Promotion of Solid Waste Management in School by Application of Environmental Education Processes

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Attaining environmental literacy is an ultimate goal of environmental education. Among several other possibilities that portend the achievement of the goal, developing an environmental curriculum to promote solid waste management in schools plays a crucial role in enhancing environmental literacy. The objectives of this study were to: a) Develop an effective solid-waste-management curriculum for schools, b) Manage learning activities through environmental processes and, c) Study the effects of the environmental literacy curriculum on students' knowledge of, awareness of, and participation in solid waste management practices. Forty-five fourth and fifth graders in Bankoh Municipality School, Muang District, MahaSarakham Province, were recruited as samples for this research, by means of the purposive sampling technique. The obtained data were analyzed by using the statistic package for finding frequency, percentage, mean, and standard deviation. F-test and T-test (independent simple) were also implemented. The results of the study showed that the curriculum development processes consisted of four steps, including; 1) investigating environmental problems in the school, 2) analyzing, concluding, and presenting the problems to the school committee, 3) planning the curriculum's contents and activities, and 4) creating the solid-waste-management curriculum. In addition, it was found that there were five processes for the implementation of the solid-waste-management curriculum including; studying fundamental data, investigating causes and effects, planning to solve the problems, solving the problems with conclusions, and discussion of problem solving strategies. In terms of students' environmental literacy, awareness, and participation, it was found that the students had higher environmental literacy, awareness, and participation after learning through the solid-waste-management curriculum. However, there were no statistical differences with regard to age or sex of the students. This study provides initial information on the development of environmental curriculum for school administrators.

Keywords : solid waste management, environmental education process

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Introduction

The environment plays a significant role on quality of life and the status quo of the exercises of the human race. The environment can be classified into different categories. Natural environments are composed of water, air, soil, sunlight and all forms of life. Man-made environments consist of products or materials from human creation such as roads, houses, and factories, among others. Cultural and social environments are forms of environment that are brought about via human productivity. Obviously, each type of environment passes interrelated effects to one another.) Singseewo, 2011a(. Environmental problems have become one of the most important problems due to the processes of modernization. Earlier, environmental problems used to be regarded as technical and economical problems. In the past few decades, however, these problems have instead been regarded as technical and economical dimensions) Tuna, 2004(. Environmental problems in developing countries arise either from conditions of poverty and underdevelopment or from negative effects of the very processes of developmen) Saha&Ghildayal, 2007(. Awareness about environmental problems is immensely emphasized in Thailand due to the fact that the problems both directly and indirectly affect the lives of Thai people)Gasiwong.2008(Based on the 2015 national environmental report, several national problems were reported, such as vital climate change and natural disasters. Moreover, it was also reported that the per capita emission of carbon dioxide among the Thai people was ranked third highest in the ASEAN community. The country also undergoes several environmental problems such as salted soil, water resource problems, coastal line and marine resource problems, biological diversity problems and pollution problems. The government pays close attention to the well-being of the environment but they have been struggling to counteract the exploitation with the conservation of natural resources. This struggle coincides with the international measures for environmental conservation. The need to sustainably conserve forest area, to use integrative methods for water management and to manage solid waste have been raised as a national agenda item (Office of Natural Resources and Environmental Policy and Planning, (2015. Factors contributing to the emission of pollution include;population growth, technological advancement and economic development. (Ratnaphianthamma, 2005). The human-produced

factors contributing to the outbreaks of environmental problems persist due to inadequate knowledge on environmental management (Veeravatnanond, 2012(and lack of awareness on environmental management. The increasing level of severity of environmental problems triggers all social units' interest in rectifying the situation with their fullest effort (Phansuk, 2005). This research

was intended to find systematic ways to remedy the solid waste management problem because the problem is placed on the national agenda and it exists throughout the country.

The government has made it mandatory for households and local communities to participate in garbage management, believing that this exercise will lead to heightened levels of awareness, a reduced level of improper disposal, and therefore a reduced impact on the environment) Chaisa, Singseewo & Jitto , Sriharuksa, Singseewo and Jitto, 2011). However, creating environmental awareness is time consuming. Therefore, equipping people with proper environmental education is believed to accelerate the process of generating awareness and bringing about concrete practices for rectification of environmental problems (Singseewo, 2011a, Veeravatnanond, 2012). This research was geared toward making changes on environmentally related behaviors among students)Singseewo, A., 2011b, Klakayan & Singseewo, 2016(. Pattern changes in student's behavior while growing into adults is believed to result in sustainable environmental conservation. Having been equipped with awareness on environmental preservation, students are expected to gain responsibility and sense on environmental nourishment, and expand this concern to their own children in the future.)Polnam-it. 2010(. As mentioned earlier, effects of environmental problems can be linked and exaggerated, meaning the problem may take place in one area but may lead to problems in neighboring areas. As a consequence, environmental problems can dramatically expand and inevitably affect quality of lives. Due to the increasing level of influence that environmental problems have on humans, prompt actions must be implemented. To be more specific, school students should be equipped with appropriate skills to assist them in effectively tackling environmental issues) Joseph, Victoria, Campbell, & Louie, 2004). Thus far, environmental education is a mean for solving environmental problems. Environmental science is a rather holistic and multidisciplinary field of study, whose curriculum includes all areas of environmentally-related topics. The activities of the environmental sciences are content- and process-based. It does not deal with moral aspect content. These qualities of the course make environmental education an effective tool to help solve environmental issues)Singseewo, 2011a, Veeravatnanond, 2003). Environmental education has been defined more or less similarly by different scholars. Stapp)1969 (asserted that the ultimate goal of environmental education is to produce citizens who are; knowledgeable about biophysical environment and its associated problems, aware of how to help solve these problems, and are motivated to work toward their solutions. Many researchers, including Hungerford and Volk)1990, (have advocated that

environmentally-friendly behavior is the ultimate goal of environmental education. Singseewo, 2011a) ,postulated that environmental education should be implemented with an attempt to create environmental awareness among its learners, making them feel environmental ownership and understand their relationship with the environment, creating positive attitudes and skills needed for the environmental conservation.

According to research by Klakayan and Singseewo (2016) ,after the implementation of a developed environmental curriculum,the student participants'mean scores of knowledge, learning skills and participation, in both the itemized and the overall investigations were found higher than those before the implementation of the curriculum, at the significance level of .05. These scores were obtainedusing the Charcoal Briquette Production. It was found in a study by Sriharuksa, Singseewo and Jitto)2011 (that after the application of the training course, the mean scores of knowledge, skills and expertise on environmental management of the health volunteers, for both the individual investigation and the overall investigation were found higher than the scores obtained prior to the application of the program. With regard to the applications of 5E-learning cycle approach)Appamaraka, Suksringarm, &Singseewo)2009., (Budprom, Suksringam, and Singsriwo, 2010) and the 7Es-Learning for environmental educationcycleapproach)Kitjinda-Opas, Suksringarm & Singseewo, 2009) it was observed that after the application of these learning techniques, the levels of the students' learning achievement, their scientific skills, and their critical thinking abilities were found higher than the scores obtained prior to the application of the program. Bankho Municipality School, Talad Sub-district, Maung District, MahaSarakham province, is under the jurisdiction of The Education Bureau of MuangMahaSarakham Municipality Office. It is believed that upper-primary school graders, ages 9-13 years old, are at the best age range to learn about environmental awareness. Starting witha topic closely related to their lives, the students learn how to manage waste in their school. The students in this school initially had problems with improper disposal habits and inadequate knowledge on separating garbage, making the school dirty. After improper disposal habits persisted for some time, the garbage problem in this school became more and more severe. In order to find a solution for this problem, the researchers became interested in developing a curriculum on environmental education in this school to help create awareness and involve the students in finding sustainable ways to tackle the garbage problem in their school.

Objective of the Study

1. To develop a curriculum on managing solid wastes in schools.

2. To conduct instruction that uses environmental education for waste management in schools.

3. To investigate the learned knowledge about garbage management, levels of awareness, and students' participation in the process of garbage management.

Materials and methods

Population and Sample

The research population were students in the upper primary school level among the sevenschools under the supervision of MahaSarakham Municipality, including; Buraphaphitayakan School, Srisawaswittaya School, Song-ngangyai School, Samakkeewittaya School, Phosri School, Bankho School, and Ban Mad School.

The samples of this research were 45 students in the upper-primary education from Bankho Municipality School in MahaSarakham Province. These students were selected via the Purposive Sampling Method.

Research Instrument

1. Teaching instrument

The curriculum on solid waste management consisted of the following contents; types of solid waste, causes and effects of solid waste, and the management of solid waste. The practical parts of the instruction consisted of 3 phases namely; waste separation, creating awareness on garbage disposal, and the establishment of the Garbage Bank.

2. Assessment instrument

2.1) Learning Assessment Form, which was a set of 20 questions, each with 4 possible answers. Correct answer was rated with 1 point, the incorrect answer was 0 point.

2.2) Environmental Awareness Assessment Form, with 5 scale ratings,ranks being highest, high, moderate, low, and lowest. The scores of 5, 4, 3, 2, and 1 were respectively allotted to these ranks. There were 10 questions for this evaluation.

2.3) Environmental Management Participation Assessment Form, with 5 scale ratings ranking from highest, high, moderate, low and lowest. The scores of 5, 4, 3, 2, and 1 were respectively allotted to these scales. There were 10 questions for this evaluation.

Data Collection

Data was collected and used as a guideline for the development of the environmental curriculum on solid waste management in order to encourage proper waste management practices in schools. The data collection process was divided into four working phases as follows;

Phase1: Investigating the school's environmental status quo

Phase2: Organizing a meeting and project discussion with the school

Phase3: Developing curriculum on solid waste management to promote a healthy environment in schools. This phase involved seven working steps, namely; investigating the needs of learners, specifying objectives, selecting contents, managing contents, selecting and implementing teaching and learning, and evaluating the curriculum.

Phase4:   Teaching the content about solid waste management using environmental education processes. The teaching process involved four steps including; investigating causes and effects, planning for problem solving, finding conclusions about problem solving, and discussing problem solving strategies.

Research Statistic

1) Basic statistics used in this research consisted of mean and standard deviation (BoonchomSrisa-ard. 2002: 102-104)

2) Statistic for Hypothesis Testing consisted of Paired samples t-test and F-test (Two - way MANCOVA and Two - way ANCOVA).

Results

1. It was observed that the process for solid waste management curriculum development was confined to the seven steps for curriculum development postulated by Taba. Content validity of the curriculum was evaluated by experts and was reported to be at an acceptable rate)$\overline{x} = 0.80 - 1.00$), the overall appropriateness of the curriculum was rated at a high level)$\overline{x} = 3.60 - 4.40$).

2. For the comparison of the pre-test and the post-test scores, it was found that all of the itemized scores and the overall score obtained after the application of the curriculum were found higher than the scores tested before the application of the curriculum with a significance level of 0.05 (See Table 1).

3. In the student awareness assessment, it was observed that the itemized and the overall scores obtained after the implementation of the curriculum were

higher than the scores collected prior to the application of the curriculum with a significance level of 0.05 (See Table 2).

4. Regardingstudent participation, it was reported that all of the itemized and the overall scores obtained after the implementation of the curriculum were higher than the scores obtained before the implementation, with a significance level of 0.05 (See Table 3).

5. The comparison of the differences in students' gender and age via the Multivariate Analysis of Variance revealed that despite differences in gender and age, the levels of knowledge gain, awareness and participation in waste management measured after the application of the curriculum for solid waste management in school were not different)p≥ 2.93(, leading to the conclusion that differences in gender and age do not interfere with the three areas of learning focused on in this research (p=.485 as shown in Table 4).

Table1 Level of knowledge before and after the curriculum on solid waste managementimplementation

Solid Waste management Knowledge n=45	Total scores	Before		After		df	t	p-value
		$\overline{x}$	S.D.	$\overline{x}$	S.D.			
Types of wastes	7	3.57	1.27	5.86	.81	44	-11.90	0.00*
Causes and effects of wastes	6	2.42	1.25	3.84	1.36	44	-6.78	0.00*
Managing of waste	7	3.77	1.75	4.95	1.38	44	-4.45	0.00*
Total	20	9.77	3.11	14.66	2.25	44	-14.58	0.00*

*With the significance at the level of 0.05

Table 2 Levels of awareness before and after the application of the curriculum for solid waste management

Environmental Awareness n=45	Before		Level of awareness	After		Level of awareness	df	t	p-value
	$\overline{x}$	S.D.		$\overline{x}$	S.D.				
Knowledge	3.12	0.90	Moderate	4.42	0.76	High	44	-7.649	0.00*
Behaviors	3.21	0.88	Moderate	4.00	0.48	High	44	-5.838	0.00*
Waste reduction	3.31	1.00	Moderate	4.43	0.60	High	44	-7.382	0.00*
Total	3.21	0.75	Moderate	4.26	0.50	High	44	-9.442	0.00*

*With the significance at the level of 0.05

Table3 Levels of participation before and after the application of the curriculum for solid waste management

Participation on solid waste management n=45	Before		Levels of partici pation	After		Levels of participation	df	t	p-value
	$\bar{x}$	S.D.		$\bar{x}$	S.D.				
Planning	3.20	0.90	Moderate	4.46	0.53	High	44	-8.219	0.00*
Practice	3.37	0.87	Moderate	4.40	0.68	High	44	-6.647	0.00*
Application of knowledge	3.18	0.86	Moderate	4.53	0.52	Highest	44	-10.223	0.00*
Total	3.24	0.79	Moderate	4.46	0.51	High	44	-9.399	0.00*

*With the significance at the level of 0.05

Table4: Comparison of knowledge, awareness, and participation on of the waste management curriculum under gender and age difference (Two-way MANCOVA)

Sources of Variation	Testing Statistics	Value	F	Hypothesis df	Error df	P	Partial Eta Squared
Pretested Knowledge	Pallai' s Trace	.438	9.340	3.000	36.000	.000*	.438
	Wilks' Lambda	.562	9.340	3.000	36.000	.000*	.438
	Hotelling's Trace	.778	9.340	3.000	36.000	.000*	.438
	Roy's Largest Root	.778	9.340	3.000	36.000	.000*	.438
Pretested awareness	Pallai' s Trace	.086	1.136	3.000	36.000	.348	.086
	Wilks' Lambda	.914	1.136	3.000	36.000	.348	.086
	Hotelling's Trace	.095	1.136	3.000	36.000	.348	.086
	Roy's Largest Root	.095	1.136	3.000	36.000	.348	.086
Pretested participation	Pallai' s Trace	.176	2.570	3.000	36.000	.069	.176
	Wilks' Lambda	.824	2.570	3.000	36.000	.069	.176
	Hotelling's Trace	.214	2.570	3.000	36.000	.069	.176
	Roy's Largest Root	.214	2.570	3.000	36.000	.069	.176
gender	Pallai' s Trace						
	Wilks' Lambda	005.	055.	3.000	36.000	.983	.005
	Hotelling's Trace	995.	055.	3.000	36.000	.983	.005
	Roy's Largest Root	005.	055.	3.000	36.000	.983	.005
		005.	055.	3.000	36.000	.983	.005
Age	Pallai' s Trace	.097	1.289	3.000	36.000	.293	.097
	Wilks' Lambda	.903	1.289	3.000	36.000	.293	.097

	Hotelling's Trace	.107	1.289	3.000	36.000	.293	.097
		.107	1.289	3.000	36.000	.293	.097
	Roy's Largest Root						
Gender* Age	Pallai' s Trace						
	Wilks' Lambda	.065	.832	3.000	36.000	.485	.065
	Hotelling's Trace	.935	.832	3.000	36.000	.485	.065
		.069	.832	3.000	36.000	.485	.065
	Roy's Largest Root	.069	.832	3.000	36.000	.485	.065

*With the significance at the level of 0.05

Discussions

This research aimed to investigate and compare learning achievement after the application of the curriculum for solid waste management to promote healthy environment in schools. The following results were reported. The knowledge level observed in the itemized and the overall scores tested after the application of the curriculum were found higher than the scores obtained prior to the application of the program with a significance level of 0.05.The learning processes were designed with the application of environmental learning process in mind. To be specific, the teaching followed 4 main environmental learning steps, including; investigating causes and effects, planning to solve the problems, solving the problems with conclusion, and discussion of problem solving strategies)Singseewo, 2015). These processes ensure that the students understand the contents and collaborate in all learning processes, leading to increased learning achievement as evidenced in the post- test scores. These findings prove that the environmental education process contributes to learning. Accordingly, in a study conducted by Chankian, Singseewo and Thamsananupap (2012), which focused on the development of science curricula for environmental conservation aimed to promote critical thinking skills in seventh grade students. The research results show that 513 student participants exhibited higher overall and itemized post-test scores on learning achievement, environmental conservation attitude, and basic science process skill than the pre-test achievement with a statistical significance level of .05. In addition, a study conducted by Budprom, Suksringam and Singseewo (2010), titled Comparison of the Effects of Environmental Education Using the 5E-Learning Cycle with Multiple Intelligences and Teacher's Handbook Approaches on Learning Achievement Relating to Basic Science Process and Critical Thinking Skills of Grade 9Students. The major substantive findings revealed that all of the students in the experimental group, both male and female, demonstrated higher learning achievement, relating to; a) their overall scores on basic science process skills and their itemized scores on the subscales 8-4 and, b) their overall

critical thinking scores and their itemized scores on the subscales 5-3. These scores were higher than the scores obtained in the pre-test with a statistical significance level of p<.0.05

Regarding the overall and the itemized scores of the students awareness, it was observed that all of the awareness scores gauged after the application of the curriculum were higher than the scores tested prior to the application of the curriculum with a significance level of 0.05. This results from the fact that the researchers had applied different techniques for awareness creation into the teaching. This coincides with the results from a study by Onpla (2010), who investigated the effects on students' knowledge and attitude of integrating self-sufficiency economic principles into forest conservation education. This research was based on 4 objectives which were to; a) measure the students' knowledge and comprehension of forest conservation after the application of the self-sufficiency economic principles, b) investigate the students' awareness of forest conservation after attaining the class that was integrated with self-sufficiency economics, c) evaluate the result of the golden teakwood planting, d) assess the students' attitude on the learning process. It was observed that the students' awareness on forest conservation was at a moderate level in the pre-test score. After the application of the curriculum the awareness score in the post-test was found at a high level, with a statistic significance level of .05. This finding is similar to the results observed in a study by Nimglad, Phitaktanin and Tooytemwong (2008) which investigated fourth graders' awareness on energy-saving after being exposed to learning through group activities. It sought to; investigate the effect of group activity on the students' awareness of saving energy, compare the energy-saving awareness level between the students in the control group and in the experimental group, identify the students' awareness before and after the application of the learning via group activity method. It was revealed that, after being exposed to the group learning activity, the students in the experimental group exhibited higher level of awareness than before learning with the group activity method with a significance level of .05.

With regard to the comparison of the itemized and the overall scores showing the students participation before and after the application of the curriculum, it was revealed that the average scores of all of itemized investigations in the post-test were higher than the scores obtained in the pre-test with a statistical significance level of .05. The instruction was designed via an exploitation of different activities with participating students. These activities included, waste management in schools and the demonstration of garbage separation. These activities triggered the students' critical thinking and problem solving skills via group collaboration. This finding is supported by a

study by Phuangpia, (2010) about the attitudes of lower secondary students in Bangkok towards reducing global warming problems. The research depicted that most of the participants exhibited a high participation level in activities regarding the reduction of the global warming. Similar results were found in ZaferKus (2015) who investigated primary school students' participation in activities held within their families, schools, and communities. The result showed that the participants had high levels of participation. The two factors that portended the students' participation in the social activities were 1) their realizations about the usefulness of these institutions, and 2) their grade level.

In piloting the curriculum, Multivariate Analysis of Variance regarding the participants' gender and age was performed. In this analysis, gender and age were independent variables while the dependent variables were knowledge, awareness and participation. It was revealed that after the introduction of the solid waste management curriculum, the students with different genders and ages did not have different levels of knowledge, awareness, or participation about solid waste management processes, meaning that gender and age did not affect the three areas of investigation. This is due to the fact that both male and female students in BanKoh schools are treated equally in all areas. In addition, it is believed that the environmental education process that was integrated into the teaching of the solid waste management content should pave the way for this result. Similarly, Appamaraka, Suksringarm and Singseewo, (2009) investigated mixed-gendered ninth graders' learning achievements, science process skills, and their abilities to think critically after they had learned about environmental sciences via the 5 Learning Circle Technique and the Teacher's Handbook Approaches. It was observed that students of different genders did not show any difference in the overall and the itemized scores in learning achievements, science process skills, or critical thinking ability. This finding is similar to a study of Kitjinda-Opas., Suksringarm & Singseewo (2009) who investigated tenth graders' learning achievements, critical thinking and integrated science process skills after they were exposed to two different learning methods, 7Es-Learning Cycle with Multiple Intelligences and the Teacher's Handbook Approaches. It was observed in the overall and the itemized analysis that gender did not make any difference in the students' learning achievement, critical thinking and science process skill.

Recommendations

(1) Suggestions for research application

      (1.1)   There should be more dissemination of knowledge regarding Proper waste management to students at all levels in order for the students to be able to apply this knowledge into their daily basis.

      (1.2)   The time for the teaching about solid waste management

should be extended and made consistent to strengthen the students' knowledge and awareness, enabling them to disseminate the waste management knowledge to their family members.

 (2) Suggestions for future research

2.1) The curriculum on solid waste management should be introduced to students in other grade levels.

2.2) It is suggested that future research involves the community into the waste management process in order to ascertain more effective waste management in community.

Acknowledgement

References

Appamaraka, S., Suksringarm, P. and Singseewo, A. (2009). Effects of Learning Environmental Education Using the 5Es-Learning Cycle Approach with the Metacognitive Moves and the Teacher's Handbook Approach on Learning Achievement, Integrated Science Process Skills and Critical Thinking of High School (Grade 9) Students. Pakistan Journal of Social Sciences, 6(5), 287-291.

Budprom, W., Suksringam, P. and Singsriwo, A. (2010). Effects of learning Environmental education using the 5E--learning cycle with multiple intelligences and teacher's handbook approaches on learning achievement, basic science process skills and critical thinking of grade 9 students. Pakistan Journal of Social Sciences, 7(3), 200-204.

Chaisa, B., Singseewo, A. and Jitto, P. (2010). A development of a learning resource of solid wastes and wastewater managements from communities. The Social Sciences, 5(1), 16-20.

Chankian,J., Singseewo, A. and Thamsananupap, P. (2012). Science Curriculum Development on Environmental Conservation, with an Emphasis on the Promotion of Critical Thinking Skills for Mathayomsuksa 1 Students. European Journal of Scientific Research, 67(4), 512-520.

Gasiwong, P (2008). Assessment of the Garbage Bank Project among the schools in Tha-Uthen Municipality, Tha-Uthen District, Nakhonphanom Province. Master Degree Thesis in Local Administration Program, Graduate School of KhonKaen University.

Hungerford, H. R. and Volk, T. L. (1990). Changing learner behavior through environmental education. The journal of environmental education, 21(3), 8-21.

Joseph, L , A., Victoria, E, A., Campbell, A, B.,&Louie, R. (2004). Teaching students to make better   decisions about the environment: Lessons from the decision sciences. The Journal of Environmental Education, 36(1), 33-44.

Kitjinda-Opas, N., Suksringarm, P. and Singseewo, A. (2009). Effects of Environmental Education Learning by Using the 7Es-Learning Cycle with Multiple Intelligences and The Teacher's Handbook Approaches on Learning Achievement, Critical Thinking and Integrated Science Process Skills of High School (Grade 10) Students. Pakistan Journal of Social Sciences, 6(5), 292-296.

Klakayan, J., and Singseewo, A. (2016). The Development of a Curriculum for Renewable Energy: A Case Study of Charcoal Briquettes from Agricultural Residues for Environmental Literacy of Secondary School Students at SamakiWittaya Municipality School. Journal of Education and Learning, 5(2), 121-128.

Nimglad, J., Phitaktanin, P. and Tooytemwong, P. (2008). Effect of group activity on the fourth graders' attitude on energy saving; a case of Rojanawitmalabing School, Phisanulok. Thesis of the Master of Education in Guidance Psychology, Naresuan University.

Office of Natural Resources and Environmental Policy and Planning (2015). *State of Environment (2015.*) 1st ed. (Text and Journal Publication Co., Ltd.

Onpla, T. (2010). The effect of the integration of the self-sufficiency economic in the teaching of the forest conservation on the comprehension and awareness of the students in Seeharatdechochai School.Master degree thesis on Environmental Science, KhonKaen University.

Phansuk, V. (2005). The Methods for Solid waste management in AnubanChumthabong School, Chumthabong sub-district, Nakhonsawan Province.Thesis of the Master of Art in Developmental Strategy, RajabhatNakhonsawan University.

Phuangpia, G (2010) .Knowledge, attitude and participation to reduce the global warming problems among the lower secondary students in Bangkok.Master Degree Thesis in Journalism Science, Faculty of Journalism and Mass Communication, Thammasat University.

Polnam-it, R. (2010). Knowledge and behaviors on solid waste management of the students in Ban Nongtu School, Makkhang District, Muang, Udonthani Province.Thesis of the Master of Environmental Management, Maha Sarakham University.

Ratnaphianthamma, W. (2005.) Environmental Management.1st ed. Bangkok :WattanaPanich.

Saha, B.H. and Ghildayal, P. (2007). Equity, environmental conservation and Sustainable development. In M.K. Satapathy) Ed. ,(Education environment and sustainable development.)pp.92-110(. Delhi, India : Shipra.

Singseewo, A. (2011a). Foundations of Environmental Education.Maha Sarakham : Mahasarakham University.

Singseewo, A. (2011b). Awareness of environmental conservation and critical thinking of the undergraduate students. European Journal of Social Sciences, 25(1), 136-144.

Singseewo, A. (2015). Development of Environmental Education Curriculum. Maha Sarakham : Kakayia.

Sriharuksa, S., Singseewo, A. and Jito, P. (2011). The Development of Training Packages Environment Education on Solid Waste in Community for Village Health Volunteer in AmphoeMuangSakon Nakhon. Soc. Sci, 6(1), 45-50.

Stapp, W. B. (1969). The concept of environmental education. Environmental Education, 1(1), 30-31.

Tuna, M. (2004). Public environmental attitudes in Turkey. In C. Phillips (Ed), Environmental justiceand global citizenshi*p*. pp. 11-20 Oxford, UK : The Interdisciplinary Press.

Veeravatnanond, V.(2003). Environmental Education.3rdEdn., Bangkok, Odean Store Printing House.

Veeravatnanond, V. (2012) Environmental Education for the Age of Global Warming. Phitsanulok :Phitsanulok Dot Com.

ZaferKus. (2015). Participation Status of Primary School Students. Procedia – Social and Behavioral Sciences ,177, 190 – 196.