family is supported by its elderly members. However, early development of the child is evolving at the same time in the family. The developmental task guide is the way to promote family health. Grandparents also need to improve their tasks as they adjust to their own deteriorating health. Adaptation to loss is the role of the family during times of significant change, especially with the loss of an older spouse.

From teaching family nursing content, the authors assigned students to learn by examining case studies in each developmental phase. Most of the time families consist of these arrangements: parent-children-grandchildren family, great grandparent-grandchildren family, and grandparent-children-son-in-law-grandchildren family. In each generation, there is a family head of household. In case analysis, the study focuses on only one family in a family system. This facilitates nurses to promote better health in the family. The development of the family can be improved at both personal and family levels. However, the plan for improving health may not be the same for all family types. Planning for improved health may be required with several developmental stages based on the unique circumstances of each family.

## SUMMARY

In the family study based on the developmental theory (Duvall, & Miller, 1985), there are eight stages of development in each period. In each development, there will be family tasks, followed by family development as mentioned above, as the normal development of a nuclear family. The first issue in the context of Thai society is the extended family. There are many family members of all ages. When it comes to caring for a family, there may be two to three family cycles nestled in one large single family. Each member of the sub-family must support the development of both their family and the family at large. If all members of the whole family are responsible to the development of the family, all members will be able to live together happily. The second issue in this article focuses on developing families with older people. From the family visit, in addition to the elderly living in the family as the framework of this concept, there is a cross-sectional family with the number of children living alone with grandparents or great grandparents, especially older grandmothers. Some children also need to become caregivers of elderly or disabled grandparents. The elderly cannot afford the financial burden of caring for their grandchildren. It is important to think about how we should address the well-being of these family members and recommend appropriate care to help them to function properly. This will lead to a family that is stronger and happier.



## REFERENCES

- [1] Office of the Economic Development Board and National Society. (2008). Population Projections for Thailand, 2000-2030.
- [2] Chayowan, N. (1992). Fostering with Life Stages of the Elderly and their Children. Institute of Demography, Chulalongkorn University.
- [3] Pothisita, C., and Thaweesit, S. (ed). (2009). Thai Family in Changing Circumstances through Social and Population. Nakhon Pathom: Population and Social Publishing
- [4] Rowe, G.P. (1981). The Developmental Conceptual Framework for the Study of Family. In F.I. Nye and F.B. Berado. Emerging Conceptual Framework in Family Analysis. New York: Preger.
- [5] Jong-udomkan, D. (2015). Nursing Family Health: Theory Concepts and Critical Family Applications. 2nd edition. Bangkok: Beyond Enterprise.
- [6] Panyathorn, K. (2014). Relationship between Selected Factors and Stability in the Life Security of the Elderly in Udon Thani. Journal of Nursing, Ministry of Public Health. 22 (2) 24-35.
- [7] Rattanamongkolgul, D., Sungkamanee, S., Rattanamongkolgul, S., et al. (2015). Heath profile of elderly people through active ageing framework in a community, Nakorn Nayok province. Journal of Medicine and Health Sciences. 22 (2) August 2015. 48-60.
- [8] Poopaiboon, R., et al. (2016). Thai Family and Changing Structure: The Initial Findings. Conference proceeding, Three Decades of Thai Family Nursing: Social Challenges and the Thai Family Health System in the 21st Century, 17-18 August 2017, Faculty of Nursing, Khon Kaen University.
- [9] Srithamrongsawat, S., Bundhamcharoen, K., Sasat, S., et al. (2009). Community Care Model for Older People in Thailand. The Thai Journal of Primary Care and Family Medicine. 1 (2). 22-10.
- [10] Duvall, E.M., & Miller, B.C. (1985). Marriage and family development. 6<sup>th</sup> ed. New York : Harper & Row.
- [11] Sindhavananda Kamthon, Air Vice Marshal. (2006). Encyclopedia of Thai Youth Vol. 22, No. 7 : Thai family. HAI JUNIOR ENCYCLOPEDIA PROJECT By Royal Command of H.M. the King. 204-207.

## XUAN DIEU'S POETRY FROM ECOCRITICISM VIEWPOINT

Bien Thi Quynh Nga

*Department of Literature, Vinh University  
182 – Le Duan street, Vinh city, Nghe An province, Viet Nam  
Tel : +84949306570, Email address: bienquynhnga@gmail.com*

### ABSTRACT

Ecocriticism is the tendency of literary research which focuses on evaluating the attitude of literature to nature based on ecological perspectives. Beginning in the 1990s, this research tendency has then gained its popularity worldwide, strongly influenced the literature of East Asian countries since the natural environment there is facing serious crisis risks. In Vietnam, from 1932 to 1945, nature attracted interest of many poets in the Tho Moi movement, among whom Xuan Dieu was the typical. This article studies insightfully Xuan Dieu's poetry from ecocriticism approach by main methods: survey, statistics and text analysis methods, evaluation and comparison methods, systemization and interdisciplinary methods. The texts surveyed are the two poem collections namely *Poetry Poetry (Tho Tho)* and *Send the Scent to the Wind (Gui huong cho gio)*. This article concluded that leaning towards “earthly nature” was the core ecological thought of Xuan Dieu, characterizing his poetry in comparison with the others’ in his time. The unique ecology in Xuan Dieu’s poetry was defined and demonstrated in this article. The article also indicated the poet’s ecological ideas, which proved to be positive and humane.

**KEYWORDS:** ecocriticism, ecology, environment, Xuan Dieu’s poetry, New Poetry in Vietnam (Tho Moi), romantic poetry.

## INTRODUCTION

Cheryll Glotfelty is one of the pioneers who has shaped and developed ecocriticism in America. Her definition of the term “ecocriticism” has been shared by many followers: “Ecocriticism is the study of the relationship between literature and nature” [1]. Recently, “ecocriticism” concept has been extended since it realises that not only the physical environment but also spiritual one exert the remarkable impact on literature. However, the term “ecology” derives from the origin “ecology”, which comes from Greek words including two parts: “Oikos” meaning the place of living and “Logos” meaning theory. Ecology is considered as the study of the relationship between the living organisms and the surrounding environment. Being influenced by ecology’s ideology, ecocriticism mainly focuses on the natural ecological content of literature, evaluates the attitude of literature to nature from ecological approach, criticizes the conventional view on anthropocentrism, states the essential role of the nature and pays attention to the expression of ecological aesthetics in literature. Ecocriticism, therefore, is an cultural approach, an interdisciplinary approach. Ecocritics must identify the natural environment and environmental consciousness in particular literary phenomena. Compared to Europe, Asia lagged behind in adopting ecocriticism theory although the environment in these areas is facing a lot of crisis risks. In the field of ecological critique in Asia, Karen Thornber is a recent acclaimed scholar. In 2012, in her work named *Ecoambiguity: Environmental Crises and East Asian Literatures*, Thornber coined a new term: “ecoambiguity”. This concept reflects the predominant characteristics of environmental discourse in East Asian cultures. *Some misperception in the folks’ consciousness and behaviour to the nature leads to lots of environmental injustice. In romantic literature, especially in poetry, “ecoambiguity” is reflected as a special sense: the nostalgic sense to nature. Tho Moi (literally meaning New Poetry) 1932 - 1945 in Vietnam is a typical phenomenon for this type of sensation.*

In the early twentieth century, parallel with French colonialism and the process of industrialization, urbanization, the Western civilization strongly invaded the civilization of Vietnam's traditional agriculture culture. In the context that new cultural values are in conflicts with the old, *the nostalgic sense to the nature appears as a way for people to preserve the spiritual values. At that moment, Tho Moi 1932 - 1945 was born as a brilliant beginning of modern poetry, letting the human with consciousness of absolute self to take the center place of universe, changing the relationship between human beings and nature that has traditionally harmonized into a new turn: “Nature becomes the aesthetic object for human to admire and enjoy” [2]. This new concept motivates new poets, including Xuan Dieu, to see nature as a necessary environment for the survival of individual self. Accessing Tho moi from ecocriticism perspective, we can see that the ecology in Xuan Dieu’s poetry is remarkably different from that in any other poets’ world. While many Tho Moi poets such as The Lu, Huyen, Han Mac Tu, Anh Tho, Bang Ba Lan, Doan Van Cu, Nguyen Binh... escape from the earth into the heaven, the metaphysical universe or “a nostalgic countryside”, Xuan Dieu leans towards earthly natural with a bold connection and love. It is innovative viewpoint that builds the unique ecological system and humane philosophy in his poetry.*

## MATERIALS AND METHODS

- We use surveying, statistical and analytical methods to survey and statistic the symbol of environment, the natural vocabulary system which was presented in two episodes *Tho Tho* and *Gui huong cho gio*. Based on this, we will analyze each specific manifestation of the ecosystem in Xuan Dieu poetry.
- In the course of the research, we will compare the ecology in Xuan Dieu poetry with the ecology of the poetry of new poets of the time such as Nguyen Binh, The Lu, Han Mac Tu, etc... to find similarities and differences. From here, we will evaluate the environmental and ecological characteristics of Xuan Dieu poetry.
- Systematic approach: We set ecological expressions in Xuan Dieu poetry in the ecological environment to see the relationship between them both.
- Interdisciplinary approach: we use the knowledge of many different branches such as culture, literature, environment, biology, geography, philosophy, ... to study and explain the object.

## RESULTS

### 1. Ecosystem in Xuan Dieu’s poetry

Ecosystem in Xuan Dieu poetry is covered from the sense of space and time, the two categories are called as the size of the whole universe by Xuan Dieu. He said: “Time is also a dimension of space, and space is also one dimension of time, can not be separated; things are always moving, so we live in a four-dimensional universe, and the fourth dimension is time” [2, p.314]. Apparently, it is so long in the past, Xuan Dieu was

aware of the natural dimensions of nature. In the beginning of Poetry Poetry, Xuan Dieu has unveiled the ecological space of a vast natural in which the earthly garden is the most characteristic ecological environment: *From butterflies and bees, here is the honeymoon/ Here are flowers of verdant meadows/ And leaves of flickering virgin branches/ From swallows and orioles, here is the ballad/ And here, when light flicks through our lashes/ Every morning, God of Joy knocks on the door (The Haste poem)*. Discovering Thơ Mới from the perspective of ecological culture, Nguyen Dang Diep noted that: the garden is the most concentrated symbol of the relationship between people and place in new poetry [2, p.38]. In there, we would like to emphasize, in each poet (broadly each generation of poetry, each ethnic group, each age), the relationship between people and the ecological environment always has different characteristics. Many poets of the Thơ mới movement write about the garden, but each poet has a different way of expressing the garden, revealing its distinctly eco-feeling. The garden in the poetry space of Huy Can is a garden of idyllic, desolate gardens; The garden in Han Mac Tu's poetry has a fanciful color; The Lu's poetry garden is famous for its flute; The garden of Nguyen Binh is reflected in the memory of the flower of the betel, the grapefruit, the sounds of the drum festival, the sprinkling of the spring rain and the dreams of... While those of them come to the nature in the nostalgia or supernatural imagination, Xuan Dieu looks for the nature in the central of the whole universe. The garden in Xuan Dieu's poetry is an earthly garden - the real garden in/ life. Image of the specific nature garden is appeared many times in his poetry: *This is the garden of ten seed seedlings; In the heart of the garden is the sound of the birds; In that night garden has many moons; Do not want to leave far away the garden; In the garden is red green color...* The earthly garden is always described in the state of fullness, always stirring, moving, boiling vitality: *Bee and butterfly are in this honey week / the flowers are in green fields...* In daytime, the garden is full of light: *The light hugs the top of trees / Yellow trees are shaking under the sun...* At night, the garden twinkle marginally: *Bâng khuâng tiếc dậm lên chân vàng/ I'm afraid of the moon rising up...* In the garden, people become the central character. With the ability to "glow" for the world, they are also a creature of nature: *You have come here by beautiful step / The flowers and birds are hissing / Making a spring style hug / Light from one hand (surrender)*.

The garden space in Xuan Dieu's poetry became richer and closer as it filled with pictures of flowers, leaves, grass, trees, sunshine, rain, clouds, wind, mist, moon, stars, birds, bees, butterflies... The garden in his poetry seems to consist of many plants and animals, both the biosphere and the atmosphere. There, when there is no human intervention in the rough, the benign and toxic nature can be parallel: *sweet honey flowers mixed with poison*. All created a pure, existing, true and alive natural world. Among the natural entities of the garden, flowers appear as a key environmental image. Of the total of 95 poems in two volumes: *Poetry poetry* and *Sentiment for the wind*, 54 in these poems are mentioned about flowers, and 19 of them not only mentioned once [4, p.114]. The poems such as *The Fall affair*, *Optimistic*, *Sentiment for the wind*, *Spring falling...* are the flower gardens. There are many kinds of flowers: from the species of flowers, regal (lilies, orchids, flowering flowers...) to the pale, simple flowers (grapefruit flowers grass, mahout, chrysanthemum, lotus, rose, dahlia, flamboyant...). Observed and perceived by a sense of sight and sensitive smell, the flowers in Xuan Dieu poetry rose up and smell the fragrance. With many advantages, flowers quickly become the central image of the world, crystallizing natural beauty. When it is, the beauty of flowers is always brilliant, the freshest. It is easy to respond to deep feeling and passionate passion in Xuan Dieu. But the flower's life is very short. There are few natural entities that die out like flowers. The fading flowers are often impressed and many times appear in his poetry: *More than one flower has fallen branches; Oh, Why should flowers fall?;...* The sympathy of Xuan Dieu with the features of flowers show that flowers, in his poems, become the symbol of the beauty but soon fade. It reminds deeply the poet of the sadness and the regret for the original world which is extremely beautiful but soon fade and it predicts the encroachment of urbanization.

If the images of grass, trees, flowers, leaves, birds, bees, butterflies (ground)... belong to the biosphere, then the wind, sunshine and fog (sky) are the atmosphere of the garden. Wind in the eyes of the poets carries many levels of vocal, nuance: *melancholy wind, sad wind, whispered rhythm wind...* Wind is not only the communication channels in the vast universe but also the connection among the sky, the earth and the other natural objects. With a strong blockade, the wind has the ability to widen the natural space, making the natural objects static at the sudden movement to become uncontrollable. On the rhythmic background of the wind, the garden becomes as a dance. Such as: *Gently strum green strands of threads/ Canorously, wind sways boughs/ In sadness drenched, stops its sounds/ The silent night's graceful soul (The Moon)*, v.v... Unlike the wind, sun is a hot and warm element. Perhaps so Xuan Dieu is more sympathetic with the sun, he wrote about the sun more

than cold rain. Grasping the objectivity of the sun, he painted the sun in poetry under many shades, intensity. The sun does not have specific shape, but invasive, light spread: *How can one explain the meaning of love! / And a day at dusk the meaning thereof/ It fills my soul with pale sunlight/ With flimsy clouds and breezes slight (Why?)*,... Dew is a factor to balance rain and sun. In many cases, Xuan Dieu depicted the image like this. Both *Poetry Poetry* and *Sentiment for the wind*, the dew has a clear move. The journey of the dew corresponds to the motion of the emotion: from bloating, drowsiness (*And on the far side mountains start to veil with fog...*) to faint, melancholy (*As silver dew holds its tongue, the night holds its breath/ While a melancholy tune reaches up to the Khue star...*). "Air of Heaven" - the most elusive element of the elusive invisible gas is also described very dynamically: *It seems the air is in a tangled web/ That each step tears and each move rips...* Sometimes, the air is tinged "While the leaden air broods o'er the parting", but in general the "clear and thin air" still occupies the dominant position. On the journey finding out the mystery of the garden, Xuan Dieu has reached the "observatory" to the celestial bodies (moon, stars, sun...). Poets in new poetry often pay much attention to the moon. Xuan Dieu's moon has many different situations. When full, dashing, full of thirst for humor: The yard's agleam with moonlight/ Which brightens up each pathway, Cold autumn grows colder in the clear moonlight... ; when lonely, ice penetrates into the skin: *I am frightened. Cold has spread everywhere/ The moonlit sky with its bone-chilling cold...* ; When shimmering, virtual in world color: *The cloudless sky makes a crystal clear night/ I shudder at such a shimmering light*. The moon, as well as other natural elements (flowers, leaves, wind, clouds, sun, mist, air...) is always covered by two extremes ("the world of melodious" and "mourning, blindness" [4, p.133]) corresponds to the opposites in Xuan Dieu soul (passionate, passionate and lonely, desperate). Viewed from the aesthetic principle of romanticism, it is easy to see that the Inevitably, the inhuman / natural world will always be / is observed by the lens of individual feeling. However, deeply in the subconscious individual, a pure nature will be a good place to rest, the ideal of the soul is fragile, fragile before the "pressure of the times". With nature, human beings always find instinctive empathy, because man is first and foremost a natural being. In other words, Xuan Dieu, as well as the romanticists, always sees in nature the aesthetic qualities appropriate to his soul. Therefore, the earthly garden in Xuan Dieu's poetry acts as an ecological environment that nourishes the soul of the poet. Nature, in the concept of Xuan Dieu, it is also opened in the direction of time. Xuan Dieu's destination is earthly garden space, so corresponding to that, the time must be in present. Xuan Dieu does not talk much about the past and he also was afraid of the future. He only loves the present, because this is the real time, when people are aware of their existence, being alive, being loved, being experienced. Xuan Dieu is very sensitive to the time of season change, he worries foreboding winter cold as soon as the autumn just coming. (*This is autumn coming*). In the seasons, spring and autumn are always mentioned in poetry, especially new poetry. Compared with autumn, Xuan Dieu wrote about spring more: *Spring smile, Luna new year, Spring fall, Spring early, Spring without season...* Even the articles not directly written about spring readers can still see that. To some extents, language is "shaped by nature", even as abstract entities such as spring. The best season of the year, of the universe, spring is often accompanied by adjectives that are warm, harmonious, cheerful, colourful, abundant. By a deep awareness, Xuan Dieu has deepened the linguistic circuit of the senses, exploring the natural spring with the capacity of naming and natural qualities of poetic language. Each poem, each verse has seen as the spring seed, the spring color, the spring flavor and the spring tone. No longer depends on the insights and emotions of classical aesthetics, The poets of Tho moi's age freely express their knowing about time, the universe and the spring with their individual's eye. Spring and spring feelings become natural, fresh, close and true. This, Xuan Dieu's poetry is a typical case. In Tho moi, Xuan Dieu is not the best poet about the theme "spring", but he is a person who always sunks infatuatedly in the spring of life. Spring pictures in Han Mac Tu's poem (*Ripe Spring*) or in Nguyen Binh's (*Spring Rain*) are still the springs in their memories which remind of time and person. To Xuan Dieu, the moment the spring was recognized in the coexistence of time and more importantly, in his concept is the moment that the poet was becoming an individual who connected deeply with the nature and the universe. Therefore, Spring becomes closer, present in the present life with *spring garden, spring smile, pink cheeks girl, green fields*,... In particular, the poet recognizes the similar resonance between human and spring. Natural spring is the season of the proliferation, the growing, the budding, the season of the beginning. Accordingly, the spring of human is the aspiration of youth, the "source" of love and the opening of the soul. Love and youth always accompany with the spring. it is combination and connection between human with the sky in the most intense emotions: *one thousand morning, Bring me with fresh spring (Multi-love)*. Spring has become a symbol of the vitality of nature, the most wonderful moment of nature that has been received by all beings of an



individual who recognizes himself before infinite space. From the sense of spring in the relationship between nature and people, the individual view is deeply aware of the “terrible consequences” of linear time: the passing of spring, the passing of youth, finite life. The poet rushes to race with time, enjoying the spring, youth. The strong moves such as *hugging, kissing, biting, drilling, drumming, picking, sticking...* express the desire to occupy the nature of the lyrical. It is the legitimate aspiration of human beings to see the beauty of nature, to know the value of nature and respect for nature. This attitude, this behavior makes nature seems more tolerant. It mixes to people. Is it the magnitude of the nature when the individual back to rest! The natural world is covered by every length and width of space and time, and is painted by the pen of a poet who is so passionate and greedy. The words indicate the level of space with the words indicate the state of virginity, virgin... They are repeated many times suggesting the concept of an endless living space, comprehensive, original. That space is where the natural objects and the human bodies relax the senses in order to enjoy and open up the ontological life. To Xuan Dieu, the relationship between humans and outside world is much more closer. This self is exalted in the minds of reason, in the desire to reconcile, enjoy all the worldly happiness that nature produces to humans. New poetry, although “take silk as the main material” [1, p.44], but very early, perhaps in the “origins memories”, Xuan Dieu vaguely felt the important position of natural as an essential environment for the survival of the human body and mind. There is no natural can not be human. Especially, in the poetic language, Xuan Dieu has a vivid re-enactment of a natural nature in the concept about nature is the root and beauty of the bar, the original one. It is the garden, the place of human search, is the place to wash, purify the human soul before the smoky era of industrial civilization. Efforts to escape the conventional dimensions of classical aesthetics and not go too far in the dream of romanticism, symbolism, surreal, Xuan Dieu has brought a new sense of ecology, seen the natural as the very nature of the primordial. The naked garden, which is the ideal ecosystem of Xuan Dieu. Furthermore, the naked garden is a manifestation of the sense of combating the environmental destruction of modern civilization.

## 2. Environmental philosophy of Xuan Dieu

### 2.1. “Everything in nature has soul”

“Everything in nature has soul” has been inherited from the traditional literature as well as influenced by the symbolism in modern Western poetry. Oriental people considered nature not only as a geographical environment but also as an entity soul. The origin of agricultural culture makes people learn to live in harmony with nature, even respect nature as a god. East Asian dwellers often have natural god worship belief. This is a profound ideology because it maintains the ecological balance of nature and maintains the psychological balance of human. This idea entered religion, philosophy and literature. Until symbolism crowned, modern poetry still interested in nature and gave nature a “position of honor”. Baudelaire - one of the pioneer of symbolic poetry – declared: “Nature is a temple in which resounds “vague, mystery words”. From that world, the ego of the poet is compressed in “extase”, “super ascend” status. The poet’s spirit escapes from imprisonment of body, as a slight steam toward super nature... With the Eastern consciousness and sympathy with Western symbolic poetry, Xuan Dieu leaned toward discovering “the spirit” of the nature, creation. Ecological garden in Xuan Dieu’s poetry has vivid entity, with both the human soul, the tree’s soul. The poet wanted to penetrate and explore the subtle changes, the vibrations, the tremble inside creatures, especially explore the ambiguous, vague shade: *The trembling wind vibrates the leaves/ A few shriveled limbs like fragile bones in somber hue* (Here Comes Autumn), *The cloudless sky makes a crystal clear night/ I shudder at such a shimmering light* (The Moon Lute),... When the nature trembles and wonders, it means that nature was considered as having human mood. The geographical environment the poet observed and felt deeply was mental environment which is difficult to distinguish. Therefore the real nature of ecological space was virtualized, the poetic image became hesitating, multi meaning. This is the space of imagination, of thought rather than of real space. Of course, providing the nature human features expressed principles of romantic poetry because romantic poetry is the voice of emotion. However, the important thing was Xuan Dieu set a new ecological structure in which nature was described as an ecosystem that envelops and nourishes the human soul. Because nature is lively creature having soul. Even anxiety of separation and loneliness which derive from human is in profound relationship with the soul of creation: *The flowers bloom to fade out... People meet to separate...* In every spiritual situation, the emotional ego always find coincidence with nature. The ego listens to the voice of the nature, deeply understand it as true meaning of life. The nature appears as a ecosystem with the human voice, the human face: *garden laughs, voice of birds, rain cries, wind whispers, pink roses smile, happy birds, v.v...* And the natural world always moves. The change of nature is expression of

human life, that life is tied to the earth, underworld. From another perspective, as an object could be watched and described, nature became character directly involved in acting:.... Nature has been recognized as an object with full value, independent status, distinguishable with the subject - human. Therefore, the nature exists in relation with human on behalf of "another one". Of course, new romantic poetry is still under the framework of thought "Human is center of the universe". Thus, human in Xuan Dieu's poetry is still in central position. Human is the measure, the criteria of natural valuation. However, the people here do not carry the desire to conquest the nature, they come back the nature to filter the soul and enjoy the nature in the soulmate, harmony relationship, in dedicating desire. In other words, the natural in Xuan Dieu's poems are paintings which are under direct management of the subject's feeling but appear as a "independent visual value" with inner vitality. It is independent but not isolated from humans. Because nature is always in human soul and maybe, the human soul is also hidden somewhere in the ecological garden.

## 2.2. "Everything in nature is correspondant"

The universe always changes, verything in nature is correspondant are the objective law of the nature. With Xuan Dieu, the natural correspondence is the reason for the existence of the world. Everything in the "underworld garden" is in status of harmony and connected with each other. The poet deeply empathized with the relationship with perfume, color, sound and light. The natural characteristics suddenly awake, harmonize and interrelates through the poet's sensitive sense. Light evokes sound: *The cry of rain, the words of sunny rays, The new flower color as the call, The light exclaims,...*; the sound transfers to color, light: *color will speak, v.v...* The poet mobilized all senses to perceive the world. The interrelated sense theory was inherited by Xuan Dieu from the French symbolists (Baudelaire, Verlaine, Stephane, Mallarme, Rimbaud...). For the first time in the history of poetry there has been a new look at the universe and life, the relationship between the poet and the manifestations of nature: *Man passes there through forests of symbols/ Which look at him with understanding eyes... Perfumes, sounds, and colors correspond* (Correspondences – Baudelaire). Symbolism recognizes the mysterious relationship between everything in the universe, between the universe and the human. This correspondances takes place in many aspects: correspondances of ideas, feelings, space, colors, flavors, etc. In fact, this theory is also very close to the "unified universe" thought in Eastern philosophy. However, nature in Eastern classical poetry has always been a revered object of poets. Nature in Tho Moi is intertwined through human intuition. And human perceive nature by the mysterious intuition about that relationship. Intuition is the revelation state of the senses. It's out of the ordinary sense. Intuition plays the leading role in cognitive and artistic creation of symbolism. Xuan Dieu is a person who loves life, loves nature and is very sensitive so he can easily find empathy with the idea of symbolism. In *The Moon Lute* poem, by the intuitively, Xuan Dieu discovered the correspondances relationship between sound and light: *The moon entered the lute's tune cold / The moon of love. Oh, moon of old! / The lute's sad voice ends in a plaintive note / As each teardrop is like a bell that tolls...* Here, many senses are mobilized to feel the sound of Moon lute from the past to the present. All music and light harmonize into the sea, bringing human to the vague and lonely. Thus, the music, the moon, the soul of the human was in harmony, do not distinguish. And music has become a symbol, activate many subconscious regions of the reader. The poet immersed in the nature, found in the natural landscape the symbolic meaning for spirit contents, turned the nature into symbolic means for the content going beyond intuitional sense. And thank to those symbolic meaning, the nature was recreated and born deeper, more beautifully.

Moreover, Xuan Dieu also discovered that: things in the universe are connected, the correspondances by a special emotional string named love. Love unfolds and sustains life. All creatures actively seek each other, make love to each other, even secretly married: *For bees and butterflies 'tis the honey season/ And these here blossoms of the green fields/ And these leaves dancing on young limbs/ And for the swallows and orioles 'tis their love song (Hurry up),...* "The earthly garden" turns into a garden of love. Love connects natural objects, unites the universe, ensures existence for the world, for human life. Nature allway observes all human behaviors, couples for couple: *my heart was married to your heart*. Human is born with nature, love is also born with nature and surrounded by the freshness of nature. By the intuitively, Xuan Dieu feel love has a special strength, both lightly, ambiguity and cause pressure to force the heart of human to "get married". Love, in this way, becomes the law of nature, bearing the origin, nature and function of the universe. Nature is not a static context but an entity, a participation. The more lonely, the more the poet aspires towards an ideal nature, where the universe corresponds, the universe is united, do not sporadic, single. At this point, Xuan Dieu poetry has towards the spirit of ecological literature: "respect the unity, not only does it care about a single aesthetic object, but it also should be placed it in the natural system".



### 2.3. Beauty originates from the nature and poetry is derived from life

With a new look on the ecology, Xuan Dieu's poetry also lean towards a progressive aesthetic idea. Xuan Dieu well aware of the relationship between nature and poetry, in which nature is the origin of all beauty, paradise only exists on earth: *I'm the bird coming from strange mountain / improvised singing / When the wind comes early and singing in the leaves / When the moon is blue night sky,...* (*The emotional*). The beauty of clouds, wind, moon, flowers... is the source of inspiration and description of art. It reflects diversity, lively in the aesthetic relation of people. Of course, this idea fit with with the artistic views of the Romanticists. Most of Tho Moi poets advocate for natural beauty, pure selflessness, mysterious and supernatural. Yet Xuan Dieu seeks the natural beauty in the earthly garden and in the present tense. Nature in this meaning symbolizes life. Thus, for him, poetry first comes from lives, from the very life and attached to human. He writes: *Being a poet means ru with the wind / Dreaming in the moon and raving with the clouds, The moon's two breasts are the poet's eternal dream/ He caresses their fullness with extended hands,...* These verses indicate the importance of life to artistic creation. Titles, layouts, regular repetition of some basic themes, some poetic spaces, poetic images... are also structured as an ecosystem. Diving into the poetry texts, if meticulously collected, there will be a system "ecological vocabulary": *sky, land, water, sea, island, sun, moon, stars, clouds*. The lyric self is always attached to the earthly, smocking the pistil from nature to produce beauty for the arts. Earthly nature as an artistic object has become the cradle of Xuan Dieu poetry garden, in the aesthetic relationship with the poet.

## CONCLUSIONS AND DISCUSSION

This ecosystem should be placed in the context of the early years in twentieth century - when the challenging impact of Western civilization has sparked a fascinating call of the new things, the civilization and the urban area widening made the natural space damaged, the original values are in the danger of breakdown, the anxiety, the pain are expressed anxiously in the poetry – as a result, readers can feel the instinct passion for living, for loving, for nature in Xuan Dieu poetry. Through his poetic ecosystem, we recognize that when inheriting the traditional Eastern philosophy or adopting modern Western thought then in the depths of human consciousness, in the origin of human culture and nature have always been a living being, an essential element of life maintaining. Leaving nature is leave the depths of spiritual values of living space as attachment, origin. Of course, taking a modern critical theory into the 1990s to study a specific literary phenomenon from the 1930s, with almost opposite ideologies (humanity centered theory "and" ecology centered theory) will easily leads to a forced look. It can not be negated that the "human centered" nuclear ideology of romantic poetry and can not assert that natural gravity as an ecological environment is a clear aware (as a conception) appeared early in Xuan Dieu or other romantic poets. In the desire to affirm the proud self of bourgeois individuals, nature is identified as an "other" - a subject, but not equal to human beings, it is still subject under the individual points. Only thing, although asserted in the center but deep in the mind, people still vaguely feel the important position of nature. People is always conceived from nature and can not leave nature as the stem, the origin and the living space of the individual. Later, it became one of the central issues of modern ecological aesthetics.

From this point of view, the article concludes: In the early twentieth century, Xuan Dieu, under the influence of cultural context, natural environment - society, aesthetic concept, explored deeply the expectations about the relationship between human and nature. He specially respects and praises the natural world. It has become a characteristic object in the soul of Xuan Dieu, contributing to the creation of an unique, meaningful ecological system and a close and different natural sense from modern ecology concept.

## AKNOWLEDGEMENTS

This research is funded by the Center for Research – Entrepreneurship Innovation, Vinh University, under contract No 06/2017/ TTNCKNST.

## REFERENCES

- [1]. Cheryll Glotfelty, *Ecocriticism is the study of the relationship between literature and nature*, (translate by Ngoc Hai), Retrieved from <https://hieutn1979.wordpress.com>.
- [2]. Nguyen Dang Diep (2014), *Modern Vietnamese poetry, process and phenomena*, Literature Publishing House, Ha Noi.
- [3]. Do Van Hieu (posted 03/02/2016), *Ecological critique, innovative literary research trends*, Retrieved from <https://dovanhieu.wordpress.com>.
- [4]. (Posted 03/02/2016), *Ecological critique, origin and development*, (Do Van Hieu translate and synthesize from the Chinese text: *Ecological criticism in the US and Europe*, Hoc Lam Publishing House, 2008, and *A collection of Chinese and international ecological literature*, Triet Giang Industry and Trade University Publishing House, 2010, pages.48-60), Retrieved from <https://dovanhieu.wordpress.com>.
- [5]. Le Quang Hung (2002), *The art world of Xuan Dieu poetry, period before 1945*, Ha Noi National University Publishing House.
- [6]. Many authors (1998), *Xuan Dieu, about authors and literature*, Education Publishing House, Ha Noi.

**ENHANCING READING COMPREHENSION BY USING COOPERATIVE LANGUAGE  
LEARNING STRUCTURES IN LARGE-SIZED CLASSES**

Lam Giang Nguyen Thi

*Department of Foreign Languages, Vinh University  
182 Le Duan Street, Vinh city, Nghe An province, Vietnam  
(lamgiangdhv@gmail.com)*

**ABSTRACT**

This research aims to investigate the difficulties that students of other faculties (non-English majored students- NEMs) in large-sized classes face when learning EFL reading comprehension skill and the effectiveness of the application of cooperative group work in large-sized reading classes. The data revealed that the most significant obstacle which could prevent the participants in learning reading skill more effectively is a lack interaction among their classmates because reading were taught with traditional method. Therefore, group work activities were applied in the classroom in the hope to obtain better results. A post-test and a pre-test of students' reading comprehension and a follow-up survey were conducted to determine the benefits of cooperative language learning. The findings show that cooperative group work had more positive impacts on the participants' reading comprehension than traditional method and their positive feedback indicates the effective use of cooperative learning in teaching and learning reading comprehension. Some suggestions of modifications were also made for better results in further research.

**KEYWORDS:** group work; cooperative language learning; reading comprehension

## INTRODUCTION

Developing reading comprehension skills is important for EFL students as it is one of the four skills that English language learners have to master through the learning process. Thanks to reading, students acquire knowledge that they could use later to improve or fulfill other skills such as listening, speaking and writing. Therefore, when teaching EFL to students of other faculties, the researcher has aimed to help them to enhance their reading skill. However, traditional teaching reading methods have been applied in classes so far, and students often read alone without peer interaction. That process of teaching reading would make reading comprehension less effective as interaction is a crucial element for effective language learning in general and for learning reading skill in particular. Hence, the most significant issue to be considered is how to teach reading skill to EFL students effectively so that students are able to enhance their reading comprehension. CLL techniques were used with the hope to help students work together to learn and to be responsible for their teammates' learning as well as their own. This pedagogical approach enhances student-student interaction via working in small groups to maximize their learning and reach their shared goal; hence they develop their reading comprehension in reading classes. It is believed to help avoid competitiveness and individualism and increase opportunities to actively construct or transform the knowledge among students. Furthermore, research has demonstrated that CLL produces higher achievement and positive relationships among students. In short, CLL is a powerful educational approach for helping all students attain content standards and develop the interpersonal skills for succeeding in their EFL study. This lead to the application of group work in one of the author's classes, and the conclusion is that engaging Cooperative Language Learning in teaching reading skills to non – English majors in reading classes is essential in order to enhance students' reading comprehension.

Cooperative Language Learning (CLL) has been recognized with its significant role in a number of fields in general, in education in particular for a long time. For over 20 years now, different researchers have developed different approaches to CLL. Hence, CLL have known with numerous forms and definitions. Slavin (1980:315) defined CLL as "the term refers to classroom techniques in which students work on learning activities in small groups and receive the reward or recognition based on their group's performance". Kagan (1985) proposed a definition of CLL as following: "Language acquisition is fostered if it occurs in a context that is supportive and motivating, communicative and referential, developmentally appropriate and feedback-rich". Johnson and Johnson (1999) described CLL as "the instructional use of small groups so that students work together to maximize their own and each other's learning." The author also describes CLL in a very simple way: "Class members are organized into small groups after receiving instructions from the teacher. They then work through the assignment until all the group members successfully understand and complete it". And understanding the complexities involving collaborative interactions is essential in order to maximize the benefits of cooperative groups. Tang (1998:116) insists on the practices and effects of CLL: this method provides a non-threatening learning context for interaction between learners. During CLL process, students present other perspectives and alternatives, they share and exchange ideas, criticize and provide feedback to their groupmates. Peer feedback would help students to enhance their awareness of their learning goals, and of the strategies to achieve those goals. In other words, cooperation provides "scaffolding" for mutual support and enables students to learn from each other.

Because CLL has numerous structures, a sufficient understanding of it structures is essential in order to understand CLL. The structures are very specific CLL strategies that can be used to organize interaction between students. Most of the structures can be used with almost any activities, but some of them can be better than others for certain tasks. Some structures maximize interaction between pairs, some for group work, and others involve the entire class. The key in learning structures is best-suited for a particular instructional purpose. Below are some of the structures most commonly used in language classes.

### ***Roundrobin***

Students are divided in teams that take turns orally responding to a question or prompt. Questions on slips of paper can be in the middle of the team, or a question can be called out loud. For example, team members can "Roundrobin" their predictions about a text before doing an activity.

### ***Roundtable***

Students divided in teams take turns passing a paper around and writing on it or completing another task. Roundtable can be used for brainstorming, reviewing, or practicing while also serving as a teambuilding activity. For example, the teacher asks a question which has multiple answers. Students take their turns and write one answer on the paper before they pass the paper and pencil clockwise to the next person. When time is up, the teams

with the most correct answers are recognized. The teams can also reflect on their strategies and consider ways they can improve.

### ***Think-Pair-Share***

Students are divided into pairs. The teacher calls out a discussion topic and students THINK of their own answer. Then students PAIR to discuss their ideas. Finally, the teacher calls on one student to SHARE their ideas with the class.

### ***Numbered Heads Together***

The teacher calls out a question and students think together in teams to discuss the answer. Then the teacher calls out a number and one person from each team responds (without help from the team).

### ***Jigsaw***

Students are on "base teams" of four. Each student is assigned a different role as an "expert." All experts with the same topic meet in a corner of the classroom to learn about their topic. Then they prepare a brief presentation on the material and return to their base teams. They teach their base team members the new material they learned.

## **OBJECTIVE OF THE STUDY**

This study aims to investigate the difficulties that students of other faculties (non-English majored students-NEMs) in large-sized classes face when learning EFL reading comprehension skill and how effective the application of Cooperative Language Learning structures in reading large-sized classes is by applying the principles of CLL to teach reading to a group of non - English majors, then comparing the results with those of a controlled group without the application. It will be an attempt to serve as a useful source of reference for teachers of English at the University afterwards.

## **MATERIALS AND METHODS**

### ***1. Materials and Participants***

#### ***Materials***

The main material used for the research was Hughes, J., Stephenson, H. and Dummett, P.(2015). *Life Pre-Intermediate Student's Book with online Workbook*. Cengage Learning Asia Pte Ltd. This textbook treats the four skills of listening, speaking, reading, and writing thoroughly and combines traditional methods of language teaching and more recent communicative ones. The pre-test and post-test were extracted from Betsis, A. and Mamas, L. (2014). *Succeed in Cambridge English Preliminary*. GLOBAL ELT publisher.

#### ***Participants***

This research paper was carried out with the aim of exploring how implementing CLL activities in reading classes at Vinh University could improve non - English majors' reading comprehension. To make a clear data analysis of the research, two main groups were focused: two classes of 48 and 46 Students of other faculties participated as experimental and control groups. These students came from different departments and their mastering of English is heterogeneous. The students were between 19 and 22 years old and most of them have been studying English as a foreign language for seven years. Some of them started learning English at the age of eight (or the third grade at primary school). They are supposed to be at the pre-intermediate level. However, their English is actually at the elementary English level. We did choose these two separate classes in random to ensure the objectiveness for the study: one as a control class with 46 students who learned reading skills with traditional method (or Whole – Class Question – Answer structure) and another one with 48 students as an experimental class where CLL activities were applied in teaching reading skills. The two groups of participants attended 15 weeks of EFL during a semester and they learn a reading text in each unit in the textbook.

### ***2. Methods***

The research design consists of the quantitative, qualitative and quasi-experiment method in the forms of questionnaires, interviews, classroom observation, survey sheet and tests. The questionnaires investigate the current situation of teaching and learning reading for non – English majors at Vinh University. The interviews were used to find out more information about the students' attitudes towards the application of CLL in teaching reading. Moreover, they also provided further suggestions to promote teaching English reading with CLL. The tests were designed in order to find an answer to the question: "How effective is the Cooperative Learning approach in teaching English reading skills at Vinh University?" The research model is shown in Table 1.

Table 1. Experimental research model

Classes	Pre-test	Experiments	Post-test
Experimental Class	Reading Comprehension Achievement Test	Cooperative Learning	Reading Comprehension Achievement Test
Control Class		Traditional Teaching	

Before the experiment, we used a Pre-Test on Reading Comprehension, when the term started. During the experiment, two different treatment patterns were applied. Lesson plans of both the groups addressed the same instructional objectives based on the same reading passages and exercises. However, the experimental plans provided opportunities for small groups / pairs' interaction and sharing resources among team members. Conversely, students in control group worked individually and shared their answers with the whole class. The experiment continued for 15 weeks. After the experiment, we used a post – test on Reading Comprehension to measure the achievement of the sample subjects. At the end of the treatment, questionnaires were employed for teachers.

In term of CLL application, there are a number of CLL structures. However, not all the structures are suitable for teaching reading skills to non – English majors, therefore only some of them were applied. Below are two examples of the procedures used in reading classes when the CLL method was implemented.

#### **Application of Jigsaw structure**

The implementation of the jigsaw technique to the experimental group went through the following steps:

- (1). The teacher divided the class into pairs or groups of three, four or five students, depending on the content of each unit. A student was assigned as the monitor of a group by the teacher or by the other members of the group. Each group had a secretary to write down the answer.
- (2). The teacher then introduced the students to the topic of the reading passage and asked some pre-reading questions as a way of activating their background knowledge or providing them with the sufficient knowledge.
- (3). Each unit was divided into two, three or four independent sub-units. Then each group member received a different subunit. Thus, each student on the team became an “expert” on one part (one topic).
- (4). These students “experts” then worked with “experts” from other groups, tried to answer the questions assigned by the teacher and shared the answer with other “expert” members of other groups on the same part.
- (5). Then the “experts” returned to their teams, and each one in turn taught the group about the part they were “expert” on.
- (6). After implementing steps 1-5, students were assessed on all aspects of the text or passage.

#### **Application of Numbered Heads Together structure**

The implementation of the Numbered Heads Together technique to the experimental group went through the following steps:

- (1). The teachers divided the class into groups of five or six students. These groups were formed by the teacher him/herself or by the students. Each student was assigned a number.
- (2). Then the teacher gave all the class a reading text and questions or some specific types of exercises.
- (3). The students discussed the questions as a group based on the content of the text to make sure that everyone on the team knew the answer of each question.
- (4). After a certain period of time, the teacher called one of the numbers. The students who had that number in each group tried to answer or presented the result. The students who presented the result correctly got a reward from the teacher. Then, the teacher chose the group that answered the question randomly. The students who had the same number in other groups could give their opinion about the answer.
- (5). In the last step, the teacher and his or her students made a conclusion. Then, the teacher gave evaluation to the students.



## RESULTS

### 1. The difficulties that Students of other faculties in large sized classes have when learning EFL reading skill

#### Context of teaching and learning English at Vinh University.

Before discussing about the problems that Students of other faculties face when learning EFL, it is essential to draw a background of its teaching and learning process. English is a compulsory subject at Vinh University. Non - English majors have to complete 7 credits of English (equivalent to 105 periods of 50 minutes each) at the university. Each class consists of at least 40 students and up to 75 sometimes (large-sized classes). At the end of the semester, students have to participate in a written test that is essentially on grammar, vocabulary, reading and writing. During one semester, students are required to do at least a midterm test (the number of tests depend on each teacher and the number of credits of each subject). The mark of the midterm test will be counted for 20% for the final result. Generally, students perform low and have a mixed level of English. This is because some students have previously studied English for 3-7 years in the secondary and high school levels, in which the instruction was primarily focused on written English. In addition, some students enter the university having had no opportunities to learn any English previously. These students are hardly able to communicate in English while the others can speak and use English at certain level.

#### Difficulties faced by Students of other faculties when learning EFL

First and foremost, some of the students' poor English knowledge often makes them feel shy and afraid of making mistakes. They do not feel comfortable to participate in the activities in the classes and normally attend the course by staying in silence. Furthermore, the traditional methods of teaching affect the students' awareness of their needs for real communication in daily life. They learn reading skill by reading a text and answer the questions. If their classmates have done it, they raise their hands and perform the tasks; therefore the students who are shy or the students who do not know the answers do not have to do it. Moreover, English learning is influenced by the students' attitudes towards learning. Some students find English not a major subject and not useful for their future. Thus, their final goal is to pass the exams or to achieve their objective of having good marks. In addition, the lacks of appropriate learning strategies or the habit to learn independently or creatively often result in the fact that they hardly prepare lessons or review the lessons regularly at home.

### 2. Effectiveness of CLL structures on students' reading skills

At the beginning of the study, a Pre-test of reading comprehension was administered to the two classes and the results were recorded. The results of the Pre-test were also used to determine the level of the students in order to divide them equally among the groups to make them as heterogeneous or mixed in ability as possible. Students were requested to do the test in 50 minutes. The test was extracted from Betsis, A. and Mamas, L. (2014). *Succeed in Cambridge English Preliminary*. GLOBAL ELT publisher, Test N°1. The test consisted of 35 questions over five short reading sections and the students had to choose the right answer out of three or four options, match questions to texts, or determine if a sentence about a text is correct or incorrect. No guidance or help was given during the test.

Table 2. Reading comprehension achievement pre-test scores of experimental and control class

Class	N	$\bar{X}$	Sd
Experimental	48	6.04	1.521
Control	46	5.98	1.358

Table 2, it is apparent that the Pre – test scores of the two classes are very close to each other and the fact that there is no significant difference between the highest and the lowest scores of these classes. This shows that groups were at a similar level of achievement at the beginning of the term.

At the end of the term, a post – test was carried out with the main purpose of measuring how students in the two classes improved their reading ability. For the study, we chose the Reading comprehension part of Test N°1 in Betsis, A. and Mamas, L. (2014). *Succeed in Cambridge English Preliminary*. GLOBAL ELT publisher. to test the students' level. The test consisted of 35 questions over five short reading sections and the students had to



choose the right answer out of three or four options, match questions to texts, or determine if a sentence about a text is correct or incorrect. Students were requested to do the test in 50 minutes. No guidance or help was given during the test.

Table 3. Reading comprehension achievement post-test scores of experimental and control class

Class	N	$\bar{X}$	Sd
Experimental	48	6.88	1.409
Control	46	6.18	1.415

The results as seen in Table 3 show a statistically significant difference between the achievements of the two classes on the post-test. The achievement of the experimental class is better than that of the control class. In the experimental class there is a significant improvement in reading comprehension in contrast with their Pre-test results. This difference indicates that applying CLL for teaching English reading skills has a positive effect on the student achievement. The CLL method can help intermediate level English students improve their performance the most. Most students with relatively good level admitted that they could improve their reading skill by explaining the lessons to other students. About 90% of the students with a low level of English improved their reading comprehension.

#### a. Analysis of Pre-Test Results of the Two Classes

Based on the figures of the Pre-Test scores of the two classes above, the author cumulated the frequency of each mark as follows:

Table 4: Frequency of Distribution of the Pre-Test Scores of the Experimental and Control classes

Experimental Class			Control Class		
Scores	Frequency	Valid percent (%)	Scores	Frequency	Valid percent (%)
3.5	2	4.2	3.5	2	4
4	6	13	4	2	4
4.5	5	10	4.5	8	16
5	3	6.3	5	3	6
5.5	4	8	5.5	7	20
6	4	8	6	4	8
6.5	8	16	6.5	6	14
7	6	12	7	4	8
7.5	2	4	7.5	5	10
8	5	10	8	2	4
8.5	1	2	8.5	2	4
9	2	4	9	1	2
9.5	0	0	9.5	0	0
10	0	0	10	0	0

The table above presents the percentage of distribution's frequency in two classes. Firstly, it can be seen clearly from the Table 2 and Table 4 that results of the Pre – test scores of the two classes are very close to each other and the two groups are at a similar level of achievement at the beginning of the term. Actually, the scores of the two classes spread from 3.5 to 9 mark, which is almost the same for the two classes. Though there are slight differences at specific scores, the figures are not too dissimilar from each other. There is almost no significant difference between the highest and the lowest scores of these classes.

#### b. Analysis of Post-Test Results of the Two Classes

Table 5: Frequency of Distribution of the Post-Test Scores of the Experimental and Control classes

Experimental Class			Control Class		
Scores	Frequency	Valid percent (%)	Scores	Frequency	Valid percent (%)
3.5	1	2	3.5	0	4
4	1	2	4	2	4
4.5	2	4	4.5	5	8
5	1	2	5	6	10
5.5	2	6	5.5	6	12
6	9	18	6	7	14
6.5	4	10	6.5	5	10
7	5	10	7	5	14
7.5	7	14	7.5	2	4
8	8	16	8	5	14
8.5	2	4	8.5	1	2
9	4	8	9	2	4
9.5	2	4	9.5	0	0
10	0	0	10	0	0

The Table 3 and Table 5 above show the difference between the post-test results of the two classes. In the Experimental class, there is a significant improvement in reading comprehension in contrast with their Pre-test results while there is only a very slight enhancement in the Control class. The results also indicate that the Experimental class, where students were taught in a cooperative environment, got a better achievement in reading comprehension skills in comparison with those who were taught EFL reading skills by using the whole-class method in the Control class.

#### c. The Test Means' Comparison

From the results of the Pre-test and Post-test score, we could calculate the Coefficient of variation as follow:

$$V_{E1} = \frac{S_{E1}}{X_{E1}} = \frac{1.521}{6.04} = 0.25 \quad V_{E2} = \frac{S_{E2}}{X_{E2}} = \frac{1.409}{6.88} = 0.20$$

$$V_{C1} = \frac{S_{C1}}{X_{C1}} = \frac{1.358}{5.98} = 0.227 \quad V_{C2} = \frac{S_{C2}}{X_{C2}} = \frac{1.415}{6.18} = 0.228$$

Table 6: The statistics parameters of the two groups' Pre-test scores

Class	Cases	Number of test takers	Pre-Test $\bar{X}_1$	$S.d_1$	$V_1$	Post-Test $\bar{X}_2$	$S.d_2$	$V_2$
Experimental	48	48	6.04	1.521	0.25	6.88	1.409	0.20
Control	46	46	5.98	1.358	0.227	6.18	1.415	0.228

As shown in the Table 4, Table 5 and Table 6, there is a difference in the mean scores in the Post-Test of the two classes, which was in favor of the Experimental one ( $6.88 > 6.18$ ). And we can see that a significant number of the students in the Experimental class improved their reading skills. Especially, the students who have had scores of an average level (ranging from 5.5 to 7) improved their reading ability better than the ones who are in a lower level. In the Pre-Test, the mean scores of the Experimental and Control classes were almost the same (6.04 and 5.98 respectively). However, after the application of CL in teaching reading skill for NEMs in the Experimental class, there was a gap between the mean scores of these two classes.

Moreover, in the experimental class, the students improved their social skills. They learned how to encourage their groupmates to participate in activities and to answer the questions. They also learned how to give compliments to their groups' members. In term of behavior, from the application of CLL in the reading class, we found the following results. First of all, CLL reinforces relationships between students in the groups. The final result of students is much better in comparison with the result of the pre-test at the beginning of the term. Students also have good attitude toward learning reading which is normally boring and difficult for them.

Students are more confident in expressing themselves, not only for the topic they learned but also questions related to the topic. They develop not only their reading skills but also speaking skills. They can express themselves much better. They are eager to show what they think because CLL creates competition among groups.

Teachers can apply more activities in reading classes than before, and this created a friendly environment for EFL classroom. Instead of asking students to read and answer the questions on the books, teachers can prepare and adapt suitable activities that create a more dynamic ambiance of learning for students.

The most significant factor of CLL is that it is student centered and teachers do not have to talk as much as usual because there are the leaders of the groups who guide the group members in carrying out the tasks.

## CONCLUSIONS AND DISCUSSION

Based on the above findings, we propose some implications for implementing CLL in reading classes. First, in order to achieve better results, teachers should consider the diversity of students in each class in term of level of English and other factors such as personality. This helps them to take control of the situation and prepare them for what is going to happen in their class. It is the teacher who knows exactly how different his/her students' learning styles, cultures, learning competence, and so on, so that he/she could organize the lessons or conduct the activities effectively. Giving greater help reduce the workload for low-level students by ignoring some tasks or replacing them with easier and more interesting ones and encourage these students to express themselves from the simplest sentence in the simplest activity. For Students of other faculties, teachers should be sensitive in assigning tasks and in putting them into groups. To avoid the situation that someone in the group who has better knowledge who do all the tasks for the other members, teachers should give them the strict rules, based on which students with better levels can help the students with lack of knowledge and skills.

Second, teachers should teach students some basic skills of team work (group and social skills) so that students do not have difficulties when group work is applied in their classes. For the fact that the teacher-fronted classes do not train students to work in a cooperative environment, the group skills such as sharing ideas, supporting each other, trust-building, conflict-management, etc. are always essential for the group work to go more smoothly. More importantly, there are also basic skills for students to be successful in their lives and their future working environment.

Finally, teachers should take a good control of the class time and use time appropriately for CLL activities. Make sure that students have enough time to be exposed to pair or group reading. Although it is not always advisable to use CLL in all reading classes, teachers can combine reading tasks in text book with a suitable CLL so that students may practice language skills as well as improve social skills at the same time. To summarize, considering the results of the present study, applying the CLL method helps improve students' achievement in learning reading comprehension skills. It is a more effective method to teach English reading skills to students of other faculties at Vinh University than other traditional methods because the students can have fun during reading classes, thus gradually increasing their interest in learning. However, in order to manage the large size classes, teachers should find suitable ways to control student interaction in the tasks and activities in reading classes.

## REFERENCES

- [1] Brown, H.D. (2007). Principles of language learning and teaching. New Pearson: Longman.
- [2] Betsis, A. and Mamas, L. (2014). Succeed in Cambridge English Preliminary. GLOBAL ELT publisher.
- [3] Hughes, J., Stephenson, H. and Dummett, P.(2015). Life Pre-Intermediate Student's Book with online Workbook. Cengage Learning Asia Pte Ltd.
- [4] Kagan S. (1985). Dimensions of cooperative classroom structures. In *Learning to cooperate, cooperating to learn*. Ed. R. Slavin, S. Sharan, R. Kagan, R. Hertz-Lazarowitz, C. Webb, and R. Schmuck. New York: Plenum.
- [5] Kagan, S. (1994). Cooperative Learning . San Clemente, California: Kagan Publishing.
- [6] Johnson, D. W., & Johnson, R. T. (1999). *Learning together and alone: Cooperative, competitive and individualistic learning* (5<sup>th</sup> ed.). Boston: Allyn & Bacon.
- [7] Slavin, R.E. (1980). Cooperative learning. *Review of Educational Research*, 50(2).
- [8] Slavin, R. E. (1995). Cooperative learning: Theory, research, and practice (2<sup>nd</sup> ed.). Englewood Cliffs, NJ: Prentice Hall.
- [9] Tang, C. (1998). Effects of collaborative learning on the quality of assignments. In B. Dart & G. Boulton-lewis (Eds.), *Teaching and Learning in Higher Education*. Melbourne, Australia: The Australian Council for Education Research Ltd.

## A STUDY OF RELATIONSHIP BETWEEN HEALTH LITERACY AND OBESITY OF JUNIOR HIGH SCHOOL STUDENTS AT THE CENTRAL PART OF THE NORTHEASTERN REGION IN THAILAND

Kitapon Srithanee\*

*Department of Bachelor of Community Public Health Program, Faculty of Science and Technology  
Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000*

*Corresponding ; Kitapon Srithanee, e-mail : Kitapons@gmail.com Fax : 043-712620*

### ABSTRACT

This research was a cross-sectional study to find health literacy related to obesity level and to study relationship between environment factors and health literacy related to obesity in junior high school students at the central part of the northeastern of Thailand. The 427 samples of the students who lived in Roi-et, Khon Kaen, Maha Sarakham and Kalasin were collected by the questionnaires and health literacy test forms. The data was collected during January to February 2016 and analyzed by frequency, percentage, mean, standard deviation and tested the relationship by Chi-square test. The results were revealed that health literacy of decision skill was a high level, cognitive skill, data access skill and self-management skill were middle level, communication skill and media literacy skill were low level. Environment factors; the meal preparation within one day in the family was related to cognitive skill and data access skill, the available of learning resource and equipment for seeking health data in school was related to access skill, communication skill and media literacy skill, the utilization for health services of the students in the last year was related to cognitive skill, decision skill about obesity significantly at 0.05 level.

**Keyword:** Health Literacy, Obesity, Junior High School Student, Central Part of the Northeastern, Thailand

### INTRODUCTION

Thai children were the hunters of the western life style culture. They have been lived with the environment and consumption values. It is the important factor to make them unsuitable living. According to the report, there were found that Thai children using time with the media, internet, television and chatting for 8-9 hours per day without self-control. Moreover, there were found that these group risked to obesity more than others because they had not physical activities. (Population and social institute, 2014) [1] In addition, they had the improper food consumption behaviors. The last survey of the nutrition department of public health were found that the 6-14 aged of children liked to intake a high calorie food and over sugar volume. The opposite, they did not select the healthy food such as, vegetable, fruit and fiber diet for their consumption and the important thing, they had not exercise. These are induced to fat accumulation in the body and leading to obesity. (Sirikulchayanon, 2013) [2]

Sinthuchai (2013) [3] reported data from the department of health about proportion of Thai children in 2015 for pre-school children showing a high proportion of 5 persons will be gotten obesity 1 person. While, the school children were found 1 person within 10. For 10 years ago, the incidence rate of children obesity was rapidly increased. It was indicated that Thailand had a rapid increasing obesity children in the world. There was report for 5 years ago that the pre-school children got to rich the obesity for 36 % and 15.5 % in 6-13 years old. The 2008 survey was found that high school student for 10 % were overweight. When they go to be adult in the future they will risk for non-communicable diseases such as, diabetic mellitus, hypertension, vessel and heart disease, stroke and cancer more than normal children. (Srikaew, 2013) [4] These health problems are related to the lack of health literacy.

Health literacy is the person could to access health information from variety knowledge resources, have cognitive skill for health content, could to evaluate the reliability of health content with themselves, thinking with reasonability, make decision and try to practice, assess to their daily life and could to communicate health information to the individual, family and community for a good health. (Health systems research institute, 2010) [5] There were the studies about health literacy related to obesity in students in the past found that the samples in Bangkok had communication skill and media literacy skill in the low level. (Thipwong and Numpon, 2014)

[6] These data were indicated that the junior high school students in Thailand must be had health literacy for enhancing their knowledge to solve health problems affect to obesity in the future.

Conclusion, the researcher want to study health literacy of junior high school students in the northeastern region in Thailand. The most of them have been lived in the country and the statistics survey were found that the children who lived in the country were obesity 10.6 %. It was nearly by the children in urban areas were 11.3%. (National statistical office, 2013) [7] The junior high school students are the first adolescence period who have changing their physical, mental, social and developing their wisdom and health behaviors. So that, the objectives of the study were studied health literacy level about students obesity and to find the environment factors that related to obesity. The benefits of the study will show the principle data for making decision, planning, media creation and more activities include health care services design that suitable for healthy students in the future.

## MATERIALS AND METHODS

This study was a cross-sectional research to study health literacy level related to obesity, and relationship between environment factors and health literacy related to obesity in junior high school students in the central North-Eastern region provinces group. The 427 samples were students who lived in Roi-et, Khon Kaen, Maha Sarakham and Kalasin from 4 communities. Data were collected by the questionnaires and the health literacy test forms that were tried out with students in others area and tested reliability with Cronbach's alpha coefficient was 0.84. The questionnaire divided into 3 parts; part 1 the individual data, part 2 the environment factors, and part 3 health literacy that was analyzed content validity with index of item objective congruence (IOC) method by 3 experts was 0.97. Data were collected between January to February 2016 and were analyzed by computer software package, presented with descriptive statistics, mean, standard deviation. The inferential statistics were Chi-square test.

## RESULTS

The 427 samples were divided to male 41.7%, female 58.3%. The most of them were 13 years old for 36.1%, the students about 36.6% studied in high school grade 8, 35.8% in grade 7 and 27.6% in grade 9 respectively. The 49.2% students were received income from their parents between 50-99 bahts per day. The meal preparations in family within one day were 58.5% for 3 meals, 27.4% for 2 meals and 14.1% for 1 meal respectively. The available for learning resource and equipment for seeking health data of school were middle level 60.0%, high level 24.6% and low level 6.5% respectively. In addition, the utilization for health care services of the student in the last year were 58.1% and 41.9% they did not using the any health care services. The level of health literacy for 6 perspectives were shown that 61.6% of the cognitive skill was middle, data access skill was middle, communication skill was low, decision skill was high, self-management skill was middle and media literacy skill was low. (Table 1)

**Table 1** Health literacy level related to obesity (n=427)

Health Literacy	Level	Frequenc y	Percentage	$\bar{X}$	S.D.
1. cognitive skill	Middle	264	61.8	12.37	1.57
2. data access skill	middle	208	48.7	11.50	1.43
3. communication skill	low	213	49.9	5.88	2.39
4. decision skill	high	229	53.6	16.46	1.30
5. self-management skill	middle	224	52.5	11.44	1.34
6. media literacy skill	low	206	48.2	5.90	2.31

When studying for the relation between the environment factors and health literacy, the results were revealed that meal preparations in family within one day was related to cognitive skill and data access skill significantly at 0.05 level. (Table 2)



Table 2 *Relation between family meal preparation within one day and health literacy level related to obesity (n=427)*

Health Literacy	Family meal preparation within one day			Total	$\chi^2$	p-value
	1 meal	2 meals	3 meals			
1. cognitive skill						
low	17	28	21	66	18.436	0.001*
middle	33	152	79	264		
high	10	70	17	97		
Total	60	250	117	427		
2. data access skill						
low	33	88	44	165	10.018	0.040*
middle	21	125	62	208		
high	6	37	11	54		
Total	60	250	117	427		
3. communication skill						
low	36	123	54	213	6.408	0.171
middle	20	105	58	183		
high	4	22	5	31		
Total	60	250	117	427		
4. decision skill						
low	4	16	10	30	6.646	0.156
middle	16	100	52	168		
high	40	134	55	229		
Total	60	250	117	427		
5. self-management skill						
low	29	91	48	168	3.979	0.409
middle	28	135	61	224		
high	3	24	8	35		
Total	60	250	117	427		
6. media literacy skill						
low	30	118	58	206	0.965	0.915
middle	22	93	45	160		
high	8	39	14	61		
Total	60	250	117	427		

\*p-value<0.05

The available of learning resource and equipment for health data seeking of school was related to data access skill and media literacy skill significantly at 0.05 level. (Table 3)

Table 3 *Relation between the available of learning resource and equipment for health data seeking of school and health literacy level related to obesity (n=427)*

Health Literacy	The available of learning resource and equipment for health data seeking of school			Total	$\chi^2$	p-value
	low	middle	high			
1. cognitive skill						
low	7	31	28	66	6.407	0.171
middle	27	163	74	264		
high	9	62	26	97		
Total	43	256	128	427		
2. data access skill						
low	21	110	34	165	12.102	0.017*
middle	18	117	73	208		
high	4	29	21	54		
Total	43	256	128	427		
3. communication skill						
low	15	148	50	213	6.408	0.171
middle	23	98	62	183		
high	5	10	16	31		
Total	43	256	128	427		
4. decision skill						
low	1	19	10	30	1.821	0.769
middle	18	102	48	168		
high	24	135	70	229		
Total	43	256	128	427		
5. self-management skill						
low	17	110	41	168	4.375	0.358
middle	23	126	73	224		
high	3	20	12	35		
Total	43	256	128	427		
6. media literacy skill						
low	19	137	50	206	16.715	0.002*
middle	21	91	48	30		
high	3	28	30	61		
Total	43	256	128	427		

\*p-value<0.05

The utilization for health service of the students in the last year was related to cognitive skill and decision skill significantly at 0.05 level. (Table 4)

Table 4 Relation between the utilization for health service of the students in the last year and health literacy level related to obesity (n=427)

Health Literacy	The utilization for health service of the students in the last year		Total	$\chi^2$	p-value
	no	yes			
1. cognitive skill					
low	34	32	66	10.007	0.007*
middle	95	169	264		
high	50	47	97		
Total	179	248	427		
2. data access skill					
low	74	91	165	1.615	0.446
middle	86	122	208		
high	19	35	54		
Total	179	248	427		
3. communication skill					
low	90	123	213	0.021	0.989
middle	76	107	18		
high	13	18	31		
Total	179	248	427		
4. decision skill					
low	18	12	30	7.666	0.022*
middle	77	91	168		
high	84	145	229		
Total	179	248	427		
5. self-management skill					
low	68	100	168	1.458	0.482
middle	99	125	224		
high	12	23	35		
Total	179	248	427		
6. media literacy skill					
low	79	127	206	3.884	0.143
middle	68	92	160		
high	32	29	61		
Total	179	248	427		

## CONCLUSIONS AND DISCUSSION

The levels of health literacy related to obesity were indicated that the most of them were low level and middle level. They were found the health literacy problem in the 5th ranking were; communication skill, media literacy skill, data access skill, self-management skill and cognitive skill. It may be due to the less process for making activities about health literacy development in the children in Thailand. But decision skill was high level it was consistent to Suramitmitree's study was shown that the health literacy of Thai people for making decision according to the ABCDE behavioral campaign suggested by the Ministry of Public Health. The ABCDE convey five principles of practice which are; A: Alcohol abandon, B: Baccy, free of smoking, C: Coping with emotion, D: Diet, cares of food consumption, and E: Exercise was also high. (Suramitmitree, 2013) [8]

The communication skill and media literacy skill were low level. They were could description by there are many advertisement media in the present such as website, internet, television that introduced the children to believe in and consume foods with the viral trends without the reliability evaluation and they may be did not a confidence about their information and knowledge to communicate among their friends. These issues were consistent to Thipwong and Numpul (2013) [6] that was found the low level also. Moreover, It was coherent with the low level for communication skill and media literacy skill in the elderly among the northeastern study.

(Srithanee, 2017) [9] Even though, we can develop these health literacy skill with communication innovation that was shown by Khunthikul et al (2015) [10] to changing overweight and obesity behaviors of the children by using cartoon animation for them the satisfaction of the samples were 90%. It can be used for the targets and helping them to be adults who have quality of life in the future.

For the relation study, there was found that the meal preparation within one day related to cognitive skill and data access skill. The students had 2 or 3 meals trend to have health literacy more than the students had 1 meal. It was explained that the interaction with their parents during had the family meals. The meal preparation in family was the one of health behavior that revealed by Daroon's (2016) [11] study. There was the relation between health literacy and any health behavior. So that, the parents should be preparation family meals with nutrition knowledge.

The available for learning resource and equipment for seeking health data of school was related to cognitive skill, communication skill and media literacy skill. The data was shown that there were moderate and high level for learning resources in the school. They were affected for health literacy of the students. The resource, library, computer, internet for seeking data were adequate to promote health literacy skill specially communication skill and media literacy skill including integrated learning activity with information technology for health information evaluation efficiency. (Maitaothong, 2011) [12] Even though, the management for learning resource in school the leader will be concern about the available for equipment and convenience tools for accessing health data also. (Ngamlard et al, 2016) [13]

The utilization for health service of the students in last year was related to cognitive skill and decision skill. They could ask any health information during received health care service in hospital. Moreover, they were contact many media from hospital and had interaction with health care providers to share and transfer knowledge between them. There was the report about the patients who went to using health care service trend to have health literacy more than the others who did not. Daroon (2016) [11] was found that the experience of the person for using health care services related to the positive of health literacy. It may be mentioned that they were received health information from doctors, nurses and the others of health care providers to enhance them for cognitive skill and introduce to the decision skill later. This topic was consistent to the study of Lee et al. (2010) [14] that was studied in Taiwan founding that health literacy related to the number of admission in hospital statistics significantly at 0.01 level. So that, It can be said that the person who used to using health care services had health literacy different from the others who did not go to hospital for using health care service.

In conclusion, the study was obviously indicated that children lacked of some health literacy perspectives especially during they were stayed and taking time in school. So that, the environment factors that associated to health literacy must be concerned by school leaders to manage and fulfill their health literacy skill with focusing on communication and media literacy skill.

## ACKNOWLEDGEMENTS

The author is very grateful to the director of research and development institute, Rajabhat Maha Sarakham University. Special thanks also go to the community public health staff of Science and Technology Faculty, who helped me in questionnaire development. I acknowledge the University of Rajabhat Maha Sarakham scholarships. Most importantly, the author would like to thank all community public health students who participated voluntarily in this study.

## REFERENCES

- [1] Population and social institute. (2014). Thai health 2014. Local community self-management...to Thailand principle revolution. Nakhonpathom: Ammarin printing publishing.
- [2] Sirikulchayanon, S. (2013). Survey report was found that children 66% hyperlipidemia 20% obesity. Dailynew newspaper 7 Thursday 2013 page 15.
- [3] Sinthuchai, C. (2013). Opp! 10 years ago, Thai children obesity increasing to the 1 ranking in the world. <http://www.thairath.co.th>.
- [4] Srikaew, C. (2013). Concern the adolescence depended on drug addiction and reducing obesity drug, drinking-smoking aged 16. [www.thairath.co.th](http://www.thairath.co.th).

- [5] Health systems research institute. (2010). Health literacy survey in the sample for psychometric analysis for checking the correct. [www.http://hsri.or.th](http://hsri.or.th).
- [6] Thipwong, A. and Numpon, J. (2014). Relationship between health literacy related to obesity and food consumption behavior and exercise in overweight children in Bangkok. Research report; Suansunanta Rajabhat University.
- [7] Nation statistical office. (2013). [www.http://nsive.promo.go.th](http://nsive.promo.go.th).
- [8] Suramitmitree, B. (2013). Health literacy study and situation for health promotion of Thai people for AEC. Research report; foreign affairs executive programme , Devawongse varopakarn institute of foreign affairs, ministry of foreign affairs.
- [9] Srithanee, K. (2017). Relationship between health literacy and quality of the elderly's life at the central part of the north-east Thailand. Journal of health systems research. 11(1):26-36.
- [10] Khunthikul et al. (2015). Communication innovation for changing behavior to protect and control overweight and obesity for children and adolescence in Lumpoon province. Journal of health science. 24(6): 1107-17.
- [11] Daroon, P. and Khunpijan, N. (2016). Factors affective to health literacy and health behavior outcome in Buengkan province. Journal of SKR 9. 22(1): 14-24.
- [12] Maittaothong, T. (2011). Concept for health literacy teaching. Journal of information science. 29(2): 65-72.
- [13] Ngamleard, S. et al. (2016). The role in learning resources management of school leader in Sakaeo primary education service area office 1. Journal of education STOU. 9(1): 114-27.
- [14] Lee, S. Y. et al. (2010). Health literacy, health status, and health care utilization of Taiwanese adults: result from a national survey. BMC public health. 10 : 614.

## **Posters Presentation Committees**

- Assoc. Prof. Dr. Sittisak Khampa
- Assoc. Prof. Dr. Saowalak Kosonkittiaumphon
- Assoc. Prof. Dr. Narongrit Sopa
- Asst. Prof. Dr. Manit Aunyapo
- Asst. Prof. Dr. Poonsak Sirisom
- Asst. Prof. Dr. Nonthaphong Phonphuak
- Asst. Prof. Dr. Chanukorn Tabtimsai
- Asst Prof Dr. Surapon Promkul
- Dr. Sukan Saengchod
- Dr. Anusorn Chanprathak
- AJ Ubonwan Kidkana

## Oral Presentation Committees

- Asst. Prof. Dr. Choosak Nithikathkul
- Asst. Prof. Dr. Sarayuth Kunlong
- Asst. Prof. Dr. Buawaroon Srichaikul
- Asst. Prof. Dr. Sasithorn Chaowarut
- Asst. Prof. Dr. Sooksil Prasongsook
- Asst. Prof. Dr. Piyaluk Potiwan
- Asst. Prof. Dr. Jiraporn Chano
- Asst. Prof. Dr. Poosit Boontongtherng
- Asst. Prof. Dr. Yannapat Srihamongkol
- Asst. Prof. Dr. Samrit Kangpheng
- Asst. Prof. Dr. Wimonmas Pathomvanichkul
- Asst. Prof. Dr. Rattana Panyapa
- Asst. Prof. Dr. Jitti Kittilertpaisan
- Asst. Prof. Dr. Pramuk Srichaiwong
- Asst. Prof. Dr. Panya Klaydesh
- Asst. Prof. Teerapat Loywirat
- Dr. Zahid Mushtaq Wani
- Dr. Ei Ei Phyo Myint
- Dr. Panadda Tansupo
- Dr. Gordon Richard Bakker
- Dr. Nguyen Thi Hang Phuong
- Dr. Grichawat Lowatcharin
- Dr. Craig J. Wheway
- Dr. Duangporn Sriboonruang
- Dr. Puttarat Thasa
- Dr. Sukan Sangchote
- Dr. Chaemchan Reelachat
- AJ Hathaikarn Labkham
- AJ Jade Jatuphon
- AJ Yupharat Phumikari
- AJ Bruce A. Robertson
- AJ Chawin Srisawat
- AJ Brenda Diana Morizaki
- AJ Nathaya Chomchiawchan
- AJ Thanaporn Pomin
- AJ Nathaya Jaiboon
- AJ Justin Yoshida
- AJ Suwitchan Un-Udom
- AJ Teera Tunboontor



## Proceeding Assembling Staffs

Assoc. Prof. Dr. Sitthichai Budsamun	Acting President
Assoc. Prof. Dr. Sanya Kenaphoom	Director (Research and Development Institute)
Assoc. Prof. Dr. Prapatsorn Preeiam	Vice Director
Asst. Prof. Dr. Suthinee Atthakorn	Vice Director
Mr. Pak Satanasawapak	Vice Director
Mr. Krisda Sanbuakham	Vice Director
Dr. Mali Nachaisin	Assistant Director
Dr. Kanlayani Charoensoparat	Assistant Director
Asst. Prof. Thanwapon Wimonchalerk	Assistant Director
Ms. Thanatporn Kattayanon	Assistant Director
Mr. Chawisorn Phukapak	Assistant Director
Mr. Thanyachanok Pawara	Assistant Director
Ms. Manassawin Chittanont	Assistant Director
Ms. Supasorn Silaruk	Assistant Director
Mrs. Piyanart Panprasit	Staff
Mr. Puthai Rattaban	Staff
Ms. Pornanong Rawadchoo	Staff
Mr. Weerawat Samanen	Staff
Ms. Sulawan Koodwisai	Staff

