

Developing a Green School Training Manual for High School Students Pracharat Wittaya Serm School

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Abstract

This research aimed to develop a green school training manual for high school students in Pracharat Wittaya Serm School with an efficiency index at a rate of 80/80. The scores of knowledge, attitudes, and participation of the research participants gauged before and after the training were compared. The simple random sampling method was used to recruit a group of 54 student samples from Pracharat Wittayaserm School in the first semester of the academic year 2021. The research instruments consisted of The Green School Training Manual, The Knowledge Testing Form, The Attitude Testing Form, and The Participation Testing Form. The statistics used in the data analysis were frequency, Percentage, mean, standard deviation, and paired t-test. It was found that the efficiency of the training manual was 80.45/82.60, and the efficiency Index (E.I.) was 0.5840. These statistics indicate that the students had a 58.40 percent of knowledge progression. It was also observed that the average post-test scores of knowledge, skills, and environmental management participation were higher than the pre-tests scores with the significance at the level of 0.05.

Keywords: green school training manual, knowledge, attitude, participation

1. Introduction

The current environmental problem is a global problem that affects humans and is closely related to humans' lives.

The environmental problems have soared dramatically during the past decades, causing losses to both property and life. The increasing number of the world has led to an infinite increase in the demand for natural resources because human beings have a desire to live comfortable life. This has resulted in the invention of new productions with an increasingly advanced producing method. Industrial development has led to high competition and careless business, whose operation is regardless of its consequences to the health of the environment. As this business progress, more and more amount of toxic substances have been dumped into rivers. The release of large amounts of untreated toxic fumes from factories into the atmosphere has been more than common at present. It causes pollution problems that worsen the threatening effects of global warming that inevitably damage the equilibrium of life. In their attempt to address these problems, many countries are trying to find ways to conserve natural resources. Educating people about the impact of environmental issues on human life is an effective alternative for environmental protection. It is also important to cultivate a sense of environmental preservation. The previous attempts for environmental protection were performed regardless of community involvement, which is a key factor for the unrewarding attempts for environmental protection. To make environmental protection successful, community participation should be included (Meepradit, 2005, p. 201).

Solving environmental problems requires collaboration from people from all sectors of society. In the field of education, environmental studies is another means to help build knowledge, raise awareness and create a sense of environmental responsibility for future citizens (Onder & Kocaeren, 2015). In the Belgrade International Declaration, held at the International Conference on Environmental Studies (Woraphong, 2018), the following six environmental objectives were defined. 1) To raise awareness and alertness to environmental problems, 2) To cause understanding of how different sections of people or things influence each other environmentally, 3) To trigger senses of environmental protection, 4) To build skills to solve environmental problems correctly and appropriately under a given situation, 5) To recognize the assessment of environmental measures, and 6) To

engage with a sense of urgency to seriously solve environmental problems (Sitthi-chok, 2016; Woraphong, 2018).

The “Green Classroom Project”, an innovation that develops all-around learners, is applicable for organizing learning in all learning areas. It is an attitude enhancement program, that aims to generate participation in an electricity saving scheme launched by The Electricity Generating Authority of Thailand in 1993. The program is in operation to the present day. The Green Classroom Project is a project that involves strengthening character traits and instilling an attitude to save electricity and other energy among Thai teenagers. The program helps strengthen the learning process and develop self-conceptualization and team working. The program educates the students on how electric power is generated and transferred to different locations while fostering changes in electricity consumption behavior for energy efficiency purposes. Following the merit of the program, the students have been trained to use electricity sustainably, leading to the conservation of natural resources and the environment. The program targets children and young people in Thai schools from kindergarten to secondary levels. From 1998–2004, the Green Classroom Project established 430 green classrooms for K-12 schools nationwide, providing schools with the equipment to support the learning of the project. Therefore, the students could experiment and realize the need to save electricity and know different types of power generators. The program articulates the cabinet’s attempts broadcast the impacts of wasting electricity through social media to promote electricity saving. For this purpose, learning devices are installed in a classroom. Green classrooms are designated to have an area of about 90 square meters or more. Schools participating in the Green Classroom Program must meet the selection criteria. For example, if the schools are located in Bangkok and metropolitan areas, they must have 1,000 or more students for primary school, and 1,500 or more students for secondary schools to be eligible for the program. For the provincial schools, the number is set at 800 or more students for primary schools and 1,000 or more students for secondary schools (Electricity Generating Authority of Thailand, 2005).

Training techniques are very important elements to promote environmental preservation ability for people. The training participants should be educated in a way that helps increase their level of knowledge, skills, and attitudes. Mastering these key elements during the training should allow the participants to sufficiently be a part of environmental preservation. Whether or not training’s objectives be accomplished is based on actual techniques being employed in the training. To achieve its goals, training should be equipped with proper teaching materials that are relevant to the objectives of particular training. Moreover, training should be placed in the right location with adequate and proper facilities, and training supplies, such as audiovisual equipment. The environmental training needs to be assigned with proper operating times, expenses, and management techniques, all of which can be varied across different training programs (Therachai Bumrunsil, 2012).

Pracharat Wittayaserm School, located in Ban Ton Sub-district, Phra Yuen District, Khon Kaen Province, is a sub-district level school that has yet to conduct a concrete environmental project of its own to raise students’ awareness of environmental participation. The school previously attended an environment training program on solid waste sorting campaigns in schools organized by external agencies.

Therefore, the researchers were interested in developing green school training manuals and had accordingly conducted environment training for school children to broaden knowledge, attitude, and participation in environmental engagement in the schools. Due to the coronavirus pandemic, the activity was offered both on-site and online.

2. Research Objectives

- 1) To develop a green school training manual, for secondary school students in Pracharat Wittayaserm School, with an effective index of 80/80.
- 2) To study and compare knowledge about green schools before and after the training.
- 3) To study and compare attitudes towards green schools before and after the training.
- 4) To study and compare the students’ rates of contributions to environmental preservation in schools before and after training.

3. Research Hypothesis

- 1) The Green School Training Manual developed in this study would have acceptable efficiency index at the rate of 80/80 or higher.
- 2) Students would have a higher level of knowledge of green schools after the training.
- 3) Students would have a higher level of attitudes about green schools after the training.

4) Students would have a higher rate of environmental preservation in schools after the training.

4. Research Methodology

4.1 Population and Samples

The population for this research was 387 secondary school students from Pracharat Wittayaserm School. The simple randomization was used to recruit a total of 54 students who were the 10th graders studying in the first semester of the 2021 academic year.

4.2 Green School Training Manual Development Procedures

1) Preliminary study, involving an analysis of relevant research documents on the development of green school training manuals with 5 core activities.

2) Development and evaluation of the training manuals under the supervision of 3 experts: ① Assistant Professor Dr. Wannasak Phichit Boonserm, ② Assistant Professor Dr. Namthip Khamrae, and ③ Sudarat On-Korn.

3) Revise the content to determine the quality of the manual by considering the content's consistency, suitability, accuracy, completeness, and comprehensiveness. The evaluations of the above areas were made following the principles of content fidelity check. After that, the manuals met the required standard, they were used for the training activities.

4.3 Attesting Quality of Research Equipment

1) The Green School Training Manual for the secondary school students at Pracharat Wittayaserm School is comprised of 5 main activities including ① Green Space Activity, ② Cost-effectiveness of Energy use, ③ Waste-free School, ④ Water Saving, and ⑤ Traffic and Safety. Based on the IOC investigation performed by the three experts, it was found that the IOC values of all tested areas were rated at 0.5 or higher.

2) Green School Training's Knowledge Testing Form: This form contained 20 questions, each was presented with 4 choices. The itemized classification power value (r) for all the questions was between 0.33-0.74, and the reliability value of the whole set of questions was 0.70.

3) Green School Training's Attitude Testing Form: This test consisted of 15 questions, and each was presented with a three-level checklist answer. The test was rated with a reliability value of 0.85.

4) Green School Training's Participation Testing Form: This test had 15 questions with a five-rating scale answer. The test was rated with a reliability value of 0.81.

5. Collection of Information

1) Research Equipment Preparation: The researchers prepared research tools including, ① the Green School Training Manual to be used with the secondary school students at Pracharat Wittayaserm School, ② Knowledge Testing Form, ③ Attitude testing Form, and ④ Participation Testing Form.

2) Pre-Test: In the latter process, the researcher conducted a pretest to gauge the levels of knowledge, attitudes, and degree of participation in environmental management in the schools.

3) Conduct Training: This involved the researchers applying the Green School Training Manual with a group of samples secondary school students from the Pracharat Wittayaserm School, with a total training time of 16 hours.

4) Post-Test: At the end of the training, a post-test was conducted to gauge the levels of knowledge, attitudes, and degree of participation in environmental management in the schools.

6. Data Analysis

1) Statistical Analysis: Basis statistical values were analyzed to obtain frequency, percentage, average, and standard deviation.

2) Instrument's Efficiency Index Analysis: The effectiveness of the Green School Training Manual was evaluated against the reference criteria of 80/80.

3) Perform Hypothesis Tests, using paired t-test statistics.

7. Results

1) The Green School Training Manual for secondary school students in Pracharat Wittayaserm School had an efficiency index at the rate of 80/80.

Table 1. Efficiency index of the green school training manual (E₁/E₂)

Training Site	Total Score	\bar{x}	S.D.	Percentile
Process efficiency (E ₁)	20	16.09	1.71	80.45
Result efficiency (E ₂)	20	16.52	1.50	82.60
The efficiency of the training manual is 80.45/82.60				

The efficiency index of the process of the manual (E₁) accounted for 80.45 percent and the efficiency of the results (E₂) was 82.60 percent. This number informs that the Green School Training Manual has an efficiency index at the rate of 80.45/82.60 (Table 1).

2) Results of the effectiveness index analysis of the Green School Training Manual showed the Efficiency Index at the value of 0.5840, meaning that students having been trained using the Green School Training Manual had learning progress at the rate of 58.40% (Table 2).

Table 2. Efficiency index (E.I.) of the green school training manual

Pre-test score of knowledge	The post-test score of knowledge	Number of trainers	A total score of the training	Manual's efficiency index
628	892	54	20	0.5840

3) The results of the comparisons of knowledge, attitudes, and participation in environmental management in green schools before and after the training are as follows

Table 3. Comparison of average knowledge scores before and after training

Tested Area	Before training		Level of knowledge	After training		Level of knowledge	df	t	P
	\bar{x}	S.D.		\bar{x}	S.D.				
Knowledge (N = 15)	11.63	1.83	good	16.52	1.50	Very good	53	-22.00	.000*

Note. * Statistically significant at .05.

The comparison of the average knowledge scores showed that the average knowledge scores in the Pre-training were rated at a good (\bar{x} = 11.63) and after training the score in this area was at a very good level (\bar{x} = 16.52). Overall, the student's knowledge of the green school in the post-test was higher than the overall average score obtained in the pre-test with a statistically significant level of .05 (Table 3).

Table 4. Comparison of students' average scores of attitude on the green school before and after training, using t-test (dependent samples)

Tested Area	Before training		Attitude level	After training		Level attitude	df	t	P
	\bar{x}	S.D.		\bar{x}	S.D.				
Attitude	2.23	0.30	uncertain	2.62	0.23	agree	53	-11.36	.000*

Note. * Statistically significant at .05.

The overall attitude observed in the pre-test was at the uncertain level (\bar{x} = 2.23). After training, the students had an overall attitude average score on the agreed level (\bar{x} = 2.62). It was found that students had higher post-training attitude scores than before the training with a statistical significance at the level of .05 (Table 4).

Table 5. Comparison of average scores on participation in environment management in schools before and after training using t-test (dependent samples)

Tested Area	Before training		Level participation	After training		Level participation	df	t	P
	\bar{x}	S.D.		\bar{x}	S.D.				
participation	3.51	0.55	Very engaging.	3.95	0.57	Very engaging.	53	-3.86	.000*

Note. * Statistically significant at .05.

The average pre-test scores of the student's participation in environmental management in the school were observed at a very good level ($\bar{x} = 3.51$). After the training, the post-test score of environmental involvement in the schools was rated at a very good level ($\bar{x} = 3.95$). Overall, the students had higher post-training grade points than before training with a significance at the level of 0.05 (Table 5).

8. Discussion

1) The Green School Training Manual for the secondary school students at Pracharat Wittayaserm School had an efficiency index of 80.45/82.60, which meets the set criteria. The training manual was created systematically with a careful selection of contents under the supervision and refinement of the experts. Moreover, the learning activities included in the manual were selected based on the review of related documents. These aforementioned practices should explain how the manual has the standard efficiency index score. In line with the research of Chum-apai and Khamrae (2016, p. 208), who investigated the development of the ASEAN Natural Resources and Environment Training Manual in The Kingdom of Thailand and found that process efficiency (E1) of the manual accounted for 90.11 percent and the efficiency of the outcomes (E2) was 83.33 percent. A similar finding was observed in a research work by Soonjai (2003, pp. 37–38), who developed a series of teaching activities to raise environmental awareness. This scholar also investigated how the application of the above activities helped raise environmental awareness among the second graders in Ban Yaha School, Yaha District of Yala Province. The results showed that a series of prepared activities were able to raise the student's awareness of the environment. The students' score of environmental awareness tested after the application of the manual was found to be higher than the score observed in the pre-test with the significance at the level of .01. This pattern of finding was evidenced in a study by Likhitanuparb (2013) who developed a training guide on food contaminant testing for the 6th graders from Sarasart Ektra Bangkok School. The results showed that the training kit had an efficiency of 81.78/83.22, which is well above the 80/80 reference criteria. The student's post-training scores were significantly higher than their pre-training counterparts with the significance at the level of .01. ② Students' scientific skills observed in the post-training were higher than the pre-training score with the significance at the level of .01. ③ Students were satisfied with the training manual at a very satisfactory level. This finding was also articulated in the research of Thienwan (2005), who investigated the development of research-based learning manuals to develop environmental visions and the ability to solve environmental problems. It was found that after the students had experienced using the research-based learning guide in environmental science subjects, their environmental vision and ability to solve environmental problems were significantly higher ($p = 0.05$) than the group of students who learned the same contents via conventional learning methods.

2) Average pre-test scores of knowledge of green school among the secondary school students in Pracharat Wittayaserm School were rated had a high level. The post-test score knowledge was rated at a very high level. This showed that the students who took part in the training had higher knowledge after the training with a statistical significance at the level of .05 level. It shows that the Green School Training Manual developed under this research was capable to increase the student's level of knowledge. This is in line with the research of Pangkaew (2006), conducting operational research on the development of a series of learnings on solid waste management in schools for students in grades 4–6: A case study of schools in Songkhla province. The research also investigated the teacher's and students' satisfaction after having used the learning kits. The result showed that the students' post-test score was higher than the score of the pre-test counterpart at the statistical significance level of 0.01. Students valued the importance of waste management and had a good attitude towards school waste management, Both the teachers and the students were satisfied with the learning set at the high level. In conclusion, the research related to environmental activities in educational institutions focuses mainly on 5 areas namely, atmospheric and environmental management, environmental campaigning and conservation activities, environmental management in educational institutions, relationships between school and environmental stakeholders, and environmental communities. School administrators, community, and teamworking play a collaborative role in succeeding environmental management in a school. It was found by Wongchantra et al. (2017, p. 387) that the sample's average knowledge score of green universities obtained after the application of a learning kit was higher than the knowledge gauged in the pre-test. Similarly, Abiolu, Oluremi Adenike (2019, p. 53) found that Nigeria's youth had an increasing knowledge after receiving environmental communication through appropriate media. Moreover, BI Batri, Bouchta, et al. (2019, p. 371) found that learning activities resulted in an increase in environmental literacy among the students of Moroccan schools.

3) Results of comparison of student attitudes before and after training. It was found that after the training, students had a significantly higher attitude ($p = 0.05$) towards green schools than before the training. This shows

that the attitude of the trainees is higher after the application of the green school training manual. This is consistent with an observation of Chamber and Smith (2007) on the extent that the expressing of concern for the environment and the enthusiasm to eliminate the negative factors that harm environmental health are indicators of individuals' environmental awareness. In addition, Zecha (2012) explains that environmental awareness stems from interest and concern for the environment, leading to the quest for knowledge and participation in various environmental conservation activities. A similar pattern of results was observed in a study by Mamata and Mokhtarb (2012, pp. 7–8) who investigated the environmental attitudes of a group of Malaysian students enrolling in environmental studies courses in Malaysian public universities. This research aims to assess the environmental impact of the learning curriculum of Muslim students in Malaysian public universities in Hadhari. It was found that, after attending an environmental studies course, the students had a high level of environmental ethics and attitude. They also exhibited clear comprehension of and positive behaviors towards energy consumption, mobility and transportation, consumerism, and recycling. The student participants revealed avoidances of various activities that may take away the health of the air, water, and soil. This is in line with the research of Laloknam (2013), who investigated the quality of the environmental studies program on water quality inspection for junior high school students in Nakhon Nayok province. The activity was conducted in form of a local water conservation youth camp, which was operated for three batches to various groups of secondary school students. It was found that the students had a higher post-test score for all of the objectives of the program. The post-test scores in all of the five research objectives were significantly higher than the post-test scores with a statistical significance of 0.05 in all aspects. This defines that the water reservation camp could raise the student's levels of awareness, skills, knowledge, and understanding of water conservation concepts. Therefore, it is concluded that this environmental study program was able to develop students' environmental competencies based on the objectives of environmental studies. Research conducted by Jehteh (2013), focused on promoting comprehension of environmental conservation in schools which was a case study among the middle school students at Thammasat Wittaya Foundation School, Muang District, Yala Province. The results showed that the students had a high level of overall understanding of environmental conservation, a high level of attitude, and a moderate level of environmental participation. This is in line with the research of Evrim Ural, Guzide Dadli (2020, p. 177) investigate the effect of authentic problem-based learning (PBL) activities in the unit of "Human and Environment" on 7th graders' environmental information, their reflective thinking skills and their environmental attitudes. The sample of the study consisted of 53 7th grade students from two different classes attending Science and Technology Course at a government school in Turkey. One of the groups was attended as control group the other one was attended as experimental groups. Reflective Thinking Skills Scale, Environmental Knowledge Test, and Environmental Attitude Scale were used as data collection tools. The research design of the study was quasi experimental pre-test post-test control group design. The experimental group was taught by PBL and the control group was taught by didactic teaching method. The results of the study displayed that PBL had significant effect on 7th graders' environmental knowledge; environmental attitudes but it had no significant effect on students' reflective thinking skills

4) Comparisons of contributions to environmental conservation in schools before and after training. It was found that students had a high level of average participation scores in both pre-training and post-training tests. The average score after training was significantly higher ($p = 0.05$) than the scores rated before the training. This shows that the Green School Training Manual for the secondary school students in Pracharat Wittayaserm School adds could the students' level of environmental engagement after the training. This is in line with the research of Nuankham (2009), which aimed to monitor the water quality to develop a positive attitude towards environmental protection among the people in Bangkhen District, Bangkok. The study found that water quality in the last 5 years has been dramatically low due to the low dissolved oxygen (DO) contents in the water. This finding is consistent with the results of an analysis of BOD and total coliform content in water, showing an increasing rate of the above substances in water every year. In an investigation of water quality analysis against the water for consumption standard, the sampled water's utilization rate was at Category 5. The result was used to create a training guideline to train people on water quality monitoring. The people who had undergone that training developed higher levels of knowledge and attitude toward environmental conservation, with a statistical significance at the level of 95% ($\alpha 0.05$). This result is chorused by the case study Silprasert (2011), the assessment of the home energy saving behaviors among the 4th to the 6th graders. It was found that students who participated in the Roong-Aroon Program had significantly different energy-saving behaviors from those who did not participate in the activities, with a statistical significance at the level of 0.05. Additionally, the students participating in the program had a higher proportion of regular practices than students who did not participate in the project. Gender differences did not influence environmental behaviors while the levels of education were found to significantly ($p = 0.05$) affect the environmental behaviors of the participants both in the overall and

itemized analysis, with the significance at the level of 0.01. This is in line with the research of Georgia Liarakou et al. (2011, p. 651) investigate the Environmental volunteers: factors influencing their involvement in environmental action The results suggest that the environmental issues addressed in volunteer programmes and the standards of volunteer organisations constitute critical predictors of a volunteer's personal commitment to participation in an organisation. Learning and contact with nature clearly emerged as the most important factors in volunteer motivation. Furthermore, although the participants considered their environmental knowledge was sufficient to stimulate their action, they also recognised the importance of continuing to deepen that knowledge.

9. Suggestion

- 1) New learning activities should be included to increase the efficiency of activities.
- 2) In the next research, the content and learning issues should be made as up-to-date as possible to make the application of the research finding to be as much beneficial to learning as possible.

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