

Teaching Environmental Education Using Song - Based Learning to Enhance Environmental Knowledge, Attitudes, and Ethics for Primary School Students

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Abstract

The environmental problems are important. Environmental education is used to solve them. It helps students have to knowledge, attitudes, and ethics. The purposes were to develop an environmental education lesson plan using Song-Based Learning (SBL) to be effective and efficient according to the specified criteria, to study knowledge, attitudes, and ethics using songs-based learning on pre-test and post-test, and of students with different genders. The sample used in this research consisted of 39 students from class 6/4 at Anubanmuang-atsamat school, Atsamat district, Roi Et province, being selected using simple random sampling. The research tools included an environmental education lesson plan using SBL, an environmental knowledge test, an environmental attitudes test, and an environmental ethics test. The statistics used in data analysis were frequency, percentage, mean, and standard deviation, Item-Objective Congruence (IOC), reliability index, discrimination index, difficulty index, process efficiency index (E1), outcome efficiency index (E2), and effectiveness index (E.I.), and Paired t-test, F-test (One-Way Multivariate Analysis of Variance) statistically significant at the level of .05. The research showed that 1) The environmental education lesson plan using SBL was an effectiveness score of 90.60/86.92, meeting the criteria, an effectiveness index (E.I.) of 0.6328. This indicates that students' knowledge increased and that the plan resulted in a 63.28% improvement in learning after its implementation. 2) After the lesson, students' average scores on environmental knowledge, attitudes, and ethics were significantly higher than before the lesson statically significant at the level of .05. 3) There were differences of environmental knowledge scores of students of different genders statistically significant at the level of .05., but no differences in environmental attitudes and ethics between students of different genders.

Keywords: environmental education, lesson plan, song - based learning, knowledge, attitude, environmental ethics

1. Introduction

Humans and the environment have been interconnected since the very beginning of human existence on Earth. The environment is therefore a crucial factor in determining human lifestyles and quality of life. Human survival depends on necessities: food, water, air, and other natural resources, all of which are obtained from nature or the environment. Currently, humans are using more natural resources. This is due to population growth, which has led to the rapid depletion of these resources. As a result, the environment cannot recover quickly enough, leading to environmental problems (Worasayan, 2021).

Environmental education is an educational process aimed at developing the population's knowledge and understanding of the environment, fostering awareness of environmental problems, and cultivating an appreciation for natural resources. It focuses on developing human potential to become skilled in problem-solving, enabling them to participate in solving environmental issues, and allowing them to live in harmony with nature (Piemongsarn, 2025). It can be seen that environmental education is an educational process that emphasizes providing knowledge about the physical and social environment, both tangible and intangible, that causes environmental changes and their

impact on humans. This aims to create attitudes, behaviors, and values related to conserving and developing the quality of the environment and the quality of life for oneself and society as a whole (Weerawatthanont, 2012). Therefore, environmental education encompasses many dimensions: social and cultural, belief and spiritual, economic, and technological. Because the nature of environmental education content is integrated into and relevant to all subjects, it is crucial that teachers understand and recognize the importance of environmental education and then integrate it into their curriculum and activities in a relevant and appropriate manner (Chankaew, 2003).

Using music in teaching is considered an innovative approach to learning management. Incorporating music into lessons is novel and can effectively stimulate student interest. Music makes lessons more engaging, fun, and enjoyable, motivates students, helps retain content, creates a lasting impression, and simplifies the learning process (Koinok et al. (2025).

The environmental education lesson plan using SBL consists of five steps: 1) introduction to the lesson, 2) presentation of songs to the students, 3) singing the song together by the teacher and students, 4) discussion of the content and the song by the teacher and students, and 5) a lesson summary.

Therefore, the researchers were interested in studying environmental education lesson plans using SBL. A total of five lesson plans were studied: Forest Conservation, Humans and Nature, A Livable World: Collaborative Care, Marine and Coastal Conservation, and Global Warming. It is a guideline for promoting teaching and learning activities at the primary school. This approach offers a diverse learning style that students can adapt, fostering varied learning experiences and creating engaging motivation. It aims to engage students and promote their development of greater knowledge, attitudes, and environmental ethics.

2. Research Objective

2.1) To develop an environmental education lesson plan using SBL that is effective and efficient according to the specified criteria.

2.2) To study and compare environmental knowledge, attitudes, and ethics using SBL on pre-test and post-test.

2.3) To study and compare the environmental knowledge, attitudes, and ethics of students with different genders.

3. Method

3.1 Research Conceptual Framework

Teaching environmental education using SBL consists of five steps: Step 1) introduction to the lesson, Step 2) presentation of songs to the students, Step 3) singing the song together by the teacher and students, Step 4) discussion of the content and the song by the teacher and students, and Step 5) a lesson summary. It consists of 5 lesson plans: Lesson Plan 1: Forest Conservation; Lesson Plan 2: Humans and Nature; Lesson Plan 3: A Livable World: Collaborative Care; Lesson Plan 4: Marine and Coastal Conservation; and Lesson Plan 5: Global Warming. The research tools used included a lesson plan for environmental education using SBL, an environmental knowledge test, an environmental attitude test, and an environmental ethics test. These tools were reviewed by three experts. The tool was then tried out with 30 students in Grade 6/3 at Anubanmuang-atsamat school, Roi Et province, Atsamart district, Roi Et province. Afterward, the tool was used with a sample of 39 students in Grade 6/4 at the at Anubanmuang-atsamat school, selected using simple random sampling, as shown in Figure 1.

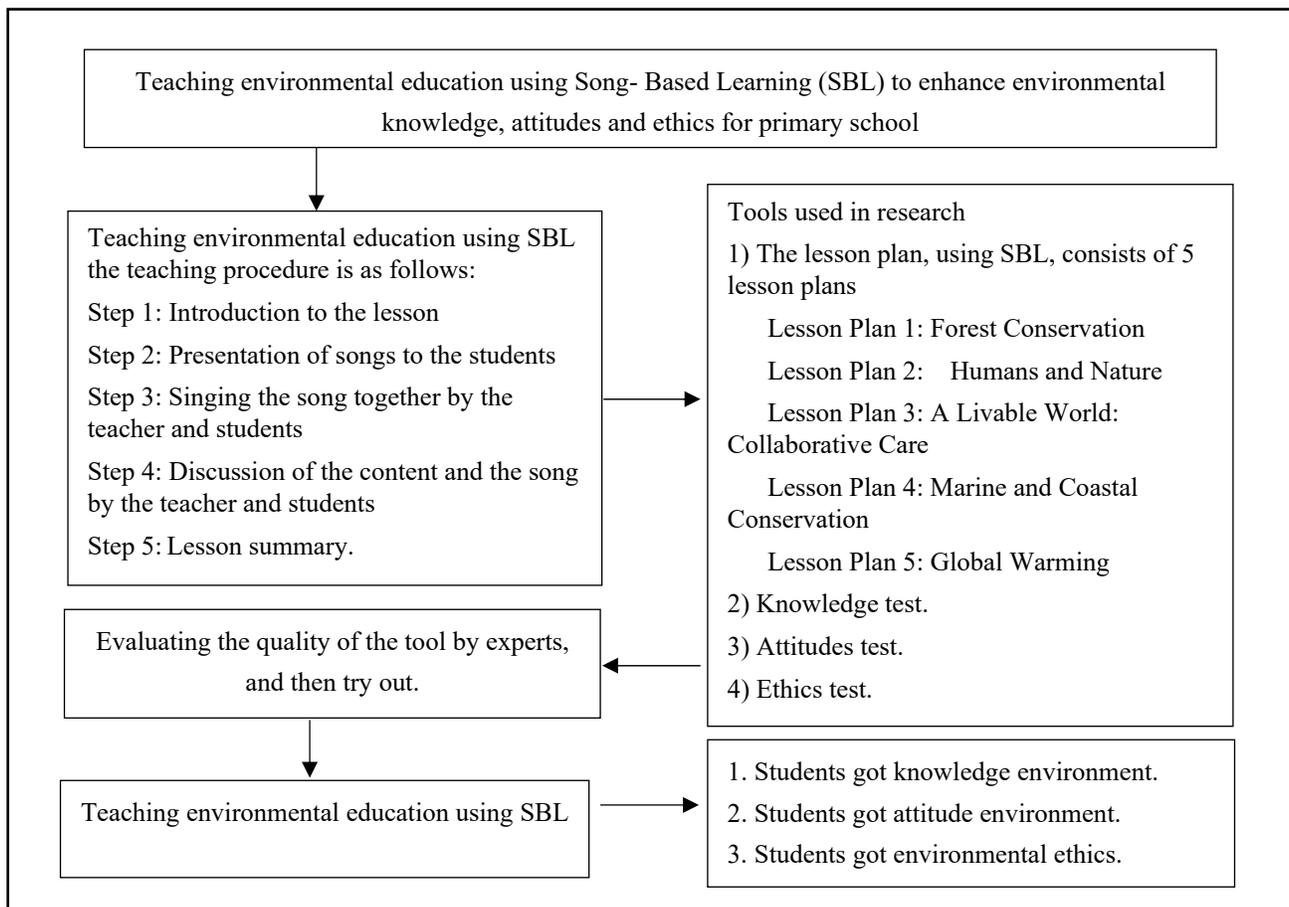


Figure 1. Conceptual Research Frame Work

3.2 Population and Sample

1) The population used in this study consisted of 142 students in the 6th grade at Anubanmuang-atsamat school, Atsamat district, Roi Et province, comprising 73 males and 69 females.

2) The sample consisted of 39 students from class 6/4 at Anubanmuang-atsamat school, Atsamat district, Roi Et province, selected using simple random sampling.

3.3 Variables Studied

1) Independent variables:

1.1) Teaching environmental education using Song - Based Learning (SBL)

1.2) gender

2) Dependent variables:

2.1) Environmental knowledge

2.2) Environmental attitudes

2.3) Environmental ethics

3.4 Tools and How to Assess Their Quality

The tools are as follows:

3.4.1 Tools for Dissemination

The environmental education lesson plans using SBL, consist of 5 lesson plans: Lesson Plan 1: Forest Conservation;

Lesson Plan 2: Humans and Nature; Lesson Plan 3: A Livable World: Collaborative Care; Lesson Plan 4: Marine and Coastal Conservation; and Lesson Plan 5: Global Warming. The following steps outline the process for creating and ensuring the quality of tools:

- 1) Review research documents related to environmental education lesson plan.
- 2) The scope and content structure of it using SBL.
- 3) It was presented to three experts.
- 4) When considering the suitability of the environmental education lesson plan using SBL, it was found that the IOC was a mean value of 0.93 and a suitability value of 4.70, which is at the highest level. This indicates that the suitability of the environmental education lesson plan using Songs - Based Learning is suitable for pilot testing.
- 5) Try out an environmental education lesson plan using SBL conducted with 30 students from class 6/3 at Anubanmuang-atsamat school, Atsamat district, Roi Et province, who were not part of the sample.

3.4.2 Measurement and Evaluation Tools

The process of creating and evaluating the quality of measurement and evaluation tools involves the following steps:

- 1) Environmental knowledge test.
 - 1.1) Study basic information, documents, and related research to guide the creation of a knowledge test.
 - 1.2) Create an environmental knowledge test. It will be a multiple-choice test with 30 questions (4 options per question: A, B, C, D). Each correct answer will receive 1 point, and each incorrect answer will receive 0 points. The total score is 30 points.
 - 1.3) The environmental knowledge test was presented to three experts. After reviewing the test's content validity, the Index of Content Validity (IOC) averaged 1.00, indicating that all questions were accurate in content and objectives, making them suitable for data collection.
 - 1.4) The environmental knowledge test was revised and improved after receiving feedback from experts.
 - 1.5) A pilot test on the environmental knowledge test was administered to 30 students in grade 6/3 of Anubanmuang-atsamat school, Atsamat district, Roi Et province. The difficulty level of the test ranged from 0.37 to 0.79, the discrimination index per item ranged from 0.27 to 0.79, and the reliability of the entire test, calculated using Crownbach's Alpha coefficient, was 0.914. This indicates that all test items met acceptable standards (Wanichbuncha, K., 2002). and can be used for data collection.
- 2) Environmental attitude test.
 - 2.1) Study background information from relevant research documents to guide the development of an environmental attitude test.
 - 2.2) The data was used to create an environmental attitude test consisting of 30 questions with three levels of responses: Agree, Unsure, and Disagree.
 - 2.3) The environmental attitude test was presented to three experts. After reviewing its content validity and appropriateness, IOC was an average value of 1.00 indicating that all questions were contentious and aligned with the objectives making them suitable for data collection.
 - 2.4) The environmental attitude test was pilot-tested with 30 students in grade 6/3 at Anubanmuang-atsamat school, Atsamat district, Roi Et province, who were not part of the sample. The item discrimination power was calculated and found to be between 0.21 and 0.50. The reliability of the entire scale, calculated using Crownbach's Alpha coefficient, was 0.829, indicating that all questions met acceptable criteria (Wanichbuncha, 2003). Therefore, the scale can be used for data collection.
- 3) Environmental ethics test
 - 3.1) Study background information from relevant research documents to guide the development of an environmental ethics test.
 - 3.2) The data were used to create an environmental ethics test. It is a multiple-choice questionnaire with four options (A, B, C, D) consisting of 20 questions. The criteria are categorized as prioritizing 1) for self-interest, 2) for friendship and family, 3) for society, and 4) for righteousness.
 - 3.3) It was presented to three experts for consideration of its content validity and appropriateness. The IOC was an average value of 1.00, indicating that all questions were contentious and aligned with the objectives, making them

suitable for data collection.

3.4) The environmental ethics test was pilot-tested (try out) with sixth-grade students from Anubanmuang-atsamat school, Atsamat district, Roi Et province, who were not part of the sample. The discrimination power of each item was found to range from 0.33 to 0.66. The reliability of the entire tool, calculated using Crownbach's Alpha coefficient, was 0.903, indicating that all test items met acceptable standards (Wanichbuncha, 2002). Therefore, it can be used for data collection.

3.5 Research Design

Teaching environmental education using SBL is a quasi-experimental study employing a single sample and a one-group pretest-posttest design (Saiyot and Saiyot, 1995).

3.6 Research Data Collection

The process of collecting data for an environmental education using SBL is as follows:

3.6.1 Introduction to the lesson: An environmental presentation was given using PowerPoint, and informational handouts were distributed to students. The lesson plan consisted of five modules: Lesson Plan 1: Forest Conservation; Lesson Plan 2: Humans and Nature; Lesson Plan 3: A Livable World: Collaborative Care; Lesson Plan 4: Marine and Coastal Conservation; and Lesson Plan 5: Global Warming.

3.6.2 Presentation of songs to the students. The five songs used in the five lesson plans are: Inheriting the Intention (by Sueb Nakhasathien), Life's Relationships, A Beautiful World Created by Our Hands, The Sea Fence, and Our Power to Reduce Global Warming.

3.6.3 Singing the song together by the teacher and students: The teacher and students sing the five songs used in the lesson together. The teacher sings each song from the lesson plan as an example, and the students sing along with the teacher, clapping to create a more enjoyable and fun musical atmosphere.

3.6.4 Discussion of the content and the song by the teacher and students: The teacher and students collaboratively discuss the content and songs used in the five lessons. This process involves the teacher engaging in a question-and-answer session with the students, and selecting students who volunteer to present their thoughts on the songs in front of the class. Finally, the teacher and students engage in a discussion and exchange opinions about the songs presented in each of the five lesson plans.

3.6.5 Lesson summary: The teacher summarizes the environmental education using SBL to ensure students understand the content correctly according to the objectives and to assess their performance.

3.7 Statistics Used in Research Data Analysis

3.7.1 Basic statistics: frequency, percentage, mean, and standard deviation.

3.7.2 Statistics used to test instrument effectiveness: IOC, reliability index, discrimination index, difficulty index, process efficiency index (E1), outcome efficiency index (E2), and effectiveness index (E.I.)

3.7.3 Hypothesis testing statistics: Paired t-test, F-test (One-Way MANOVA) statistically significant at the level of .05.

4. Results

4.1 Development an Environmental Education Lesson Plan Using SBL Being Effective And Efficient According to the Specified Criteria

The process efficiency (E1) was 90.60 percent, and the outcome efficiency (E2) was 86.92 percent. Therefore, the Lesson Plan for environmental education using SBL was an effectiveness score of 90.60/86.92. This meets the established 80/80 criteria, as shown in Table 1. The effectiveness index (E.I.) was 0.6328, meaning that students' knowledge increased and resulted in a 63.28 percent improvement in learning after the intervention, as shown in Table 2.

Table 1. The Results of the Performance Study Based on the 80/80 Criterion and the Effectiveness Index Lesson Plan for Environmental Education Using SBL. (E₁/E₂)

Activity	Full Score	\bar{x}	S.D.	Percentage of Average Score	Criterion
Process efficiency (E1)	30	26.92	2.38	90.60	It meets the criteria
Outcome efficiency (E2)	30	26.08	3.87	86.92	It meets the criteria
The effectiveness of the lesson plan was 90.60/86.92					

Table 2. The Effectiveness Index (E.I.) of the Environmental Education Using SBL

Pre-test score sum	Post-test score sum	Number of students	Maximum test score	Effectiveness Index (E.I.)
759	1,017	39	30	0.6328

4.2 Results of the Study and Comparison of Average Scores on Environmental Knowledge, Attitudes, And Ethics

4.2.1 Results of the study and comparison of environmental knowledge: It was found that before the lesson, students' average scores on environmental knowledge using SBL were at a moderate level ($\bar{x}= 19.46$), and after the lesson, their average scores were at a high level ($\bar{x}=26.08$). Comparing the average scores of environmental knowledges before and after the lesson, it was found that after the students was average scores of environmental knowledge lesson higher than before the lesson, at a statistical significance level of .05, as shown in Table 3.

Table 3. The Results of the Analysis and Comparison of the Average Scores of Environmental Knowledge Using SBL (n = 39)

Program	Before learning		Level	After learning		Level	t	df	p
	\bar{x}	S.D.		\bar{x}	S.D.				
Environmental knowledge (N=30)	19.46	3.62	moderate	26.08	3.89	high	-7.154	38	.000*

* Statistically significant level of .05

4.2.2 Results of the study and comparison of students' average scores of environmental attitudes using SBL before the intervention were in the "agree" level ($\bar{x}=2.55$), and after the intervention, their average scores were in the "agree" level ($\bar{x}=2.95$). Comparing the average scores of environmental attitudes using SBL before and after the intervention, it was found that after the intervention, students was average scores higher than before the intervention, at a statistical significance level of .05, as shown in Table 4.

Table 4. The Results of the Analysis and Comparison of the Average Scores of Environmental Attitude Scores Using SBL, Using a Paired T-Test before and after the Learning (n = 39)

Program	Before learning		Level	After learning		Level	t	df	p
	\bar{x}	S.D.		\bar{x}	S.D.				
Environmental Attitude (N=3)	2.55	0.20	agree	2.95	0.8	agree	-12.774	38	.000*

* Statistically significant level of .05

4.2.3 Results of the results of a comparative study on environmental ethics showed that before the intervention, students' average scores were at the level of "for social good" ($\bar{x}=3.04$), and after the intervention, their average scores were at the level of "for righteousness and goodness" ($\bar{x}=3.76$). Comparing the average environmental ethics

scores before and after the intervention, it was found that after the intervention, students was average scores higher than before the intervention, at a statistical significance level of .05, as shown in Table 5.

Table 5. The Results of the Analysis and Comparison of the Average Scores of Environmental Ethics Using SBL, Using a Paired T-Test Before and After the Learning (n = 39).

Program	Before learning		Level	After learning		Level	t	df	p
	\bar{x}	S.D.		\bar{x}	S.D.				
Environmental ethics (N=4)	3.04	0.59	For society	3.76	0.17	for righteousness	-5.161	38	.000*

* Statistically significant level of .05

4.3 Results of the Study on Knowledge, Attitudes, and Environmental Ethics Among Students of Different Genders

The study on environmental knowledge, attitudes, and ethics among students of different genders revealed that there were statistically significant differences in scores on environmental knowledge ($p < .05$) among students of different genders. However, there were no differences in environmental attitudes and ethics among students of different genders, as shown in Tables 6 and 7.

Table 6. The Results of a Multivariate Analysis of Knowledge, Attitudes, and Environmental Ethics Among Students of Different Genders Using a One-Way MANOVA

Test statistics	Value	Hypothesis df	Error df	F	p
Pillai' Trace	0.317	3.000	35.000	5.405 ^b	.004*
Wilks' Lambda	0.683	3.000	35.000	5.405 ^b	.004*
Hotelling's Trace	0.463	3.000	35.000	5.405 ^b	.004*
Roy's Largest Root	0.463	3.000	35.000	5.405 ^b	.004*

* Statistically significant level of .05

Table 7. The Results of a One-Way Comparison of Environmental Knowledge, Attitudes, and Ethics Among Students of Different Genders Using a Univariate Test

Independent variables	Dependent variables	SS	df	MS	F	p
Genders	environmental Knowledge	568.769	38	11.397	12.905	.001*
	environmental Attitudes	0.252	38	0.007	0.779	.383
	Environmental ethics	2.576	38	0.069	0.291	.593

*Statistically significant level of .05

5. Discussion

5.1 Development an Environmental Education Lesson Plan Using SBL Being Effective and Efficient According to the Specified Criteria

The results of the performance study based on the 80/80 criterion and the effectiveness index of the lesson plan for environmental education using SBL. It was found that the process efficiency (E1) was 90.60 percent, and the outcome efficiency (E2) was 86.92 percent. Therefore, the lesson plan for environmental education using SBL was an effectiveness score of 90.60/86.92. This meets the established 80/80 criteria, as shown in Table 1. The effectiveness index (E.I.) was 0.6328, meaning that students' knowledge increased and resulted in a 63.28 percent improvement in learning after the intervention. This demonstrates that using SBL can significantly improve academic achievement. Incorporating songs into teaching makes students happy and relaxed, and also helps them remember information about their environment better. This results in increased knowledge and improved academic

progress for students. This is with the concept of Chetsadawiroj (2007) said that using songs in teaching involves having students sing songs, or teachers singing songs to students, to introduce a lesson, conduct lesson activities or summarize a lesson and help students remember the learned content. Wajeethongratana (2014) said that defines learning efficiency as the ability to connect prior knowledge with existing information and to enhance the capacity for effective action by making permanent behavioral changes resulting from experience, knowledge, understanding, skills, and attitudes. Then applying them appropriately to the environment and situation to achieve the goals of all. This is consistent with the research by Banchuen et al. (2025) studied "development of learning achievement on Rhyming Words using an instructional song innovation combined with skill exercises in the Thai Language Curriculum for Prathomsuksa 2 Students at Thidamaeptra School, Krabi" and found that the learning activity on rhyming words, using an instructional song innovation combined with skill exercises for Prathomsuksa 2 students, was an effectiveness $E1/E2$ of 88.80/89.00. Khwunmai et al. (2023) studied the development of creative musical tales for encourage executive functions of young children at La-Or-Uthit demonstration school Suphanburi campus and found that the creative musical story set promoting executive functions of young children had a process efficiency value (E_1) of 89.12 and an outcome efficiency value (E_2) of 92.51. Rania et al. (2020) studied an evaluative study of environmental songs in light of their development of the elements of environmental literacy among children in some satellite channels. The results indicate the effectiveness of environmental songs in developing environmental literacy for the second-grade primary students, as it shows that there are statistically significant differences at (0.05) significance level between average scores of the research group of the study, regarding the pre/post measurement of the scale of environmental literacy, in favor of the post-application. The results of the research recommend the necessity of making songs for children to be including new positive values, morals and behaviors associated with how to address the emerging environmental problems, as well as including new environmental problems appropriate to the primary stage and how to deal with them through these songs, integrating also between educational and media institutions outlets to integrate and include environmental songs in the curricula and programs in children television.

5.2 The Results of a Study Comparing Environmental Knowledge, Attitudes, and Ethics Using Songs - Based Learning

5.2.1 Results of the Study and Comparison of Environmental Knowledge Before and After the Training

Results of the study and comparison of environmental knowledge: It was found that students' average scores on environmental knowledge using SBL before the lesson were at a moderate level ($\bar{x}=19.46$), and after the lesson, their average scores were at a high level ($\bar{x}=26.08$). Comparing the average knowledge scores before and after the lesson, it was found that after the lesson, students were higher average knowledge scores than before the lesson. This demonstrates that using songs as a teaching method makes lessons more interesting, fun, and enjoyable, resulting in higher post-lesson knowledge acquisition among students compared to pre-lesson knowledge. This is consistent with the concept of Loosuanrat (2015) said that knowledge is valuable information that involves analyzing human experience, judgment, thoughts, values, and intellect to support work or solve problems. Pluem-udom (2014) said that knowledge is facts, rules, and details obtained from experience and learning. It involves understanding, applying it in practice, and being able to analyze, synthesize, and evaluate results. This knowledge is derived from research, observation, and work experience. This is consistent with the research by Sookwichai (2024) studied the Creative-Based Learning (CBL) cooperated with video lessons on Photoshop for enhancing creative thinking and learning achievement and found that students' academic achievement after learning with innovative music-based teaching activities combined with developed skill-building exercises was significantly higher than before learning at the .05 statistical significance level. Koinok et al. (2025) studied the using songs to supplement Thai language on the topic of royal vocabulary of grad 5 students and found that post-test scores in Thai language were significantly higher than pre-test scores at the .05 statistical significance level. Seetee et al. (2025) studied the effect 'why forest is important' activities on students' environmental literacy and ethics in Nan Province and found that the average environmental literacy scores of students after the intervention were significantly higher than before the intervention at the .05 statistical significance level. Kezia et al. (2023) studied the enhancement of eco literacy for language learners using song lyrics and found that first, the five-song lyrics reveal ecological problems like deforestation and biodiversity loss that the singing artists lament and call for preventive actions. Secondly, song lyrics may offer imaginative use of language that can enable learners to think critically and creatively, hence useful language teaching materials.

5.2.2 Results of the Study and Comparison of Environmental Attitudes Before and After the Training

Results of the study and comparison of attitudes revealed that students' average scores on environmental attitudes

using SBL were in the "agree" level before the intervention ($\bar{x}=2.55$), and after the intervention, their average scores were in the "agree" level ($\bar{x}=2.95$). Comparing the average scores of environmental attitudes before and after the intervention, it was found that after the intervention, students were significantly higher average scores than before. This demonstrates that song-based learning is a teaching method that inspires appreciation and understanding of the environment, resulting in students having a higher positive attitude towards the environment after the lesson than before. This demonstrates that Wongchantra (2016) said that attitude is an expression of a decision based on an evaluation or perspective about a particular matter. It serves as a tool for consideration and evaluation before deciding to express oneself. Pansuwan (2015) said that attitude is an individual's internal feeling toward something, which could be a person, a group of people, an object, an institution, an event, or a situation. This feeling is expressed through evaluation, which may be either acceptance or rejection. Once an attitude is formed in one direction, it is difficult to change it to another. Sukonthawiroj (2017) defines that attitude as a thought, feeling, or belief and a tendency to express a person's behavior as a reaction based on an estimation of like or dislike, and also as a judgment of an individual's actions or behaviors that will have a positive or negative impact on other people. This is consistent with the research by Kulsuwan (2021), which studied the management of environmental education instruction for conservation among undergraduate students at Mahidol University, Amnat Charoen Campus. They found that students who studied using environmental education instruction for conservation had significantly higher attitudes towards environmental conservation after the lesson than before the lesson, at a statistical significance level of .05. Thinkamchoet & Wongchantra (2018) studied "the development of a camp on natural resources and environmental conservation in ASEAN for youths in Roi-et province" and found that the youths had significantly higher attitudes after participating in the activities than before participating in the activities, at a statistical significance level of .05. Tamaela (2016) studied the development of environmental song-based materials using a scientific approach for teaching English. It was found that the result of the preliminary field test revealed that theoretically the developed songs and activities which follow the stages of scientific approach was well accepted, with minor revision. The result of main field test indicated that empirically 85% of the participants' attitude towards the materials is positive; moreover their comprehension of the content is very good.

5.2.3 Results of the Study and Comparison of Environmental Ethics Before and After the Training

Results of the results of a comparative study on environmental ethics showed that before the intervention, students' average scores were at the level of "for social good" ($\bar{x}=3.04$), and after the intervention, their average scores were at the level of "for righteousness and goodness" ($\bar{x}=3.76$). Comparing the average environmental ethics scores before and after the intervention, it was found that after the intervention, students had significantly higher average scores than before. This demonstrates that song-based learning is a method that helps students understand and appreciate environmental values, fostering ethics and morality. As a result, students' environmental ethics scores after the lesson are higher than before. This consistent with the concept of Sorsuchat (2015) defines that ethics as the conduct qualities that society expects its members to exhibit, demonstrating correctness in behavior and freedom within the boundaries of conscience. Wongchantra (2016) said that environmental ethics is essential to create and cultivate a good awareness of nature and the environment in individuals. This will result in a reduction of environmental problems to the point of achieving environmental balance in development. Developing higher levels of environmental ethics includes cultivating a sense of shared ownership of nature and the environment, setting a good example for society and the environment, instilling a sense of moderation in the consumption of natural resources, and using social norms for development. This is consistent with the research by Singchoo (2022), who studied songwriting for instilling morals and ethics in the demonstration school of Phuket Rajabhat University and found that songwriting for instilling morals and ethics resulted in significantly higher post-test scores than pre-test scores at the .05 statistical significance level. Seetee et al. (2025) studied the effect of the activity "How important is the forest?" on environmental literacy and environmental ethics among students in Nan Province. They found that the students' environmental ethics after the intervention were significantly higher than before the intervention. Wongchantra et al. (2022) studied the effects of environmental learning management to enhance river management in northeastern Thailand using community-based learning. They found that students' environmental ethics after the learning were significantly higher than before the learning. Yanfang et al. (2024) studied the environmental ethics in the folk songs of the Yao Ethnic Group in Guangxi Province of China: analyzed the concept of ecocriticism" and found that the folk songs of the Yao ethnic group exhibit environmental ethics towards animals, expressing the belief that animals have the right to exist equally with humans. They emphasize ethical prohibitions against killing, capturing, beating, and showing anger towards certain animal species. Furthermore, they present environmental ethics towards plants, expressing the belief that destroying plants can have a broader impact on the ecosystem. There are prohibitions against destroying bamboo shoots and against cutting trees in spring. The study also applies

environmental ethical principles relating to ecosystems, aligning with the concept of ecocriticism.

5.3 The Study on Environmental Knowledge, Attitudes, and Ethics Among Students of Different Genders

The study on environmental knowledge, attitudes, and ethics among students of different genders revealed that there were differences in scores on environmental knowledge among students of different genders. However, there were no significant differences in environmental attitudes and ethics among students of different genders. Since attitudes and ethics are matters of opinion and practice towards the environment, and students are a group of the same age, their attitudes towards the environment and environmental ethics are not significantly different. This is consistent with the concept of Wongchantra (2026) said that the transfer of environmental knowledge involves bringing knowledge from a knowledge source to a target population through media, tools, and equipment, primarily using specific processes and methods. Chancha (2014) said that the development of a lesson plan has teaching components including learning objectives, teaching steps, teaching activities used in each step, teaching materials, and student assessment. Chetsadawiroj (2007) said that using songs in teaching involves having students sing songs or the teacher sings them to the students to introduce the lesson, conduct lesson activities, or summarize the lesson so that students can remember the learned content. This is consistent with the research by Wongchantra et al. (2022) studied the effect of environmental education learning for enhancing rivers management in the Northeast of Thailand using community-based learning" and found that there were statistically significant differences in knowledge among students of different genders. Ritsumdaeng et al. (2021) studied the effect of environmental education teaching using case study and games-based learning for undergraduate students" and found that there were no significant differences in environmental knowledge, attitudes towards the environment, and environmental ethics between undergraduate students of different genders. Praimee & Boomserm (2021) studied the effects of learning activities on waste and sewage management using question and problems-based learning for undergraduate students of Mahasarakham University, Thailand and found that there was no difference of scores of environmental ethics of undergraduate students with different genders. Chanwirat et al. (2021) studied the effect of environmental education activities for the developing environment and occupational health in school" found that there was no difference of scores on their environmental ethics of students with different genders.

6. Conclusion

The purposes were to develop an environmental education lesson plan using Song-Based Learning (SBL) to be effective and efficient according to the specified criteria, to study knowledge, attitudes, and environmental ethics using songs-based learning before and after the learning process, and of students with different genders. The finding showed that

- 1) The environmental education lesson plan using SBL was an effectiveness score of 90.60/86.92, meeting the criteria, an effectiveness index (E.I.) of 0.6328. This indicates that students' knowledge increased and that the plan resulted in a 63.28% improvement in learning after its implementation.
- 2) After the lesson, students' average scores on environmental knowledge, attitudes, and ethics were significantly higher than before the lesson statically significant at the level of .05.
- 3) There were differences of environmental knowledge scores of students of different genders statistically significant at the level of .05., but no differences in environmental attitudes and ethics between students of different genders.

So the environmental education lesson plan using SBL can use in teaching for enhancing environmental knowledge, attitudes, and ethics to students.

References

- Banchuen, K., Buakaew, C., & Muengnoy, T. (2025). Development of learning achievement on rhyming words using an instructional song innovation combined with skill exercises in the Thai language curriculum for Prathomsuksa 2 students at Thidamaepra School, Krabi. *Academic Journal of Curriculum and Instruction Sakon Nakhon Rajabhat University*, 17(48), 51-58.
- Chancha, S. (2014). *Instructional design and development*. Phetkesorn Printing Group Co., Ltd.
- Chankaew, K. (2003). *Environmental education*. Aksorn Siam Printing.
- Chanwirat, W., Wongchantra, P., & Bunnaen, W. (2021). The effect of environmental education activities for the developing environment and occupational health in school. *Annals of the Romanian Society for Cell Biology*,

25(6), 4959-5464.

- Chetsadawiroj, S. (2007). *Integrated teaching and learning management*. Book Point.
- Kezia, C. Y. R., Rantung, Y. M. S., Widiasmoro, & Dewi, N. (2023). Enhancement of eco literacy for language learners using song lyrics. *LLT Journal*, 26(1), 31-40. <https://doi.org/10.24071/llt.v26i1.5437>
- Khwunmai, K., Chuarklang, R., Yakaew, C., & Kanyarat, C. (2023). The development of creative musical tales for encourage executive functions of young children at La-Or-Uthit Demonstration School Suphanburi campus. *Santapol College Academic Journal*, 9(2), 114-125.
- Koinok, T., Prueangphitchayathon, S., & Intraprawat, P. (2025). Using songs to supplement Thai language on the topic of royal vocabulary of grade 5 students. *Journal of Buddhist Innovation and Management*, 7(1), 96-109.
- Kulsuwan, P., Kongsombut, P., & Muangsong, C. (2021). Environmental education teaching management for conservation for undergraduate students at Mahidol University, Amnat Charoen campus. *Journal of Educational Studies, Mahasarakham University*, 15(4), 210-221.
- Loosuwanrat, T. (2015). *Knowledge organization: From concept to practice*. Sat4 Printing Co., Ltd.
- Pansuwan, K. (2015). *Attitudes and satisfaction of the public towards the performance and services of police officers at Hat Yai Police Station, Hat Yai District, Songkhla Province* [Master's thesis].
- Piempongsarn, P. (2025). *Environmental education*. Thamada Press.
- Pluem-udom, C. (2014). *Knowledge and perceptions of children's rights among people in Samut Prakan and Chonburi provinces* [Master's thesis]. Burapha University.
- Praimee, U., & Boomserm, W. (2021). The effects of learning activities on waste and sewage management using question and problems-based learning for undergraduate students of Mahasarakham University, Thailand. *Journal of Educational Issues*, 7(1), 72-91. <https://doi.org/10.5296/jei.v7i1.18267>
- Rania, M., Youssef, H. M. I., & Zidan, H. E. (2020). An evaluative study of environmental songs in light of their development of the elements of environmental literacy among children in some satellite channels. *Journal of Environmental Science*, 49(7), 177-214. <https://doi.org/10.21608/jes.2020.193390>
- Ritsumdaeng, P., Boonserm, W., & Sookngam, K. (2021). The effect of environmental education teaching using case study and games based learning for undergraduate students. *Annals of the Romanian Society for Cell Biology*, 25(6), 13282-13293.
- Saiyot, L., & Saiyot, A. (1995). *Research techniques in education*. Suwiriyasarn.
- Seetee, N., Lamainil, S., & Dahsah, C. (2025). The effect 'Why Forest is Important' activities on students' environmental literacy and ethics in Nan Province. *Journal of Education and Innovation*, 27(3), 156-170. <https://doi.org/10.71185/jeiejournals.v27i3.279645>
- Singchoo, A. (2022). Songwriting for cultivating morality and ethics in the demonstration school of Phuket Rajabhat University. *Rangsit Music Journal*, 17(1), 150-165.
- Sookwichai, D. (2024). The Creative-Based Learning (CBL) cooperated with video lessons on Photoshop for enhancing creative thinking and learning achievement. *Journal of Education Rajabhat Maha Sarakham University*, 21(1), 183-191.
- Sorsuchat, A. (2015). *Measuring attitudes*. Retrieved from <http://www.bangkokbiznews.com>
- Sukonthawiroj, O. (2017). *Independent research as part of the curriculum*. Bangkok University.
- Tamaela, L. S. (2016). The development of environmental song-based materials using a scientific approach for teaching English. *Journal of Education and Practice*, 7(10), 145-151.
- Thinkamchoet, J., & Wongchantra, P. (2018). The development of camp on natural resources and environmental conservation in the ASEAN for youths in Roi-et province. *International Journal of Agricultural Technology*, 14(7), 2077-2093.
- Wajeethongratana, P. (2014). Learning effectiveness that affects the performance effectiveness of accountants in Nakhon Ratchasima province. *Journal of the Association of Researchers*, 20(1), 88-94.
- Wanichbuncha, K. (2002). *Statistical analysis: Statistics for administration and research* (6th ed.). Chulalongkorn University Press.

- Weerawatthanant, W. (2012). *Environmental education* (6th ed.). Odeon Store.
- Wongchantra, P. (2016). *Environmental education*. Kakayia Publishing House.
- Wongchantra, P., Ongon, S., Junkaew, L., Sookngam, K., Praimee, U., Kaeongam, S., Pronyusri, T., Ritsumdaeng, P., & Wongchantra, K. (2022). The effect of environmental education learning for enhancing rivers management in the Northeast of Thailand using community-based learning. *Journal of Educational Issues*, 8(1), 151-173. <https://doi.org/10.5296/jei.v8i1.19544>
- Worasayan, M. (2021). Environmental problems and their prevention and solution. *Journal of Humanities and Social Sciences, Burapha University*, 2(1), 17-29.
- Yanfang, M., Mookham, T., Chaimano, K., & Chaimano, B. (2024). The environmental ethics in the folk songs of the Yao Ethnic Group in Guangxi Province of China: Analyzed the concept of ecocriticism. *Journal of Roi Kaensarn Academi*, 9(9), 1374-1398.

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