

## Development of Model of Water Conservation through PAIC Process

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**Abstract:** The objective of this research was to develop a model of water conservation for secondary school student. The integrative method research was done with participatory action research with Participatory Appreciate-Influence-Control technique (PAIC). Populations were upper secondary school students of academic year 2012 of Kalasin Province. The questionnaire and evaluation forms were be used as tool for data collection and the sample was selected by purposive sampling technique. PAIC was implemented with the integration of SWOT analysis and brain storming during the training process. The 53 upper secondary school students were selected by purposive sampling technique from Kalasin Pittayasan School, Amphur Muang, Kalasin Province for training with PAIC. One -Way-ANOVA and t-test were used for data analysis. The research results illustrated that before and after PAIC process implemented, the mean scores of posttest of training achievement. The research results revealed that before and after PAIC training process implemented, the mean scores of posttest of training achievement on characteristics of Environmental Education Trainer (EET), inspiration of public consciousness, environmental conservation behavior, water conservation, and training achievement were higher than pretest with statistical significance ( $p < .01$ ,  $p < .01$ ,  $p < .01$ ,  $p < .01$ , and  $p < .01$ ). Three Dimensional Evaluations were employed for determination the perceptions of 53 upper secondary school students in three aspects evaluation covering Self-evaluation, Friend-evaluation, and Facilitator-evaluation by using One-way ANOVA in order to investigate the participation of upper secondary school students showed that there were no difference of mean scores about participation in training process through brain storming with statistical significance ( $p > .05$ ).

**Key Words:** Model of Water Conservation / PAIC Process

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### 1. Introduction

The Intergovernmental Panel on Climate Change (IPCC) is a scientific intergovernmental body (IPCC, 2010, & The Royal Society, 2005) charged to review and to assess the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. It affords the globe with a apparent scientific observation on the in progress state of climate change and its potential environmental and socio-economic results, markedly the risk of climate change sourced by human activity. The panel was first established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), two organizations of the United Nations. The IPCC shared the 2007 Nobel Peace Prize with former Vice President of the United States Al Gore (Wikipedia. 2011).

IPCC observed on impacts of climate change and revealed the new obvious evidences that during five decades. The human activities were most important effect of global temperature rising over all area of the world at average of 1.4-5.8 Celsius degrees. The change of climate has been vigorous and more frequently. The obvious examples of climate change are violent drought, storming, flooding, hurricane, tornado, and earth quake. It has caused tremendously loss of

million species of living things due to lost habitats and ecological imbalance including occurring acidity of sea water and changing of ocean currents, therefore, the small glacial age has occurred in European continent and fluctuation of climate in different areas (Sutayasue, 2010).

The risen of global temperature has affected to the ecological system obviously. Such as the rain is not raining according to periodic time and the amount of rain changes, the major change has been caused by deforestation, particularly in the tropical rain forest areas in Asia and Africa continents. Besides the global warming has loosen biodiversity of ecological system, the sea level and temperature in the sea has risen but it also impacted to ecological system of sea shore. Current sea level rise potentially impacts human populations such as those living in coastal regions and on islands and the wider natural environment such as marine ecosystems (Bindoff et al, 2007, & Fischlin, 2011).

Global average sea level rose at an average rate of around 1.8 mm per year over 1961 to 2003 and at an average rate of about 3.1 mm per year from 1993 to 2003. It is unclear whether or not the increased rate observed between 1993 and 2003 reflects an increase in the underlying long-term trend (Dahlman, 2009). However, Sea level rise is one of numerous lines of proof that strongly support the view that the climate has recently warmed (Solomon et al, 2007 & Hegerl et al, 2007). This also has caused the coral bleaching, therefore it has taken long time for recovering, and then it impacted to fishery and tourism industry. For health aspect, the climate change of temperature and humidity have caused the rapid growth of mosquito and increased the vector of malaria and dengue fever infection. Additionally, the water born disease likes as diarrheas disease has increased as well. The poor people have threatened by the climate change because they lack knowledge and good health service perceived.

Moreover, the reports of natural disasters covering volcano eruptions, earthquakes, Tsunamis, various kinds of storms including tornadoes, thunderstorms, floods, droughts, fires, landslides and mudslides, blizzard and avalanches, and human epidemics and animal diseases have occurred more frequently. The opinions of scientists over the world are congruent that the green house gases are the essential factors of these phenomena of global warming and it is cause of these natural disasters (Kotchaseene, 2010, & Bicknell, et al., Eds. 2009).

The primary green house gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Green house gases to a great extent influence the temperature of the Earth. Earth's surface would be on average about 33 °C (59 °F) colder than at present. Since the beginning of the Industrial Revolution, the burning of fossil fuels has contributed to the increase in carbon dioxide in the atmosphere from 280 ppm to 390 ppm, in spite of the uptake of a great portion of the emissions through various natural "sinks" involved in the carbon cycle. Carbon dioxide emissions come from combustion of carbonaceous fuels such as coal, oil, and natural gas. Carbon dioxide is a product of combustion of carbon, and burning coal also produces carbon monoxide (Lindeburgh, 2006).

Influencing of global warming to Thailand, even though, the climate change is not extremely affected to the agricultural sectors at over all view because most of the agricultural areas are supported by irrigation system but Thailand frequently affected by the floods almost every year, particularly, this year Thai people are facing with violent flood over the country. The Northeastern region is the driest region of the country; therefore it has a chance of water shortage in summer season for food and vegetable cultivation. The shortage of water influenced to economic and social aspects as well. Furthermore, it also impacted to water resources, especially; the river, canal, swamp, and pond would be dried in the summer season. This will affected to the breeding and growth of water plants and animals such as fish, crab, and shrimp. Therefore, the number and diversity of living things will decrease and results in decrement of biodiversity and florist in Great Mekong Region in the Northeastern region of Thailand (Thiengkamol, 2005b).

However, if climate change is still going on, Thailand might face with flood in some part of country and drought in some area such as Northeastern region. Therefore, the natural disasters will be repeated occurring every year. It was revealed that there are various areas will face to floods, landslides and mudslides covering 12 provinces included Chiang Rai, Chiang Mai, Nakhon Sawan, Pa Yao, Pichit, Pitsanulok, Lumpoon, Sukhothai, Chanthaburi, Nakhon Nayok, Prajeenburi, and Trang. Moreover, the villages nearby Cha Phraya River, the main river of country, are also affected. For drought, it is accumulated the vigorous water increment, it was found that 34 percents of villages over the country have faced with risk of water shortage, and drought, particularly, Northeastern region is in the high risk of drought (Office of Natural Resources and Environmental Policy and Planning, 2009). The estimation of water demand of whole country is 57,302.8 million cubic meters per year. For only agricultural sector has water demand of 51,786.2 million cubic meters or 90 percents per year. It forecasted that the total water shortage over the country will be approximately 4,737 million cubic meters per year (Office of Natural Resources and Environmental Policy and Planning, 2009).

From the above, it can be concluded that every region of Thailand will face with water problems in both quantity and quality. Presently, the demand of water consumption has increased in all sectors whether agriculture, industry, and household consumption but the quantity and quality of water is decreased because of water resources were contaminated with toxic substances that drained from community, factory and agriculture.

The great problems of degradation of water resources and water shortage as mentioned above, different findings showed that the people are lacking knowledge and understanding, awareness, positive attitude, public consciousness and responsibility for natural resources and environment conservation such as look after water resources, and lack of measurement to control people who lacked of consciousness to maintain and use fresh water effectively (Thiengkamol, 2011e, & Vichaidit, 1994).

Therefore, to develop people, especially, new generations to use water with minimization and realize the value of water resources, it needs to cultivate them with environmental education process through different channels of educational system whether with Formal Education System, Non-Formal Education System, Informal Education System, and Lifelong Education System (Thiengkamol, 2011e). Particularly, the youths who are students by providing teaching and learning process with various activities to raise their knowledge and understanding, awareness, positive attitude, public consciousness and responsibility for natural resources and environment conservation including water resources, it will lead to success mean of active learning process through brain storming of group dynamic activities. In addition, they will learn about the real situation of community and river resources to receive direct experience from direct contact by themselves. This will stimulate them to be good observers, be able to gathering data, discuss among their friends and their teachers including evaluating, decision making for problem solving. Therefore, it will assist them to aware the importance of water resource and it will a good process for attitude and behavior changing to conserve natural resources and environment conservation (Thiengkamol, 2011e, UNESCO, 1978 & Sariwat, 2010).

As mentioned above, the problems of lacking knowledge and understanding, awareness, positive attitude, public consciousness and responsibility for water resource conservation is critical factor of water shortage. Moreover, over consumption without economization is also another essential factor to cause water shortage in sectors of water for consumption, agriculture, industry and tourism industry. This research emphasized on development of a model of water conservation and river conservation for upper secondary school student under the Office of Kalasin Educational Area Zone 24 to encourage them with behavior change in their daily life activities.

## 2. Objective

The objective of this study was to develop a model of water conservation for upper secondary school student under the Office of Kalasin Educational Area Zone 24.

## 3. Methodology

The research design was implemented in steps by step as follows:

1) Construction of handbook for water conservation through environmental education process covered knowledge and performance of environmental education, global warming, environmental education characteristics, inspiration of environmental conservation and environmental behavior (Charoensilpa, Thiengkamol, Thiengkamol, and Kurokote, 2012, UNESCO, 1978, InWent-DSE-ZEL, 2002, Thiengkamol, 2004, Thiengkamol, 2009a, Thiengkamol, 2009b, Thiengkamol, 2011a, Thiengkamol, 2011e).

The research tools composed of test, questionnaire and evaluation form. The test was used for determining their knowledge of water conservation through environmental education process covered knowledge and performance of environmental education, global warming, environmental education characteristics, inspiration of environmental conservation and environmental behavior.

3) The evaluation form of Three Dimensions, Four Dimensions were constructed to assess the participant practice during PAIC implemented.

4) 53 upper secondary school students were selected with purposive sampling from secondary school students under the Office of Kalasin Educational Area Zone 24. They would be recruited according to the setting criteria (willingness, time, devotion, commitment, and public mind).

5) The 53 participants were employed for determining on characteristics of Environmental Education Trainer (EET), inspiration of public consciousness, environmental conservation behavior, water conservation, and training achievement. The systematic operation of 53 participants were trained with PAIC. The focus group discussion included brain storming and Training of Trainer (TOT) (Langly, 1998, Weiss, 1993, Sproull, 1988, InWent-DSE-ZEL., 2002, Thiengkamol, 2004, Thiengkamol, 2005b). The Three Dimensional Evaluation (TDE) was used to determination the congruence of three aspects evaluation, Self-evaluation, Friend-evaluation, and Facilitator-evaluation for training participation (Thiengkamol, 2004, Thiengkamol, 2005a, Thiengkamol, 2008, Thiengkamol, 2011a, Thiengkamol, 2011b, Thiengkamol, 2011c and Thiengkamol, 2011e).

## 4. Results

### 4.1 General Characteristics of Sample Group

The sample group of this study was 53 upper secondary school students that were selected by purposive sampling technique from secondary school students under the Office of Kalasin Educational Area Zone 24 in the academic year of 2012. The selected sample was student who selected to study the subject of Environmental conservation activities with interested in participation of river and water conservation. Most of them were female with 67.92%, studied at level four with 89.79% as shown in table 1.

**Table 1** Demographic Characteristics of Sample Group

Characteristics		Upper Secondary School Students	
		Frequency	Percent
Sex	Male	17	32.08
	Female	36	67.92
Education Level	Level 4	46	89.79
	Level 5	7	13.21
<b>Total</b>		53	100

### 4.2. Results of Pretest and Posttest with PAIC technique

PAIC technique was trained for 53 upper secondary school students about knowledge of water conservation. The research results revealed that before and after PAIC training process implemented, the mean scores of posttest of training achievement on characteristics of Environmental Education Trainer (EET), inspiration of public consciousness, environmental conservation behavior, water conservation, and training achievement were higher than pretest with statistical significance ( $p < .01$ ,  $p < .01$ ,  $p < .01$ ,  $p < .01$ , and  $p < .01$ ), as illustrated in table 2.

**Table 2** Pretest and Posttest of Sample Group

Training Issues	Posttest		Pretest		t	p
	$\bar{X}$	S.D.	$\bar{X}$	S.D.		
Characteristics of EET	14.56	0.73	10.52	0.65	9.02	.00**
Inspiration of Public Consciousness	18.52	1.21	12.34	1.01	11.85	.00**
Environmental Conservation Behavior	16.48	1.35	14.16	1.57	12.30	.00**
Water Conservation Behavior	16.08	1.82	13.08	2.03	14.18	.00**
Training Achievement	64.42	3.01	48.56	4.02	15.32	.00**

\*\* Significant Level at .01

### 4.3 Results of Three Dimensional Evaluations for Participation

Three Dimensional Evaluations were employed for determination the perceptions of 53 secondary school students in three aspects evaluation, Self-evaluation, Friend-evaluation, and Facilitator-evaluation by using One-way ANOVA in order to investigate the mean scores difference of three group. The results of One-way ANOVA showed that there were different of mean scores about participation in training process through brain storming with statistical significance ( $p > .05$ ) as illustrated in table 3. This meant that the perceptions of secondary school students about themselves, their friends in the group and their facilitators were no different for their participation in the focus group discussion during training process.

**Table 3** Three Dimension Evaluation of Sample Group Participation

Source of Variation	Sum of squares	df	Mean Square	F	Sig.
Between Group	1.530	2	.765	2.302	.104
Within Group	51.792	156	.332		
Total	53.322	158			

\*\* Significant Level at .01

The Scheffe was used for analysis of each pair of Three Dimensional Evaluation (TDE) to determine the mean score differences of their participation in the training process of PAIC, it showed that each pair of Self-Evaluation and Friend-Evaluation, Self-Evaluation and Facilitator-Evaluation, and Friend-Evaluation and Facilitator-Evaluation were no statistical difference ( $p > .05$ ,  $p > .05$  and  $p > .05$ ) as illustrated in table 4.

**Table 4** Scheffe' Analysis of Each Pair Comparisons

Each Pair of Variables	Mean Diff(I-J)	Std. Error	Sig.	95% Confidence Interval	
				Lower Bound	Upper Bound
Self-Eva. and Friend-Eva.	-1.33811	.60838	.079	-3.1017	-.1945
Self-Eva. and Facilitator-Eva.	-1.21245	.60838	.072	-3.1860	-.2889
Friend-Eva. and Facilitator-Eva.	-.09434	.60838	.988	-1.5979	1.4092

\* Significant Level at .05

Considering on mean scores of Three Dimensional Evaluation, the total mean scores of 5 aspects of evaluation items covering Participation in Asking Questions, Participation in Answering Questions, Participation in Discussing, Participation in Activity Doing, and Participation in Activity Evaluating during focus group discussion with brain storming process, the findings discovered that 5 aspects of participations and total mean score of Self Evaluation was lower than Friend Evaluation and Facilitator Evaluation as presented in table 5. Therefore One-Way ANOVA was employed to analyze the differences of mean scores of three aspects, it was found that there were no difference with statistically significant at level of .05 as presented in table 4.

**Table 5** Mean Scores of Three Dimensional Evaluations

Evaluation Items	Self Evaluation			Friend Evaluation			Facilitator Evaluation		
	$\bar{X}$	S.D.	Level	$\bar{X}$	S.D.	Level	$\bar{X}$	S.D.	Level
1. Participation in Asking Questions	3.74	.78	high	3.90	.86	high	4.04	.78	high
2. Participation in Answering Questions	3.78	.74	high	3.98	.82	high	3.98	.99	high
3. Participation in Discussing	3.98	.80	high	4.42	.69	high	4.44	.58	high
4. Participation in Activity Doing	4.16	.74	high	4.26	.72	high	4.52	.54	high
5. Participation in Activity Evaluating	4.14	.81	high	4.28	.73	high	4.02	.82	high
<b>Total</b>	<b>3.96</b>	<b>.61</b>	high	<b>4.13</b>	<b>.66</b>	high	<b>4.20</b>	<b>.43</b>	high

During, the PAIC training implemented, focus groups discussion and brain storming were integrated, therefore, it is obviously seen that after training they had intended to run 4 pilot projects from 6 projects. They search the way to maintain the four pilot projects with different ideas being suggested during this brain storming process in order to meet their intentions of water conservation to prevent fresh water shortage and in order to alleviate global warming, especially in accordance with the action plan of "Water Conservation" across the Northeastern region. The four pilot projects including the first project was "Save Tape Water", the second project was "Monitoring the Water Leakage for My House", the third project was "Surveying Tape Water Appliance Effectiveness" and the fourth was "Practice Daily Life for Water Conservation". After four of projects were implemented, the students realized that all activities would be implied to explained, they accomplished the Concept environmental education and global warming alleviation. The PAMEI used for

participatory assessment, participatory monitoring, participatory evaluation and participatory impact were approval for projects implementation.

## 5. Discussions

The results indicated that the secondary school students had knowledge of water conservation through environmental education process covered knowledge and performance of environmental education, global warming, environmental education characteristics, inspiration of environmental conservation and environmental behavior after participating in the PAIC training. These were congruent to a variety of studies of Thiengkamol, (2004, 2005a, 2005b, 2010b, 2011b, 2011c, 2011g, 2011h, 2011i: in press & 2012). It might be explained that the training with PAIC technique is able to raise knowledge in various issues and for different target groups and it can be used for stimulation the knowledge and performance of environmental education, global warming, environmental education characteristics, inspiration of environmental conservation and environmental behavior after participating in the PAIC training through genuine practicing behavior in their daily life activities for global warming alleviation. The findings are also pertinent to the results of different studies of Thiengkamol, and Thiengkamol colleagues (2004, 2005a, 2005b, 2010b, 2011b, 2011c, 2011a, 2011g, 2011h, 2011i, 2011j, 2012a, & 2012b) and researches of Sukwat, Thiengkamol, Navanugraha, and Thiengkamol, 2012, & Wattanasaroch, & Thiengkamol, 2012, & Jumrearnsan, & Thiengkamol, 2012 that the participation is affected to water conservation and river conservation for global warming alleviation to meet sustainable development through environmental education process covered knowledge and performance of environmental education, global warming, environmental education characteristics, inspiration of environmental conservation and environmental behavior.

The results of TDE of 53 participants were employed for determination of the congruence of three aspects evaluation, Self-evaluation, Friend-evaluation, and Facilitator-evaluation. The mean scores three aspects were no difference among three aspects ( $p > .05$ ,  $p > .05$ , and  $p > .05$ ). The mean scores of Self-Evaluation was lower than mean scores of Friend-Evaluation and Facilitator-Evaluation, so it indicated that the participants evaluated themselves lower than friend and facilitator because they are humble persons that are general style of Thai children. Additionally, TDE was used to evaluate the participation of secondary school students; it was found that the mean scores of Self Evaluation, Friend Evaluation and Facilitator Evaluation were at high level as illustrated in table 5. It might be concluded that secondary school students during training process as illustrated in table 5 paid attention for training process participation at very good level. The result of training was pertinent to different studies of Thiengkamol, (2004, 2005a, 2005b, 2010b, 2011b, 2011c, & 2011a) and researches of and Thiengkamol colleagues such as Sukwat, Thiengkamol, Navanugraha, and Thiengkamol, 2012, & Wattanasaroch, & Thiengkamol, 2012. Furthermore, it was found that PAIC training is effective for training with integration of brain storming process to develop a shared vision, action plan and projects in different issues of training such as energy conservation, urban community food security management, environment and natural resource conservation, development of health cities network for Mekong Region, development of women's political participation in Pattaya City, community strengthening, environmental management in dormitory, and soil and water conservation (Thiengkamol, 2004, Thiengkamol, 2005a, Thiengkamol, 2005b, Thiengkamol, 2010b, Thiengkamol, 2011b, Thiengkamol, 2011a, Thiengkamol, 2011g, Thiengkamol, 2011h, Thiengkamol, 2012b, Wattanasaroch, & Thiengkamol, 2012, & Sukwat, Thiengkamol, Navanugraha, and Thiengkamol, 2012).

Additionally, the results of training achievement was congruent to numerous studies of Thiengkamol, (2005a, 2005b, 2010b, 2011b, 2011c, 2011g, 2011h, 2012a, & 2012b), and Thiengkamol colleagues Wattanasaroch, & Thiengkamol, 2012, Sukwat, Thiengkamol, Navanugraha, and Thiengkamol, 2012, Jumrearnsan, & Thiengkamol, 2012, Saenpakdee, & Thiengkamol, 2012, Sukserm, Thiengkamol, and Thiengkamol, (2012)., and study of Jansab, 2006.

## References

- Bicknell, J., D. Dodman, et al., Eds. (2009). *Adapting Cities to Climate Change: understanding and addressing the development challenges*. London: Earthscan.
- Bindoff et al. (2007). *Chapter 5, Introductory Remarks*. Retrieved from [http://en.wikipedia.org/wiki/Current\\_sea\\_level\\_rise#CITEREFIPCC\\_AR4\\_WG12007](http://en.wikipedia.org/wiki/Current_sea_level_rise#CITEREFIPCC_AR4_WG12007)
- Charoensilpa, D., Thiengkamol, N., Thiengkamol, C., and Kurokote, J. (2012). Development of Environmental Education Characteristics. *Journal of the Social Sciences*. 7 (2):71-76.
- Dahlman, L. (2011). "NOAA Climate Portal: ClimateWatch Magazine: Climate Change: Global Sea Level". NOAA Climate Services. Retrieved from <http://www.climatewatch.noaa.gov/article/2009/climate-change-sea-level>.
- Fischlin, A. (2011). "Section 4.4.9: Oceans and shallow seas – Impacts". Chapter 4: Ecosystems, their Properties, Goods and Services. p. 234. Retrieved from [http://www.ipcc.ch/publications\\_and\\_data/ar4/wg2/en/ch4s4-4-9.html](http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch4s4-4-9.html)

- Hegerl et al. (2007). Executive summary, Section 1.3: Consistency of changes in physical and biological systems with warming, in IPCC AR4 SYR 2007. IPCC. (2011). Organization. Retrieved from <http://www.ipcc.ch/organization/organization.shtml>
- InWent-DSE-ZEL. (2002). *Regional Training Course "Advanced Training of Trainer"*. Grand Jomtien Palace. Pattaya City. Thailand.
- Jansab, S. (2006). Strategies for the Development of Women's Political Participation in Pattaya City. Thesis of Master of Art Master of Art (Women Studies), Office of Women and Youth Studies of Thammasart University.
- Pimdee, P., Thiengkamol N., Thiengkamol T., (2012) Psychological Trait and Situation Affecting through Inspiration of Public Mind to Energy Conservation Behavior of Undergraduate Student, *Mediterranean Journal of Social Sciences* Vol 3 (3)
- Jumreamsan, W. and Thiengkamol, N. (2012). Development of an Environmental Education Model for Global Warming Alleviation. *Journal of the Social Sciences*, 7 (1):67-70.
- Kotchaseenee, J. (2010). *Human and Environment*. Sixth Edition. Bangkok: Chulalongkorn University Press.
- Langly, A. (1998). "The Roles of Formal Strategic Planning" *Long Range Planning*. Vol. 21, No.1.
- Lindeburgh, M. R. (2006). *Mechanical Engineering Reference Manual for the PE Exam*. Professional Publications, Inc., Belmont: CA.
- Office of Natural Resources and Environmental Policy and Planning. (2009). *Report the Situation of Environmental Quality*. Bangkok: Bejapol.
- Saenpakdee, A. & Thiengkamol, N. (2012). Formulation of Community Forest Act for Thailand. *The Social Sciences*, 7: 71-76.
- Sariwat, L. (2010). *Psychological Work in Community*. Bangkok: Se-education Limited.
- Sproull, N.L. (1995). *Handbook of Research Method: A Guide for Practitioners and Scientific teachers in the Social Science*. (2nd ed.). Metuchen, NJ: Scarecrow Press.
- Solomon et al. (2007). *Technical Summary, Section 3.4 Consistency among Observations*, in IPCC AR4 WG1 2007.
- Sukwat, S. Thiengkamol, N., Navanugraha, C. and Thiengkamol, C. (2012). Development of Prototype of Young Buddhist Environmental Education. *Journal of the Social Sciences*, 7 (1):56-60.
- Sukserm, T., Thiengkamol, N. & Thiengkamol, T. (2012). Development of the Ecotourism Management Model for Forest Park. *Journal of the Social Sciences*, 7 (1) : 95-99.
- Sutayasue, U. (2010). Global Warming. Retrieved from [http://www.thaigoodview.com/library/teachershow/usa\\_s/global\\_Warming/aboutme.htm](http://www.thaigoodview.com/library/teachershow/usa_s/global_Warming/aboutme.htm)
- Thiengkamol, N. (2004). *Development of A Learning Network Model for Energy Conservation*. Doctoral Dissertation of Education (Environmental Education) Faculty of Graduate Studies, Mahidol University, Thailand.
- Thiengkamol, N. (2005a). Strengthening Community Capability through The Learning Network Model for Energy Conservation. *Journal of Population and Social Studies*, 14 (1), 27-46.
- Thiengkamol, N. (2005b). Development of Health Cities Network for Mekong Region. In *Proceedings of the International Conference "Transborder Issues in the Grate Mekong Sub-Region" Ubon Ratchathani, Thailand, 30 June-2 July 2005* (pp.111-119). Ubon Ratchathani: Nevada Grand Hotel.
- Thiengkamol, N. (2009a). *The Great Philosopher: the Scientist only know but Intuitioner is Lord Buddha*. Bangkok: Prachya Publication.
- Thiengkamol, N. (2009b). *The Happiness and the Genius can be Created before Born*. Bangkok: Prachya Publication.
- Thiengkamol, N. (2010b). Urban Community Development with Food Security Management: A Case of Bang Sue District in Bangkok. *Journal of the Association of Researcher*, 15 (2), 109-117.
- Thiengkamol, N. (2011a). *Holistically Integrative Research* (2nd ed.). Bangkok: Chulalongkorn University Press.
- Thiengkamol, N. (2011b). Development of Energy Security Management Model for Rural Community through Environmental Education Process. In *Proceedings of the 1st EnvironmentAsia International Conference on "Environmental Supporting in Food and Energy Security: Crisis and Opportunity" Bangkok, Thailand, 22-25 March 2011* (pp.11). Bangkok: Rama Garden Hotel.
- Thiengkamol, N. (2011c). Development of Food Security Management Model for Undergraduate Student Mahasarakham University through Environmental Education Process. In *Proceedings of the 1st EnvironmentAsia International Conference on "Environmental Supporting in Food and Energy Security: Crisis and Opportunity" Bangkok, Thailand, 22-25 March 2011* (pp.12). Bangkok: Rama Garden Hotel.
- Thiengkamol, N. (2011e). *Environment and Development Book*. (4th ed.). Bangkok: Chulalongkorn University Press.
- Thiengkamol, N. (2011f). *Nurture Children to be Doctors*. Bangkok: INTELLUALS.
- Thiengkamol, N. (2011g). Development of Energy Security Management for Rural Community. *Canadian Social Science*, 7 (5), October 31, 2011.
- Thiengkamol, N. (2011h). Development of a Food Security Management Model for Agricultural Community. *Canadian Social Science*, 7 (5), October 31, 2011.
- Thiengkamol, N. (2012a). Development of a Prototype of Environmental Education Volunteer. *The Social Sciences*, 7: 77-82.
- Thiengkamol, N. (2012b). Development of Food Security Management for Undergraduate Student Mahasarakham University. *European Journal of Social Sciences*, 27 (2):246-252.
- The Royal Society. (2005). "A guide to facts and fictions about climate change". Retrieved from [http://royalsociety.org/uploadedFiles/Royal\\_Society\\_Content/News\\_and\\_Issues/Science\\_Issues/Climate\\_change/climate\\_facts\\_and\\_fictions.pdf](http://royalsociety.org/uploadedFiles/Royal_Society_Content/News_and_Issues/Science_Issues/Climate_change/climate_facts_and_fictions.pdf)
- UNESCO. (1978). Intergovernmental Conference on Environmental Education Organized by UNESCO in Cooperation with UNEP Tbilisi (USSR) 14-16 October 1977. Final Reports. Paris: UNESCO.
- Vichaidit, T. (1994). Utilization of Water for Consumption. Seminar on Law Formulation on Utilization and Water Resource Conservation in Celebration of Queen Sirikit of 60 years old. Bangkok: Office of the National Research Council of Thailand, Ministry of Science, technology and Environment.

- Wattanasaroch, K. and Thiengkamol, N. (2012). Training ISO 14001 to Develop Green Dormitory Standards. *Journal of The Social Sciences*, 7 (2): 98-110.
- Weiss, J. W. (1995). *Organizational Behavior and Change: Managing Diversity, Cross Cultural Dynamics and Ethics*. Anaheim, CA: West Publishers.
- Wikipedia. (2011). Intergovernmental Panel on Climate Change. Retrieved from [http://en.wikipedia.org/wiki/Intergovernmental\\_Panel\\_on\\_Climate\\_Change](http://en.wikipedia.org/wiki/Intergovernmental_Panel_on_Climate_Change)