

The Effects of Environmental Conservation School Activities Development Using Team Work Based Learning (TWBL) for Students of MuengRoi-Et Municipality Schools, Thailand

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ABSTRACT

The purposes of this research were to effects of environmental conservation school activities development using Team Work Based Learning (TWBL), to compare environmental conservation knowledge, environmental ethics and environmental volunteers, before and after the activities, to compare knowledge, ethics and volunteers of students with different gender and grade level. The sample used in the research were 47 students, grade 10 – 12 at Wat Sa Thong Municipality School, Mueng district, Roi-Et province by purposive sampling. The research tools were an environmental conservation school manual, environmental conservation knowledge test, environmental ethics test and environmental volunteers test. The statistics used in the research were frequency, percentage, mean, standard deviation, t-test, F-test (One-Way MANOVA, One-Way MANCOVA). The results showed that 1) The manual were the efficiency of 87.31/85.81, the efficiency index was a value of 0.7322. 2) In the post-test, the students had an average score of knowledge about environmental conservation, environmental ethics and environmental volunteers higher than the pre-test statistically significance ($p < .05$). 3) There was no different of mean score of knowledge about environmental conservation, environmental ethics and environmental volunteers of students with different gender ($p > .05$). There was statistically significant different of score of knowledge about environmental conservation and environmental ethics of students with different grade level ($p < .05$), there was no difference of environmental volunteers of students with different grade level.

Keywords

Environmental Conservation School; Knowledge; Environmental ethics; Environmental volunteers

Introduction

Environment is inseparable from human beings and things in all respects because of that environment refers to everything that surrounds the human being, from minerals, masses, both living and non-living molecules, that occurs spontaneously and man-made and both seen with the naked eye and invisible to the naked eye, such as beliefs and cultural traditions that man-made. All things are that human beings accept and act together. And the environment is related throughout the system. When one thing has a problem or is affected will affect other things and finally come back to the human being. Human beings are the creators of environmental sustainability activities and environmental potential control activities. It can be seen that whether it is positive or negative activity on the environment, naturally arises from all human beings. The cause is human by creating human driving forces, including population increase, education, public health/health, culture, economy, recreation, life safety. And these properties have a wide range of separate activities, with both positive and negative impacts on the environment. Which the above problem is the cause of the problem of rising global temperature (global warming) continuously; the deterioration problem and changes in the ionosphere, problem of pollution in the atmosphere in which humans live, problems of degradation of soil and water resources in agriculture, problem of degradation of fresh water, problems of degradation of marine and coastal resources, community pollution problem, pollution problems in the workplace, problem of toxic residues in food and the human environment is facing the problem of quality of life that deteriorates continuously. Therefore, there is a need for correction by providing education, information and news about the environment which should start in the school first and then expand the effect to the community further in order to learn all aspects [1].

The school is a kind of social organization and what society is created or defined to have. In order to serve the needs of society in developing youth to become a complete person and the school has a direct role in human development, that is, it is a direct role in youth development or the development of the people under the responsibility of the school to become perfect people. Currently, education management is widely accepted that there are problems in every aspect, be it the management system, quality of educational organization manual, media, teaching and learning process teachers and educational personnel. And in the past, the study management was based on centralized

manuals, educational institutions provide separate learning. The students were separated from the community, from their own traditional and cultural bases. The past studies were focused on the subject matter only, make students lead a separate life taking a role model for modern people. The students are not learning what is close to them, do not know the true way of life of the community not participating in cultural traditions. While the community is a model of practice that encompasses fine cultural traditions. School is an important unit of education administration because it is very close to the learner and the community. Learning and teaching activities to promote the learning of the learners will take place at the school. The implementation of the school-based environmental learning reform approach, which is appropriate and consistent with the burden of responsibility, is a key factor in the provision of quality education [2].

The school environment is one of the things that the school needs to focus on. This is the school atmosphere is a condition resulting from the interaction between the individual and the school environment. Then affect the feelings of the person. Therefore, the most important thing that result in a good atmosphere is school environment arrangement, the school has to be safe both inside and outside the building as well as having good natural resources and overall environment in the school area. In addition, it is important to consider the green practices of the school in terms of energy, water use and waste management. All sectors in Thailand should take concrete steps to preserve and manage the matter. This will lead to sustainable environmental management [3].

The school environment is very important to the development of students, students learn from their surroundings, both live and inanimate. They also have a curiosity always learn and follow and imitate others and is the age that accumulated experience and is an important age in the development of body, mind, brain as well as character but school people are the ones who destroy or cause environmental problems in the school. And one of the people involved in creating environmental problems comes from students, which have to be addressed to school environmental problems such as solid waste, polluted water, polluted air, and even electricity consumption. And the school environment as well as the school area lacks maintenance to be in perfect condition.

Environmental conservation is very important, especially in the conservation of the school environment because the school is an important part of the community and play a role in educating instil various personality traits to students by aiming for students to apply the experience gained from their studies to life being creative, thinking and solving problems in one day, students must spend at least 8-10 hours in school life. In addition to students receiving knowledge teachers learn from lessons and students also learn from the environment around them. Therefore, the conservation of the school environment is important for students. So that they train themselves to take responsibility preserve the environment and love nature as a result, students are well-qualified people, be a quality person that society expects. And the best result of the environment within the school is clean, shady and beautiful, will result in children that grow into valuable human resources of the nation in the future [4].

Team Work Based Learning (TWBL) is a discipline of learning to be able create the value of the team above the value of the person, by bringing the difference. The similarities and potentials of each individual in the team come together, to increase these potentials into various powers make teamwork more efficient. Learning as a team during collaboration helps build beliefs, values, goals. It also fosters a work environment that encourages everyone to recognize the importance of learning, to change and develop yourself all the time in particular, adaptation to economic changes, technology, knowledge, and new information [5]. Which is team work to enhance interpersonal skills and responsibility. Learners can work with others, work as a team, be a leader and a follower have a good relationship with learners, co-workers, parents, and people in the community, society and environment.

Mueang Roi-Et municipality schools are in an urban area and a school that focuses on activities and education for students. Therefore, the researcher is interested in studying the development of environmental conservation school activities using Team Work Based Learning for students of Mueang Roi-Et municipality schools to guide the creation of environmental learning processes in schools, creating environmental ethics knowledge and environmental volunteers. The purposes of this research were to develop an environmental school activity manual using Team Work Based Learning for students of Mueang Roi-Et municipality schools, to study and compare knowledge about environmental conservation, environmental ethics and environmental volunteers before and after the activity and to study and compare knowledge about environmental conservation, environmental ethics and the environmental volunteers of students with gender and different grades level.

Methodology

1. Research conceptual framework

The research on entitle “The development of environmental school activities using Team Work Based Learning for students of MuengRoi-Et municipality schools”, the researcher has created a conceptual framework for the study by dividing the study into 2 phases: Phase 1: The development of environmental conservation school activities for MuengRoi-Et municipality schools. The tools used in the research were 6 environmental school activity manual, including; activity unit 1; water and wastewater management in schools, activity unit 2; energy in schools, activity unit 3; school environment, activity unit 4; occupational and school safety, activity unit 5; solid waste and school sewage management and activity unit 6; trees in the school, knowledge about environmental conservation test, environmental ethics test and environmental volunteerism test. After that, the advisor was examined and the quality of the tools by 5 experts was then sent to try out with non-sample students. Phase 2: The Management of environmental conservation school activities using Team Work Based Learning for students of MuengRoi-Et municipality schools, which has a sample group students 47 in grade 10 - 12, Wat Sa Thong Municipality School, Mueang District, Roi-Et Province, by purposive sampling in the environmental protection club, to obtain an effective environmental school activity manual and to give students knowledge about environmental conservation environmental ethics and environmental volunteers.

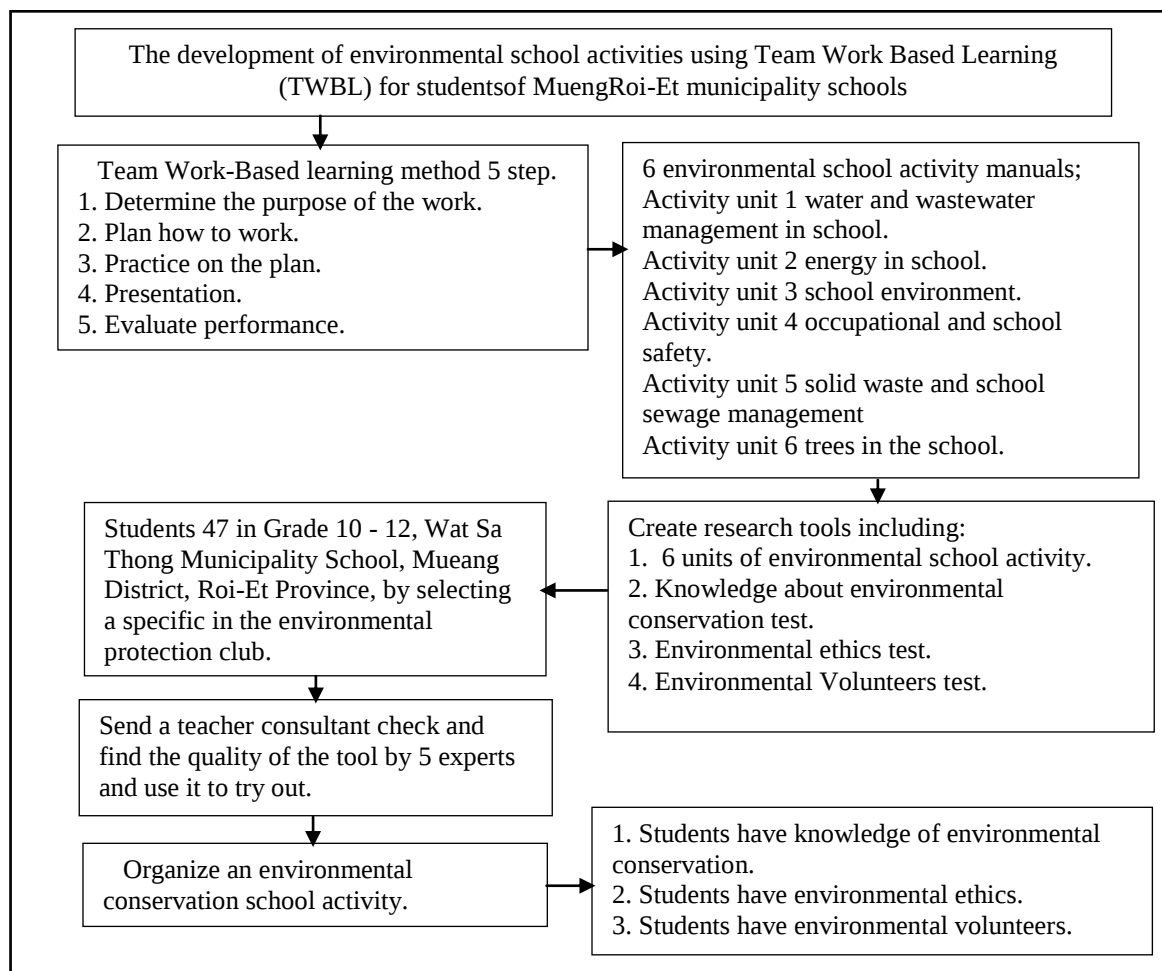


Figure 1. the researchConceptual framework.

2. Population and sample

The population used in this research was 100 students of MuengRoi-Et municipality schools, Muang district, Roi-Et province.

The sample used in this research were 47 students, grade 10 – 12 at Wat Sa Thong Municipality School, Muang district, Roi-Et province from the environmental protection club, being selected by voluntary sampling.

3. Studied variables

The independent variables were the environmental school activity manual and the individual variables were gender and grade level.

The dependent variables are knowledge about environmental conservation, environmental ethics and environmental volunteers.

4. Research model

1) Design and development of environmental school activities using Team Work Based Learning (TWBL) for students of MuengRoi-Et municipality schools. It was quasi experimental research by using one sample group as an experimental group. The results were measured before and after the experiment (One Group Pretest-Posttest Design) [6] as shown in Table 1.

Table 1. Research plan (One Group Pretest-Posttest Design)

Experimental group	Pretest	Treatment	Posttest
E	T ₁	X	T ₂

E is the sample population. (Experimental group)

T₁ is a test of knowledge, environmental ethics, environmental volunteerism before the activities (Pretest)

X is the organization of environmental school activities Team Work Based Learning (Treatment)

T₂ is a test of knowledge, environmental ethics, environmental volunteerism after the activities (Posttest)

5. Research instruments

1) The tools used in the transmission are the environmental school activity manual using Team Work Based Learning (TWBL) for students of MuengRoi-Et municipality schools.

2) The instrument used for measurement and evaluation, including of knowledge about environmental conservation test, environmental ethics test and environmental volunteers test.

6. The research tools and quality of tools

The researcher has built and evaluated the quality of the research tools, the procedure as follows:

6.1) The environmental school activity manual using Team Work Based Learning for students of MuengRoi-Et municipality schools.

1) Study and research preliminary information related to the development of the activity manual by studying concepts, theories, documents and related research in order to plan for the preparation of the manual for efficiency.

2) Study knowledge about environmental conservation by studying the document books, texts and various media to guide the activities in the development of the manual. It will focus on the content to be consistent with the objectives of the activity.

3) Determine the scope and content of the activity manual in accordance with the educational framework to create an environmental school activity manual using Team Work Based Learning for students of MuengRoi-Et municipality schools with content in the amount of 6 activity units.

4) Bring an environmental school activity manual using Team Work Based Learning for students of MuengRoi-Et municipality schools created for 5 experts.

5) Adopt environmental school activity manual from expert assessment to analyse based on the average score of 3.50 or more as a criterion. It was found that there were the suitability of environmental school activity manual at the mean ($\bar{x}$) = 4.48 and the standard deviation (S.D.) = 0.64 in the most appropriate level and the consistency value (IOC) = 0.96.

6) Improve the environmental school activity manual and applied to try out with 30 students grade 10 at NongYa Ma Municipality School (Roi-Et Municipal Sport School) that were not sample.

7) Adopt an environmental school activity manual using Team Work Based Learning for students to improve and complete for further data collection with the sample.

6.2) The tools used in the measurement and evaluation, including the environmental conservation knowledge test, environmental ethics test and environmental volunteers test are details as follows:

1) Study basic information from textbooks, relevant research papers to guide the creation of research tools.

2) Use data to create tools for measuring and evaluating results, including:

2.1) Environmental conservation knowledge test which is a select-and-answer option, there are 4 options, which are: A, B, C and D, 60 items choose only one correct answer. The criteria for a correct answer gave 1 point, the wrong answer gave 0 points, the criteria for interpreting the points are as follows: the average score is 0.00 - 12.00 means that the students are the least level of knowledge, the average score is 12.01 - 24.00 means that the students are a low level of knowledge, the average score of 24.01 - 36.00 means that students are moderate knowledge, the average score of 36.01 - 48.00 means that the students are at a high knowledge level and the average score of 48.01 - 60.00 means that students are at the highest knowledge level.

2.2) Environmental ethics test, there are 4 options, which are: A, B, C and D, 60 items. There are 4 levels set by the ethical rating as follows: the average score is 1.00 - 1.75 for myself, the average score is 1.76 - 2.50 for relatives and friends, the average score is 2.51 - 3.25 for society and the average score is 3.26 - 4.00 for correctness and goodness.

2.3) Environmental volunteers test, there are 5 options, which are: A, B, C, D and E, 60 items with the following scoring criteria: an average score 1.00 - 1.80 means that the students have the least volunteer, an average score of 1.81 - 2.60 means that the students have a low volunteers, average score of 2.61 - 3.40 means that the students have moderate volunteers, average score 3.41 - 4.20 means that the students have a high volunteer and average score of 4.21 - 5.00 means that the students have the highest volunteers.

3) Take the measuring and evaluating tools to 5 experts for considering the consistency of the instruments used for research purposes to find: environmental conservation knowledge test, the index of item objective congruence was 0.93, Environmental ethics test, the index of item objective congruence was 0.94 and Environmental volunteers test, the index of item objective congruence was 0.95 which is greater than 0.50 indicated that all tests are correct for their content and purpose and can be used for data collection.

4) Take the measuring and evaluating tools to try out with the grade 10, 30 students at NongYa Ma Municipality School (Roi-Et Municipal Sport School) that were not a sample to analyse the difficulty index, discrimination and reliability found that:

4.1) All of the environmental conservation knowledge tests had an available difficulty index level; the lowest 0.40 and the highest 0.60 using criteria for classifying high and low groups analysis of the discrimination to classify each item with a value of 0.20 and above found that all questions have discrimination at a valid level; 0.20 - 0.60. The reliability of the knowledge test using the α - Cronbach Coefficient method was found that there is a confidence factor of 0.924, indicated that all tests of knowledge comply with an acceptable value of 0.70 or higher, which can be used to collect data.

4.2) All of the environmental ethics tests had available discrimination at a valid level; 0.30 - 0.59. The reliability of the environmental ethics test using the α - Cronbach Coefficient method was found that there is a confidence factor of 0.957, indicated that all tests of environmental ethics comply with an acceptable value of 0.70 or higher, can be used to collect data.

4.3) All of the environmental volunteers tests had available discrimination at a valid level; 0.20 - 0.80. The reliability of the environmental volunteers test using the α - Cronbach Coefficient method was found that there is a confidence factor of 0.938, indicated that all tests of environmental volunteers comply with an acceptable value of 0.70 or higher, can be used to collect data.

5) Revised the tools used for measurement and evaluation and make them complete to collect data with the sample.

7. Data collection

In the development of environmental school activities using Team Work Based Learning for students of Mueng Roi-Et municipality schools, the researcher divided the data collection into 2 phases: phase 1; development of environmental conservation school activities using Team Work Based Learning for students of Wat Sa Thong

Municipality School Roi-Et Province, phase 2; environmental conservation school activities using Team Work Based Learning which information is collected in both phases is as follows:

Phase 1: development of environmental conservation school activities using Team Work Based Learning for students of WatSa Thong Municipality School Roi-Et province.

1) Study detailed information about environmental conservation to determine the purpose and content the data used to create the manual activity.

2) Learn the principles and methods for creating a document-based activity guide, related books and research to determine activities related to environmental conservation to create an activity guide, namely the importance of the manual, manual purpose activity content techniques and methods of organizing activities and evaluation of each activity.

3) The researcher has developed a school activity manual using Team Work Based Learning for students of MuengRoi-Et municipality schools to contain content and set the scope of activities related to the school to protect the environment in all 6 activities, consisting of:

Activity unit 1: water and effluent management in schools.

Activity unit 2: energy in schools.

Activity unit 3: school environment.

Activity unit 4: occupational and school safety.

Activity unit 5: solid waste and school sewage management.

Activity unit 6: trees in the school.

4) Bring an environmental school activity manual using Team Work Based Learning for students of MuengRoi-Et municipality schools created for 5 experts to assess the suitability of the activity manual, an open-ended rating scale was created at the end of the assessment form to ask opinions and suggestions.

5) Modify according to the advice of experts and bring the school activity manual using Team Work Based Learning for students of MuengRoi-Et municipality schools in order to do activities with 47 sample students which are students in the grade 10 - 12, Wat Sa Thong Municipality School, Muang District, Roi-Et Province in the environmental clubby purposive sampling.

Phase 2: Environmental conservation school activities using Team Work Based Learning for students of Wat Sa Thong Municipality School Roi-Et province.

1)The duration of the activities is 12 times, 3 hours each time, a total of 36 hours (as in Table 2). The venue for the event is Wat Sa Thong Municipality School, Muang District, Roi-Et, and the participants who were 47students in the grade 10 - 12, Wat Sa Thong Municipality School, Muang District, Roi-Et who are in the environmental protection club.

Table 2. Schedule for organizing environmental school activities.

Time	Activity unit	Duration (hours)
1-2	Activity unit 1: water and effluent management in schools.	6
3-4	Activity unit 2: energy in schools.	6
5-6	Activity unit 3: school environment.	6
7-8	Activity unit 4: occupational and school safety.	6
9-10	Activity unit 5: solid waste and school sewage management.	6
11-12	Activity unit 6: trees in the school.	6
Total		36

2) Preparation before the event the researcher has prepared documents for activities such as the school environmental conservation activity manual using Team Work Based Learning for students of Wat Sa Thong Municipality School

Roi-Et province, knowledge about environmental conservation test, environmental ethics test and environmental volunteers test.

3) Take a test before studying with knowledge about environmental conservation test, environmental ethics test and environmental volunteers test that the researcher created.

4) Conduct an environmental conservation school activities using Team Work Based Learning for students of MuengRoi-Et municipality schools using Team Work Based Learning in 5 steps:

4.1) Objectives of the work on environmental conservation in schools.

4.2) Plan work methods to conserve the school environment.

4.3) Practice on the school environmental conservation plan.

4.4) Presentation of the results by having each group of students present the guidelines for environmental conservation in the school.

4.5) Evaluate the work by completing exercises at the end of the chapter, namely a test on knowledge about environmental conservation test, environmental ethics test and environmental volunteers test as well as jointly conclude on environmental conservation in schools.

8. Research statistics

The statistics used to analyze the data in this research the details are as follows:

1) Basic statistics such as frequency, percentage, mean and standard deviation.

2) Statistics test the performance of the tool, including: 2.1) The suitability of the environmental conservation school activity manual. 2.2) Conformity index value. 2.3) Difficulty of the environmental conservation knowledge test. 2.4) The power to classify each item of the questionnaire using Item-total correlation. 2.5) The confidence according to Cronbach's alpha coefficient formula. 2.6) Process efficiency factor (E_1). 2.7) Result efficiency factor (E_2). 2.8) Effectiveness Index (E.I.)

3) Statistics test results and hypotheses at the .05 level of statistical significance, including: 3.1) Paired t-test. 3.2) One-Way MANOVA. 3.3) One-Way MANCOVA. 3.4) Univariate Test. 3.5) Comparisons of each pair according to Scheffe's method in One-Way ANOVA.

Results

1. The effect of developing an environmental school activity manual using Team Work Based Learning (TWBL) for students of MuengRoi-Et municipality schools on Efficiency Criteria 80/80 (E_1/E_2) and an analysis of Effectiveness Index (E.I.) of the environmental school activity manual.

1.1 The effect of the developing an environmental school activity manual the efficiency of the 80/80 criterion (E_1/E_2) was found that the process efficiency (E_1) was 87.31% and the efficiency of the outcome (E_2) was 85.81%. Therefore it has an efficiency of 87.31/85.81 which meets the criteria set as in Table 3.

Table 3. Results of the Efficiency Criteria of the environmental school activity manual according to criteria 80/80 (E_1/E_2).

Environmental school activity manual	Full score	$\bar{x}$	S.D.	percent
Process efficiency (E_1)	60	52.83	2.31	87.30
Efficiency of results (E_2)	60	51.48	2.23	85.81

Performance of manual 87.30/85.81

1.2 The effect of the Effectiveness Index (E.I.) study of the environmental school activity manual found that the effectiveness index of the environmental school activity manual was 0.7322, meaning that the students had

knowledge of environmental conservation increased and resulted in students having increased learning progress after using the activity manual 73.22% as shown in Table 4.

Table 4. Results of the Effectiveness Index (E.I.) study of the environmental conservation school activity manual.

Sum of knowledge points before the activity	Sum of knowledge points after the activity	Number of participants	Full score of knowledge	Effectiveness Index (E.I.) of the manual
1,326	2,420	47	2,820	0.7322

2. The effect of study and comparison of knowledge about environmental conservation, environmental ethics and environmental volunteerism by using t-test (Paired Samples) before and after the activity.

2.1 The effect of comparing students' average knowledge about environmental conservation, students had an average score of knowledge about environmental conservation before the activity, students had a moderate overall knowledge average ($\bar{x} = 28.21$) and after the overall activity was at the highest level ($\bar{x} = 51.48$). When comparing the knowledge average score of environmental conservation before and after the activity, it was found that after the activity, the students had mean scores of knowledge about environmental conservation higher than before the activity statistically significant level. 05 as shown in Table 5.

2.2 The effect of comparing the environmental ethics mean score of the students showed that the students had the average score of environmental ethics. Before the activity, the students had an overall the average score of environmental ethics for relatives and friends level ($\bar{x} = 2.08$) and after this activity, students had an overall the average score of environmental ethics for correctness and goodness ($\bar{x} = 3.77$). When comparing the average score of environmental ethics before and after the activity, it was found that after the activity, the students had the average score of environmental ethics higher than before the activity statistically significant level. 05 as shown in Table 5.

2.3 The effect of comparing the environmental volunteer scores of students showed that the students had the mean scores of environmental volunteer before the activity, students had a least overall mean score of environmental volunteers at least level ($\bar{x} = 2.45$) and after the activity, the students had overall mean score of environmental volunteers at high level ($\bar{x} = 3.90$). When comparing the mean score of environmental volunteer before and after the activity, it was found that after the activity, the students had mean score of environmental volunteers higher than the before the activity statistically significant level. 05 as shown in Table 5.

Table 5. Results of comparison of knowledge about environmental conservation, environmental ethics and environmental volunteers using t-test (Paired Samples) (n = 47).

List	Before activity		Level	After activity		Level	t	df	p
	$\bar{x}$	S.D.		$\bar{x}$	S.D.				
knowledge (N = 60)	28.21	2.48	Moderate	51.48	2.23	Highest	-66.18	46	.001*
environmental ethics (N = 4)	2.08	0.11	For relatives and friends	3.77	0.06	For correctness and goodness	-76.37	46	.000*
Environmental volunteers (N = 5)	2.68	0.13	Least	4.26	0.26	High	-36.57	46	.000*

* Statistically significance . 05

3. The effect of study and comparison of knowledge about environmental conservation, environmental ethics and the environmental volunteerism of students with gender and different grades level were found that

3.1 There was no difference of mean scores of knowledge about environmental conservation, environmental ethics and environmental volunteers of students with different genders in Table 6-7.

Table 6. The results of the comparison of the multiple variance of knowledge about environmental conservation, environmental ethics and environmental volunteers of students of different genders using One-Way MANOVA.

Test statistics	Value	Hypothesis df	Error df	F	p
Pillai's Trace	.055	3.000	43.000	.833	.483
Wilks' Lambda	.945	3.000	43.000	.833	.483
Hotelling's Trace	.058	3.000	43.000	.833	.483
Roy's Largest Root	.058	3.000	43.000	.833	.483

Table 7. One-way analysis of covariance of environmental conservation knowledge, environmental ethics and environmental volunteers after the activities of students of different genders using pre-test scores is a common variable (One – Way MANCOVA).

Early variant	Dependent variable	SS	df	MS	F	p
Genders	knowledge	6.886	1	6.886	1.390	0.245
	environmental ethics	0.003	1	.003	0.687	0.411
	Environmental volunteers	0.004	1	.004	0.059	0.809

3.2 There was difference of mean scores of knowledge about environmental conservation, environmental ethics and environmental volunteers of students with different grade level statistically significant level. 05. And when testing the Univariate Test, it was found that there was difference of mean scores of knowledge about environmental conservation and environmental ethics of students with different grade level statistically significant level. 05, whereas the environmental volunteers was not difference as shown in Table 8-9.

Table 8. Comparison of the multiple variance of environmental conservation knowledge, environmental ethics and environmental volunteers of students with different grades level using One-Way MANOVA.

Test statistics	Value	Hypothesis df	Error df	F	p
Pillai's Trace	.459	6.000	86.000	4.271	.001*
Wilks' Lambda	.547	6.000	84.000	4.936	.000*
Hotelling's Trace	.819	6.000	82.000	5.595	.000*
Roy's Largest Root	.806	3.000	43.000	11.546	.000*

* Statisticallysignificance . 05

Table 9. The results of comparing the one-way variance of knowledge on environmental conservation, environmental ethics and environmental volunteers of students with different grades level using Univariate Test.

Dependent variable	variance	SS	df	MS	F	p
knowledge	Contrast	73.436	2	36.718	10.336	.000*
	Error	156.308	44	3.552		
environmental ethics	Contrast	.040	2	.020	5.390	.008*
	Error	.165	44	.004		
Environmental volunteers	Contrast	.149	2	.074	1.077	.349
	Error	3.037	44	.069		

* Statisticallysignificance . 05

3.3 There was no difference of mean score of knowledge about environmental conservationand environmental ethics of the grade 10 students and grade 11students. There was difference of mean score of knowledge of environmental conservationand environmental ethics of the grade 10 students and grade 12 students statistically significant level.

05. There was difference of mean score of knowledge of environmental conservation and environmental ethics of the grade 11 students and grade 12 students statistically significant level. 05 as in Table 10-11.

Table 10. The results of the comparison of knowledge about environmental conservation of students with different grade levels in pairs according to the Scheffe method.

Grade levels	$\bar{x}$	Grade 10	Grade 11	Grade 12
		50.26	50.93	53.18
Grade 10	50.26	-	.616	.000*
Grade 11	50.93	-	-	.006*
Grade 12	53.18	-	-	-

* Statisticallysignificance . 05

Table 11. The results of the comparison of environmental ethics on environmental conservation of students with different grade levels in pairs according to the Scheffe method.

Grade levels	$\bar{x}$	Grade 10	Grade 11	Grade 12
		3.81	3.78	3.73
Grade 10	3.81	-	.616	.009*
Grade 11	3.78	-	-	.142
Grade 12	3.73	-	-	-

* Statisticallysignificance . 05

3.4 There was difference of mean scores of knowledge about environmental conservation and environmental ethics of students with different grade level statistically significant level. 05. Whereas the environmental volunteers was not difference as shown in Table 12.

Table 12. One-way analysis of covariance of environmental conservation knowledge, environmental ethics and environmental volunteers overall, after the activities of students with different grades level using the pre-test score was used as a common variable (One – Way MANCOVA).

Dependent variable	variance	SS	df	MS	F	p
Grade levels	knowledge	73.436	2	36.718	10.336	.000*
	environmental ethics	.040	2	.020	5.390	.008*
	Environmental volunteers	.149	2	.074	1.077	.349

* Statisticallysignificance . 05

Discussions

The development of environmental school activities using Team Work Based Learning for students of MuengRoi-Et municipality schools was discussed the results of the study as follows:

1.The development of environmental school activities manual using Team Work Based Learning for students of MuengRoi-Et municipality schools, it was found that:

1.1) Environmental school activity manual using Team Work Based Learning for students of MuengRoi-Et municipality schools process efficiency (E_1) was 87.31 percent and the efficiency of the result (E_2) accounted for 85.81 percent. Therefore it has an efficiency of 87.31/85.81, which meets the set criteria, due to the environmental school activity manual each unit has a variety of activities, that according students to learn by discussed the level of effectiveness themselves [7] of the manual to help the trainers learn to a level that the training provider would be satisfied with. If a manual is effective to that level, it is valuable and can be put into training. Media efficacy based on manual evaluation criteria. It is a review or evaluation of the effectiveness of a popular manual that assesses it as a guide for group activities or a skill training form the assessment criteria for the cognitive content category will use

the 80/80 standard [8]. This is consistent with the research of Pongphila, P. et.al. [9] conducted a study of the results of teaching about life and the environment using the Yonisomnsikarn learning model and the normal form affecting learning of students Mathayomsuksa 3, found that the learning management plan using the Yonisomnsikarn learning model its efficiency is 88.81/86.25. And Arthivichai, W. & Pansuphawatt, A. [10] found that a set of science learning activities on environmental conservation and development by using local learning resources as a base. It has E_1/E_2 efficiency of 79.27/83.08, which is higher than the specified threshold. And Cumrae, N., Toomhome, P., Momkuntod, S. [11] found that the effectiveness of the training manual for green product consumption efficiency is 80.70/83.68, so it shows that environmental school activity manual being efficiency, effecting in increased students' knowledge.

1.2) Effectiveness index of the environmental school activity manual using Team Work Based Learning for students of Mueng Roi-Et municipality schools, the value was 0.7322, meaning that students had increased knowledge of environmental conservation and resulted in 73.22 percent of students progressing after using the environmental school activity manual. This is result of the environmental school activity manual developed by the researcher as a student-centered activity model and has passed the audit process by experts as a result, students have more academic progress. The effectiveness index is a value that indicates the progress of the participants' learning by comparing the score added from the pre-training test score with the score obtained from the post-training test [12], to run the training it is a process that brings together courses and resources, to perform in accordance with the objectives specified. The implementation of training or teaching methods is at the heart of education in all disciplines because it allows the trainee or learner to achieve the aim of the training or teaching of that subject [13]. This is consistent with the research of Piwkaao, O., & Salee, B. [14] developed a training manual on natural resources and environment, ASEAN: Kingdom of Cambodia it was found that the effectiveness index of the training manual was 0.8804. And Pongphila, P. et.al. [9], found that the learning management plan using the Yonisomnsikarn learning model has an effectiveness index of 0.6753. And Wongchantra, P., Wongchantra, K., Kombusadee, T., Punatung, Y. [15] found that the manual has an effectiveness index (E.I) of 0.7500. So it showed that environmental school activity manual is effective and appropriate, resulting in students having a good understanding of the content of the manual.

2. Study and compare knowledge about environmental conservation, environmental ethics and the environmental volunteer before and after the activity was found that:

2.1) After the activity, the students had mean scores of knowledge about environmental conservation higher than before the activity. This is due to the environmental school activity manual, there are many techniques and learning activities. It is an activity that students have to do in real practice, able to study and research by themselves, creating an effective learning process. In which knowledge is the perception of facts various detailed events resulting from observation, study, experience in both natural and social environment, basic knowledge or individual background that has been memorized or collected and can be expressed in observed or measured behavior [16]. And in organizing activities to achieve effective learning and achieve the aims of learning or teaching that subject various methods are required take into account together [13]. This is consistent with the research of Erdogan, M. [17] found that the students who participated in the summer environmental education have increased knowledge of the environment. And Aliman, M., Sumarmi, B. & Astina, K. [18] found that students who had learned the earth community form in a geography class have a higher knowledge of environmental problems. And Charoensook, K. Wongchantra, P., Salee, B. & Jansamood, Ch. [19] found that the second grade students after the training on the conservation of local vegetables in the Songkhram River Basin have a higher knowledge score than before the training. And Namuangrak, N., Wongchantra, P. [20] found that the sample group that passed the fishery resource conservation training in the Ubolratana Dam increased knowledge. And Kullrawong, T., Sirisamphan, O. [21] found that the learning achievement of the environmental crisis using case studies and problem solving of Mathayomsuksa 2 students after studying higher than before studying. So it shows that environmental school activities are appropriate as a result, students have increased their academic progress.

2.2) After the activity, the students had the average score of environmental ethics higher than before the activity. This is a result of each unit of the school's environmental conservation activities that the researcher has developed consists of 6 activities: water and wastewater management in schools, energy in school, environment in school, occupational and school safety, management of solid waste and school sewage and trees in school. Each activity unit is content that corresponds to the daily life of the students. There are activities interfering with ethics affect the behavior of environmental conservation within the school which teaching and training values the importance of the natural environment. Humans should be taught and taught that the environment is of vital importance to the existence

of human life. Humans cannot survive if environmental conditions are severely degraded or degraded [22]. Environmental ethics is an environmental practice for humans that is based on integrity, correctness according to morality and compassion to treat the environment. Which will have an impact on life and on human beings together. In order for humans to treat the environment, there are foundations of different moral beliefs at different levels of environmental impacts [13]. This is consistent with the research of Wongchantra, P., Wongchantra, K., Kwaenthaisong, U. & Phumdandin, P. [23] found that the students who passed the environmental science course have higher environmental ethics before studying. And Wongchantra, P., Limmanee, P., Wongchantra, K., Nanthasomboon, K., Tapa, S., a Jarnkaew, L. [24] studied environmental ethics in teaching ecology for environmental studies, found that students studying ecology principles for environmental studies by inserting environmental ethics have higher environmental ethics before studying. And Krulit, P., Suthirat, C. [25] found that after participating in the environmental camp activities, students had higher environmental ethics than before participating in the activities. And Shounchupon, A. [26] found that the students who studied the courses of human life and environmental ethics have higher environmental ethics after studying. So it shows that school environmental conservation activities, there are activities that contain morality environmental ethics as a result, the students who participated in the activities have increased environmental ethics.

2.3) After the activity, the students had mean score of environmental volunteers higher than the before the activity. This is the result of the volunteer mindset as a shared person's consciousness volunteer people will demonstrate behaviors that volunteer to benefit the public. Through all 6 activities, activities are promoted and interpolated to enable students to develop environmental volunteer behavior. The nature of volunteer behavior is a behavior that results from an awareness of the value of using things that belong to the common one and for the sake of the common good. Cooperation in various activities in society or community maintaining the public domain is avoiding the use or act that will cause damage to the common use of the public [27]. Volunteering comes from being cultivated since childhood, from families and schools and raising awareness through activities that help and benefit others [28]. This is consistent with the research of Wongchantra, P., Wongchantra, K., Kaeongam, S., Ongon, S., Junkaew, L., Sookngam, K. & Praimee, U. [29] found that MathayomSuksa 4-6 students at Na ChueakPittayasan School, Na Chueak District, Mahasarakham Province, the average score of volunteerism prior to the training was higher than that of the environmental volunteer development training. And Niyomdech, N., Sabaiying, M. [30] found that the students who participated in environmental public consciousness activities after participating in the activities were able to demonstrate higher environmental awareness than before participating in the activities. And Wongchantra, P., Boonserm, W., Wongchantra, K., Chanwirat, W., Praimee, U., Ongon, S. [31] found that the students who studied using the flipped classroom learning method had a more volunteer environment after learning than before.

3. Study and compare knowledge about environmental conservation, environmental ethics and the environmental volunteerism of students with gender and different grade level were found:

3.1) There was no difference of mean scores of knowledge about environmental conservation, environmental ethics and environmental volunteers of students with different gender. As a result of all students, whether female or male, all participated in an environmental school that has a process and has 6 equal units of activity. And in each unit there will be an interpolation of moral and ethical activities in order to strengthen students' environmental volunteers. The training is a process or activity organized to develop skills, expertise, and knowledge. This will result in a change in attitudes and behavior in work effectively without limitation of education, location and gender [32]. And to change the behavior, it is necessary to be aware of how it behaves towards natural resources and the environment. Taking into account the survival of oneself and the public in the future try to understand the nature and possibilities of various systems. In nature in order to improve their behavior in order to be as consistent and harmonious as possible with nature [33]. Therefore, to have environmental ethics, it is essential to create and cultivate people to have a good conscience for nature, the environment [22]. Which in the process of volunteering that creates from oneself build confidence in oneself for volunteers, there should be activities that help and do things that benefit others [28]. This is consistent with the research of Chandapan, D., Wongchantra, P. & Sali, B. [34] found that gender had no effect on knowledge about natural resource and environment conservation. And Suparat B., Singsewo A., Pinyoanunt B. & Thamaseana P. [35] found that the youth in Ban Khao Phra community, Nakhon Nayok Province, that training practices in forest conservation and restoration who have different genders and have no different knowledge in the field of environmental ethics. And Shounchupon, A. [26] found that male students and female students had no different results in developing environmental ethics. And Pawanna, P. [36] found that male and female students of the institute of physical education had no differences in morality, ethics, and individual aspects and in the field of

environmental volunteerism. And Kansaat, P. [37] it was found that male students and female students had no different social responsibility. And Srisoonthornwohan, S. [38] found that students of different sexes showed no different in public mental behavior overall.

3.2) There was difference of mean scores of knowledge about environmental conservation and environmental ethics of students with different grade level, whereas the environmental volunteers was not difference. As a result of environmental school activities it is an activity that integrates the concept of environmental education with the contents of the environment to provide students with knowledge and understanding as a result of the learning process and real practice. However, it depends on the original knowledge of each class of different students. In addition, environmental studies are limited especially in both formal and informal studies. Therefore, a curriculum on environment should be included in the education system [39]. The school therefore plays an important role in helping students learn from hands-on experience resulting from real practice and grow up to be an environmental citizen ready to act responsibly [40]. The integration with the environmental education process is a process that will make people appreciate and understand the principles of the relationship between humans and the environment, which will lead to the development of attitudes, awareness and responsibility for environmental preservation. This includes developing the skills in making decisions about the environment and creating good ethical practices in treating the environment for good environmental quality [41]. Enhancing environmental ethics in addition is education for the knowledge and understanding of the realities of the environment surrounding the human being in accordance with the teaching and learning activities, the environmental principles, there should be a practice that supports the environment or destroys the environment to a minimum. Human development in all areas, so be careful of the impact on the environment because destroying the environment is equal to the destruction of human beings [13]. In the development of various fields should not be too much economic. Because of the emphasis on economic development alone, the use of natural resources is burnt out. There should be a lot of emphasis on social development at the same time, known to solve problems and share a sense of responsibility [22]. This is consistent with the research of Siripongouthomporn, P., Wongchantra, P., Sali, B. [42] found that the network of volunteers to protect the natural resources and the village environment with different grade levels and knowledge of natural resource conservation and environment, water resource management. And Sakulratanakulchai, S. [43] found that the model of proactive learning management in different classes influence the self-learning competencies of students. And Cheatea, M., Phuchinda, W. [4] found that students with different grades, there are different environmental conservation behaviors in schools. And Khamta, J., Warintornnuwat, S. [44] found that the students who were studying at different grades levels of the year were different have different morality and overall ethics. And Wachirayano, K., Srinok, S., Siriwat, C., Khonsue, C. [45] found that students at different grades levels have different opinions on upholding morality and ethics. So it shows that Students with different grade levels have different knowledge about environmental conservation and environmental ethics.

There was no difference of mean scores of environmental volunteers of students with different grade levels. As a result of environmental school activities it is learning that is student-centered. There are activities that promote cooperation within the group this makes it possible to brainstorm and express the behavior of each student makes no difference in volunteerism. The volunteer is a person's consciousness towards society as a whole through caring and helping. Where people with volunteer show behaviors that volunteer to benefit the public [46]. Volunteer behavior in the area of social responsibility is study intention dare to offer opinions in a constructive way to society, persistence help others interested in social problems and propose ideas for solving them [27]. The process of creating a conscious and environmentally appropriate behavior will take place it must arise from planning and effective teaching and learning processes [13]. In which, in the school environmental conservation activities, there is a promotion activity for students to have a public mind and passed a process of evaluating by experts as to whether it is appropriate. When used to teach, students have a volunteer environment that is no different. This is consistent with the research of Srisoonthornwohan, S. [38] found that the students who studied in different years had public psychological behavior. overall was no different. And Kota, P., Tungsomworapongs, S., Wattananarong, A. [47] found that the monks who studied in different years had no different overall public consciousness. And Nakaseni, S., Panchapalinkul, C., Moon, S. [48] found that students with different grade level. There was no difference in overall public mental behavior. So it shows that students with different grade level when going through environmental school activities. There is no difference in environmental volunteers.

Conclusion

The development of environmental school activities using Team Work Based Learning(TWBL) for students of MuengRoi-Et municipality schools was found that

- 1) The environmental school activities using Team Work Based Learning for students of MuengRoi-Et municipality schools was the efficiency of 87.31/85.81, the efficiency index was a value of 0.7322.
- 2) In the post-test, the students had an average score of knowledge about environmental conservation, environmental ethics and environmental volunteers higher than the pre-test statistically significance ($p < .05$).
- 3) There was no different of mean score of knowledge about environmental conservation, environmental ethics and environmental volunteers of students with different gender ($p > .05$) and there was statistically significant different of score of knowledge about environmental conservation, environmental ethics of students with different grade level ($p < .05$), but there was no difference of mean score of environmental volunteers.

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