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Environmental Education in Thai High Schools: The Insights into Learning Objectives and Pedagogical Approaches

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Abstract

Environmental Education (EE) has been recognized by the United Nations Sustainable Development Goals (SDGs) as a vital component in fostering environmentally literate citizens and promoting global sustainability. However, despite its acknowledged importance, there is limited understanding of how high school teachers integrate EE into authentic learning environments. Existing literature on environmentally EE has predominantly concentrated on interventions and their effects on environmental knowledge, pro-environmental behaviors, and related outcomes. This study employed simple random sampling to select 42 teachers from 22 secondary schools regarding their learning objectives and pedagogical approaches in EE. The respondents were selected from three groups of teachers: 1) biological or environmental science teachers, 2) social studies or civic education teachers, and 3) advisors for assemblies or extracurricular activities related to EE or sustainable development. The data were systematically analyzed by calculating the frequency and percentage distributions of the respondents' selections, as well as identifying the key learning objectives and pedagogical approaches utilized by the teachers. The findings indicated that the primary goals of EE were the application of knowledge, the cultivation of environmental values, and the acquisition of environmental knowledge. The most commonly employed pedagogical approaches included traditional lectures, inquiry-based learning, and problem-based learning. Conversely, less frequently adopted approaches encompassed place-based learning, emancipatory approach, and action project learning. The study further revealed that classroom-based EE tended to prioritize knowledge acquisition and its practical application, rather than fostering students' ability to initiate environmental change through collaboration with relevant stakeholders. These findings highlight the necessity for expanding the repertoire of pedagogical approaches in EE and advocate for a shift towards more proactive, capacity-building approaches that encourage collaborative networks. Such an approach would empower students to actively engage in addressing environmental challenges.

Key Words: environmental education, high school, pedagogical approach, learning objective

Introduction

This study explores the implementation of environmental education (EE) in schools located in the southern region of Thailand. This area is known for its remarkable natural resources and unique environmental context. The school district encompasses seven national parks featuring diverse ecosystems, including rainforests, mangrove forests, caves, islands, and coral reefs. This ecological diversity, combined with its rich species population, makes the district vital for environmental conservation efforts. However, the region has been facing several environmental issues. The southern region of Thailand has been dealing with critical challenges such as biodiversity loss, land degradation, and the adverse effects of climate change. Waste management in the upper southern region, in particular, has been a long-standing problem (Environment and Pollution Control Office 14, 2023). Additionally, microplastics have been detected on beaches, underscoring the severity of pollution in the area (Wangrittikrikul et al., 2020). Similar environmental issues are also prevalent across Southeast Asia, where countries face urgent biodiversity crises along their coasts and within marine ecosystems (Lechner et al., 2021).

The fundamental question raised by the current escalating environmental situation is: How can a safe and sustainable future for ourselves and the next generations be secured, especially as the population continues to grow? As the global populace maintained a high standard of living, the demand for consumption was not limited (United Nations Educational, Scientific, and Cultural Organization [UNESCO], 2016). The prevailing economic system, capitalism, was encouraged by spending that neglected the limits and capacity of ecological waste (Ketsing, 2023; Washington et al., 2017). This contradicted the scientific consensus that human activity is a major contributor to global climate change (Intergovernmental Panel on Climate Change [IPCC], 2021). While the root causes and consequences of environmental problems were well-known, substantive action to address these issues was not seriously taken (IPCC, 2021). Substantive actions must be taken by all of us to conserve and restore the environment.

Even so, it was shown by past research that EE primarily focused on environmental knowledge, pro-environmental behaviors, and related variables (Ardoin et al., 2018; Ardoin et al., 2020; Kyburz-Graber, 2019). However, it became increasingly clear that environmental knowledge and attitudes did not constitute a sustainable solution to environmental problems (Kyburz-Graber, 2019). Scholars suggested that the scope of EE in schools should be expanded to encourage students to participate in various sectors of society as citizens, enabling them to jointly diagnose problems and take meaningful

action to address the root causes of environmental issues (Kyburz-Graber, 2019; Jensen & Schnack, 1997).

In this regard, the role of teachers in EE should not be overlooked, as their choices of pedagogical approaches directly affect students' ability to address environmental issues. To facilitate effective EE, learning experiences that connect learners with society and the surrounding environment should be designed by teachers (Ardoin et al., 2020; Jensen & Schnack, 1997; Ketsing et al., 2023; Kyburz-Graber, 2019; Thomas et al., 2019). Learning activities are intended to provide students with opportunities to make decisions about solutions to environmental problems appropriate to their context (Blythe & Harré, 2020; Cincera et al., 2020). In doing so, the next generation is empowered to become agents of change for the environment (Jensen & Schnack, 1997; Wals & Benavot, 2017).

In our context, Thailand had an environmental education curriculum that was developed by organizations outside the Ministry of Education. A significant aspect of this curriculum was its focus on involving local communities and creating a supportive framework for effective execution (Department of Climate Change and Environment [DCCE], 2024; Earth5R, 2024). Nonetheless, this curriculum was not extensively embraced by schools, as it did not form part of the national core curriculum. However, There were also indicators within the national core curriculum that suggested students ought to apply their knowledge to real-life situation (Ministry of Education [MOE], 2010, 2017). Subjects like science, social studies, and various extracurricular programs in schools incorporated elements related to natural resources protection and environmental issues. Despite this, there has been a lack of research providing evidence on the actual approaches teachers employed to teach EE. Theoretically, the instruction of EE necessitates an integrated approach. The advancement of EE requires a comprehensive approach, encompassing science, social studies, and geography (WWF-Thailand, 2018). Therefore, comprehending pedagogical strategies in EE is vital for encouraging student engagement in tackling environmental issues (Corpuz et al., 2022).

While research highlighted ideal learning experiences in EE, limitations were present in practice. Real-world constraints included the lack of emphasis on students taking action to address the root causes of environmental problems (Jensen & Schnack, 1997; Kyburz-Graber, 2019). Existing literature often focused on knowledge acquisition and environmental attitudes rather than on meaningful problem-solving and recognizing students' capacity for change (Ardoin et al., 2018; Ardoin et al., 2020; Kyburz-Graber, 2019; Wals & Benavot, 2017; Wu et al., 2020). Additionally, opportunities for students to collaborate with external stakeholders to tackle local environmental challenges were not provided by many EE programs (Ardoin et al., 2020; Wu et al., 2020).

The knowledge gap on how EE was implemented in real classroom contexts remained limited, highlighting the significance of this study as it aimed to uncover high school teachers' choices of EE implementation and the learning objectives they expected their students to achieve. By exploring the

complexities of EE in high school settings, this study provided valuable insights that could inform future educational strategies and empower teachers to foster environmentally active citizens. In summary, the research aimed to bridge this knowledge gap by investigating how high school teachers delivered EE—their pedagogical approaches and expected learning objectives.

Research Objectives

1. To identify the primary learning objectives that high school teachers involved in environmental education (EE) or related content knowledges aim to achieve.
2. To examine the pedagogical approaches typically used by high school teachers when teaching EE.

Operational Definitions

Learning Objectives in Environmental Education

The primary focus of this study is to explore the learning objectives established by high school teachers in teaching EE and assess their alignment with or deviation from existing literature. We utilize a conceptual framework adapted from Ardoin et al. (2018) to define these learning objectives. In this context, the learning objectives refer to the outcomes or competencies that teachers aim to cultivate in high school students (grades 10-12) when teaching EE.

Pedagogical Approaches in Environmental Education

In this study, "pedagogical approaches" refers to the instructional approaches employed by high school teachers to facilitate students' learning of EE in their schools. These approaches encompass the methods by which teachers engage students in EE learning experiences. Various pedagogical approaches typically emphasize different aspects, such as student-centered learning, inquiry-based learning, collaborative learning, or direct instruction. The selection of a teaching approach often depends on the specific learning objectives of the lesson and the broader educational goals.

According to the literature on EE, teachers should provide students with opportunities to connect with society and the surrounding environment (Ardoin et al., 2020; Jensen & Schnack, 1997; Ketsing et al., 2023; Kyburz-Graber, 2019). Students should be actively engaged in environmental problem-solving, which can enhance their capacity and confidence to act as change agents (Blythe & Harré, 2020; Jensen & Schnack, 1997; UNESCO, 2016). Pedagogical approaches in EE should enable learners to address the root causes of environmental issues by fostering a conscious understanding of their actions, the reasons behind them, and the potential consequences (Blythe & Harré, 2020; Jensen & Schnack, 1997). Core elements of EE learning experiences should include creating spaces for collaboration between learners and stakeholders in addressing environmental challenges, using local

environmental contexts as learning settings, and consistently measuring and evaluating improvements in environmental quality (Ardoin et al., 2020; Jorgenson et al., 2019). In summary, the literature highlights several key characteristics of effective EE teaching, including hands-on problem-solving, collaborative networking, student-centered learning, decision-making, and leadership. This study examines whether the pedagogical approaches chosen by high school teachers align with these identified characteristics.

Methodology

This study employed a survey research methodology to investigate common practices among high school teachers in delivering EE. The initial premise assumed that these teachers possessed prior experience in teaching environmental topics. The study specifically sought to identify their learning objectives and the pedagogical approaches they employed to enhance student learning in EE. In light of the scarce research on typical EE practices at the high school level, this investigation aimed to address this gap in the literature.

Research Site and Target Group

The study focused on high school teachers from a specific school district located in the southern region of Thailand. The selection of this district was based on its remarkable natural resources and unique environmental context. The district encompasses seven national parks featuring diverse ecosystems, including rainforests, mangrove forests, caves, islands, and coral reefs. This ecological diversity, coupled with the richness of species, renders the district crucial for environmental conservation efforts. A simple random sampling technique was employed to select high school teachers within the district. Three questionnaires were distributed to each of the 22 schools in the district, resulting in a total of 66 participating teachers.

The target group comprised three distinct categories: teachers specializing in biological or environmental sciences; teachers responsible for social studies or civic education; and teachers serving as advisors for assemblies or extracurricular activities related to EE or sustainable development. The rationale for selecting these categories was grounded in the structure of Thailand's Basic Education Core Curriculum, which integrates EE into these subject areas, as well as into assemblies and extracurricular activities (MOE, 2010, 2017). Consequently, the study engaged three teachers from each of the 22 schools, yielding a total sample of 66 high school teachers.

Ethical Consideration

In accordance with ethical guidelines for research involving human subjects, this study was conducted with high school teachers aged over 20 years, aiming to capture their regular practices in teaching EE without introducing any interventions. The school principals and teachers received a detailed explanation of the research on the first page of the questionnaire, which included the study's

objectives, potential benefits, and possible risks. Confidentiality was ensured, as the teachers were not required to disclose their names, and the results will be presented in aggregate form. Participation was voluntary, with both school principals and teachers having the freedom to decline without any coercion. These measures were implemented to uphold the ethical principles of respect for persons and beneficence. Regarding the principle of justice, the selection of respondents was guided by the learning standards and indicators outlined in Thailand's Basic Education Core Curriculum (MOE, 2010, 2017), ensuring fairness and equity in the participant selection process.

Questionnaire

A questionnaire was employed to investigate high school teachers' typical practices of EE in their school contexts. The questionnaire development began with clearly defining its objectives, followed by a comprehensive review of relevant literature on learning objectives and pedagogical approaches to EE, both from Thai and international sources. The questionnaire's format was carefully aligned with these objectives to ensure relevance and coherence. The content was then developed to meet the research aims. To validate the instrument, three experts in the field of EE reviewed the questionnaire. After incorporating their feedback, a pilot study was conducted with a similar group to assess its applicability before full implementation.

The instrument consisted of two sections. Part 1 gathered general information about the respondents through six checklist questions, with space for additional comments. These questions covered key demographic details such as gender, age, educational background, field of study, EE teaching experience, and courses taught. Part 2 focused on EE learning objectives and pedagogical approaches, featuring two checklist questions with room for additional comments.

These questions aimed to identify key learning objectives and the pedagogical approaches utilized for EE. To ensure clarity, explanations were provided for each item in the checklist, allowing teachers to fully understand each option before selecting the learning objectives and pedagogical approaches that reflected their classroom practices.

For content validity, the questionnaire was reviewed by three experts in the field of EE, and revisions were made based on their feedback. The Item-Objective Congruence (IOC) values for the items ranged between .67 and 1.0. To assess the appropriateness of language and estimated completion time, a pilot test was conducted with a group of high school teachers similar to the target group.

Data Collection

In January 2023, questionnaires were distributed to 22 schools within the selected school district. Prior to distribution, permission was obtained from the school administrators, and the respondents were informed about the research. This information was provided on the cover page of

the questionnaire, which included the research objectives, the benefits of participation, and any time-related risks that respondents might encounter while providing their information. It was emphasized that school principals and individual respondents had the right to decline participation if they were not willing to engage in the study.

Each school administrator was asked with distributing the questionnaires to three distinct teachers to ensure representation from specific categories: one teacher specializing in biological sciences or environmental sciences, one teacher focused on social studies or civic education, and one teacher serving as an advisor for assemblies or extracurricular activities related to the environment. Respondents were given the option to complete the questionnaire in its physical form or through a Google Form. A QR code linking to the Google Form was included on the first page of the questionnaire for convenience. Ultimately, 42 completed questionnaires were received out of the 66 originally distributed, resulting in a response rate of 63.64% among the target group. However, the responses were collected from 19 schools, representing nearly all the schools (22 schools) in the study area. Therefore, the findings are likely to be reliable and representative of the teachers in the region. This data provided valuable insights into the perspectives of high school teachers regarding EE.

Data Analysis

In the data analysis process, the data from Part 1 was analyzed, which contained general information about the respondents, by calculating the frequency and percentage of responses for each question. For Part 2, which focused on the normal practices of EE, we examined the data by calculating the frequency and percentage of respondents selecting each item. This analysis illuminated the specific learning objectives and pedagogical approaches utilized by the teachers. Unfortunately, no written comments were found from the respondents in the space provided for both sections of the questionnaire.

Findings

Basic Information of Respondents

This study focused on biology/biological science teachers, social studies/civics/geography teachers, and those responsible for extracurricular environmental activities across all 22 schools in the research area. In some cases, individual teachers took on multiple roles; for instance, a biology teacher might also oversee extracurricular activities related to EE. As a result, the population could not be quantified in precise numerical terms. The total number of high school teachers who provided complete answers on the questionnaire was 42 out of the 66 questionnaires that were originally distributed. The response rate was 63.64%. However, the responses were collected from 19 schools,

representing nearly all the 22 schools in the study area. Therefore, the findings are likely to be reliable and representative of the teachers in the region.

The majority of the teachers were female (86.80%). Teachers aged between 21 and 30 years old were the largest portion of the respondents (34.20%), followed closely by teachers aged between 31 and 40 years old (31.60%). In terms of educational background, most teachers completed a bachelor's degree (71.10%). The majority of them have a degree in education (65.80%), while a significant portion have degrees in science or applied science (28.90%).

In regard to environmental teaching experience, the majority of teachers had less than 5 years of experience (44.70%), followed by teachers with 5–10 years of EE teaching experience (31.60%). The courses or classes that most teachers taught in relation to EE included social science and citizenship (34.20%). A significant number of teachers taught about EE in biology (31.60%), botanical garden assembly (30.00%), and natural science (28.90%). Additionally, a few teachers were involved in EE in civic education, service learning, geography, environmental science, and other environment-related assemblies. Unfortunately, no respondents mentioned that their schools have an EE course.

Environmental Education Learning Objectives

Figure 1 presents the results of the questionnaire on EE learning objectives. In this figure, respondents were provided with explanations for each item, as outlined in Table 1. These explanations were designed to ensure that teachers clearly understood the differences between each learning objective and were able to select items aligned with their classroom practices. It should also be noted that multiple learning objectives for EE could be selected by each teacher for their students.

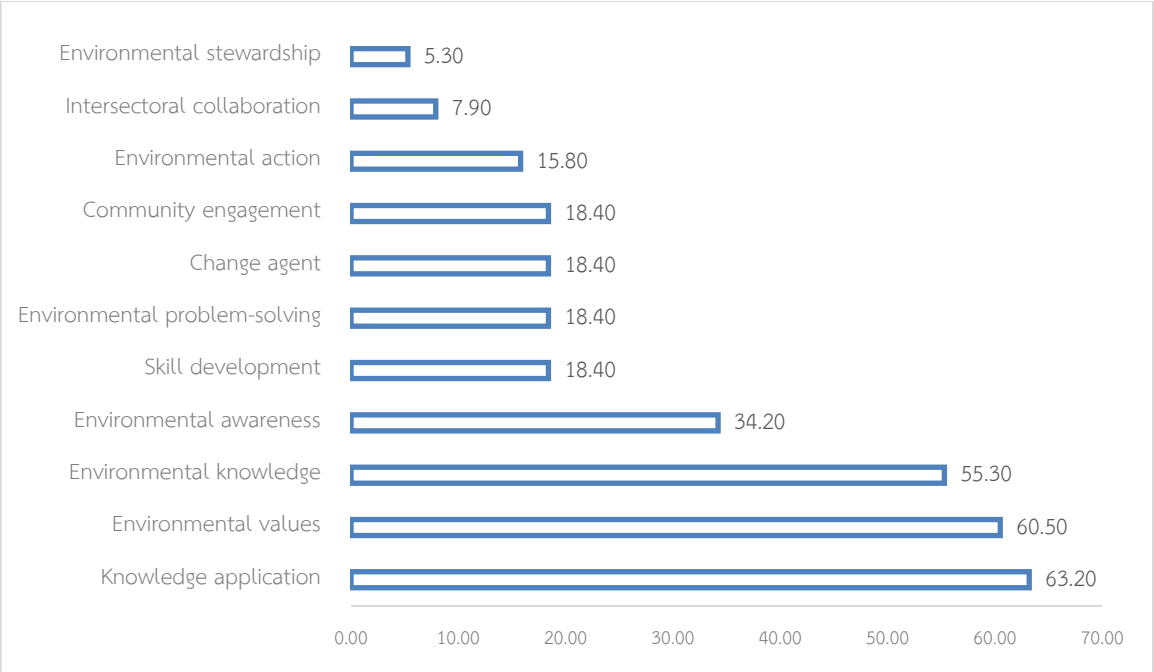
Table 1 Environmental Education Learning Objectives from Literature

Learning objectives	**Clarification**
Knowledge application	Students can apply their environmental knowledge to benefit society and improve livelihoods.
Environmental values	Students value the environment and maintain a positive attitude toward resolving environmental problems.
Environmental knowledge	Students possess comprehensive knowledge and understanding of the environment and environmental issues.
Environmental awareness	Students demonstrate heightened awareness and sensitivity to environmental problems.
Skill development	Students acquire the essential skills needed to effectively address environmental challenges.
Environmental problem-solving	Students actively participate in the planning, formulation of solutions, and offer suggestions for resolving real environmental issues.

Learning objectives	Clarification
Change agent	Students undergo a transformative change in their identity to become agents of positive environmental change.
Community engagement	Students actively engage with their communities and comprehend the intricate relationship between humans and the environment.
Environmental action / Action competence	Students are motivated and determined to take meaningful action in solving root-cause of environmental problems.
Intersectoral collaboration	Students possess the capacity to collaborate with various sectors to address environmental challenges.
Environmental stewardship	Students are committed to solving environmental problems and conserving natural resources.

The research findings revealed the top three learning objectives most frequently chosen by high school teachers. These objectives were: 1) knowledge application, referring to the practical application of environmental knowledge for societal and livelihood benefits (63.20%); 2) environmental values, meaning students anticipate the value of the environment and adopt a positive attitude toward solving environmental problems (60.50%); and 3) environmental knowledge, indicating a comprehensive understanding of the environment and its associated issues (55.30%). These objectives emerged as key priorities in EE among the participating high school teachers.

Conversely, certain learning objectives received less attention from the teachers. These were: environmental stewardship (5.30%), which refers to a commitment to solving environmental problems and protecting natural resources; intersectoral collaboration (7.90%), indicating the capacity to work in partnership with stakeholders on environmental challenges; and environmental action (15.80%), denoting self-determination in taking action to address the root causes of environmental problems. Although these objectives are essential for preparing active citizens to tackle environmental crises, teachers placed less emphasis on them in their teaching practices.



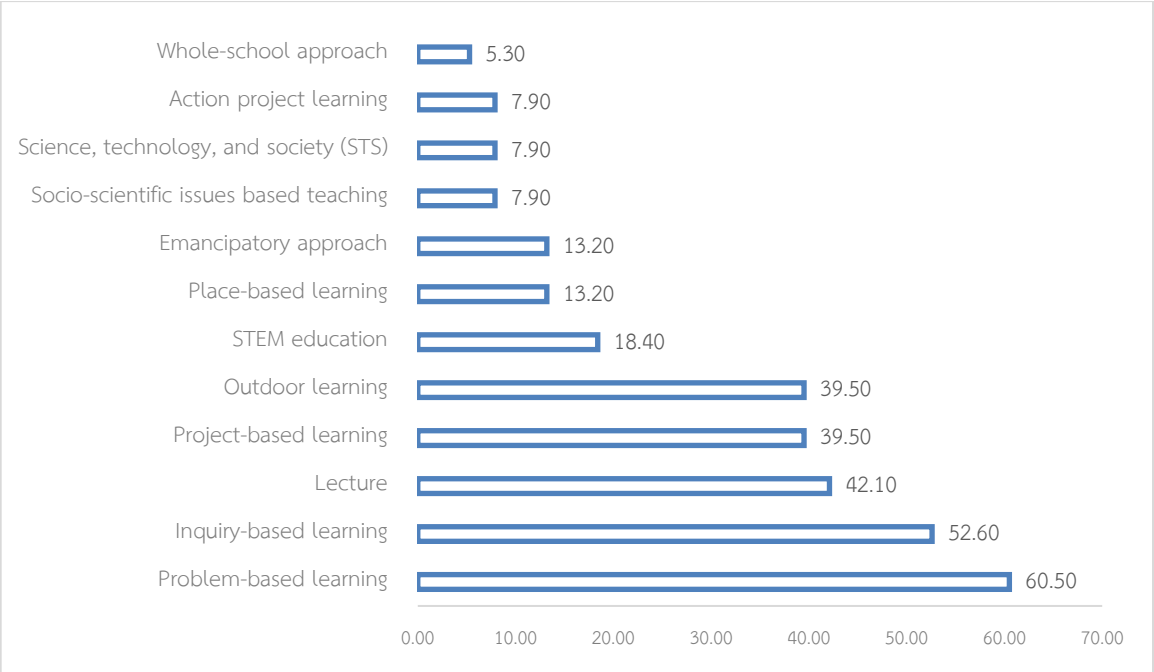
Note. The sum exceeds 100% because each teacher can select multiple learning objectives.

Figure 1 High School Teachers' Learning Objectives in Environmental Education

Pedagogical Approaches in Environmental Education

Figure 2 presents the results of the questionnaire on pedagogical approaches to EE. In this figure, teachers were provided with explanations for each choice item to ensure that respondents understood the differences between the pedagogical approaches and could select the methods they employed in their classrooms. The study identified the top five instructional approaches most commonly used by teachers, which were: 1) problem-based learning (60.50%), 2) inquiry-based learning (52.60%), 3) lecture (42.10%), 4) project-based learning (39.50%), and 5) outdoor learning (39.50%).

In contrast, several pedagogical approaches received less attention from most teachers. These approaches included the whole-school approach (5.30%), action project learning (7.90%), science, technology, and society (STS) (7.90%), socio-scientific issues (SSI)-based teaching (7.90%), the emancipatory approach (13.20%), and place-based learning (13.20%). These less frequently utilized approaches focus on action-oriented learning, capacity-building, and collaborative networking to address environmental challenges. These findings emphasize the need to consider a broader range of pedagogical approaches in EE.



Note. The sum exceeds 100% because each teacher can select multiple pedagogical approaches.

Figure 2: High School Teachers' Pedagogical Approaches in Environmental Education

Discussion and Conclusion

The research findings are discussed in relation to the research objectives, which focus on learning objectives and pedagogical approaches. A detailed discussion of these findings is provided below:

Environmental Education Learning Objectives

The findings of this research indicate that high school teachers primarily prioritize teaching objectives related to knowledge application, environmental values, and environmental knowledge. These priorities align with previous literature on EE, which has traditionally emphasized knowledge-related aspects rather than the development of practical skills and active engagement in addressing environmental challenges (Ardoin et al., 2020; Kyburz-Graber, 2019; Thomas et al., 2019).

These findings also correspond with the principles outlined by UNESCO (1978), which underscore the significance of knowledge as a critical factor in raising awareness about environmental issues and as a fundamental component of global citizenship, enabling individuals to take responsibility for environmental problems. Furthermore, they align with the perspective presented by the North American Association for Environmental Education (NAAEE) (2010), which highlights the importance of knowledge application in shaping students' environmental literacy. In the context of Thailand's Basic Education Core Curriculum, these findings correlate with the learning standards and indicators for

science education, which aim to equip students with the ability to apply acquired knowledge for the benefit of society and their own livelihoods (MOE, 2010, 2017).

However, it was important to recognize that while knowledge was undeniably vital, it represented only one aspect of comprehensive EE. Learners also needed to develop the skills, values, attitudes, and commitment necessary to take meaningful action in addressing environmental problems, as emphasized by NAAEE (2010) and UNESCO (1978). A holistic approach to EE better equipped students to become active and responsible stewards of the environment, capable of contributing to the resolution of pressing environmental challenges.

The findings of this research suggested that many teachers had not prioritized the development of learners in other critical environmental dimensions. These dimensions included environmental stewardship, intersectoral collaboration, and environmental action. Environmental stewardship involved fostering a proactive stance toward environmental issues in students, encouraging them to actively conserve natural resources. Being environmental stewards entailed taking responsibility for maintaining environmental quality (Ardoin et al., 2018). Intersectoral collaboration equipped students with the ability to work across various sectors to address environmental challenges. In today's interconnected world, solving complex environmental problems often required collaboration between diverse stakeholders (Jensen & Schnack, 1997; Sass et al., 2020). Environmental action involved learners actively addressing the root causes of environmental issues, understanding the impact of their actions, and acting with self-motivation rather than external influence (Blythe & Harré, 2020; Jensen & Schnack, 1997; Ketsing et al., 2023). These dimensions were consistently highlighted in scholarly works and international frameworks as essential components of EE. Nevertheless, the research revealed that these areas had received comparatively less emphasis from high school teachers.

The emphasis placed by teachers on applying knowledge to solve environmental problems may have reflected the persistence of the anthropocentric paradigm in EE at the secondary school level. This paradigm emphasized the utility of the environment for human needs and societal benefit, often overlooking the intrinsic value of other living beings and the environment itself. An anthropocentric view prioritized human well-being over the welfare of other species and ecosystems (Edgeman, 2020). However, an alternative paradigm existed—the ecocentric or biocentric perspective—which emphasized the interdependence of all living and non-living entities on Earth and acknowledged the intrinsic value and rights of all beings to exist (Washington et al., 2017). From this perspective, humans had a moral responsibility to protect nature and respect the rights of other beings to coexist on Earth alongside humans.

Another possible reason for the focus on knowledge-based EE objectives was that teachers' practices may have been influenced by a human-centered, capitalist economic system, which fostered the belief that humans could control and manage the environment and its finite natural resources.

Additionally, this emphasis may have been attributed to the learning standards and indicators in Thailand's Basic Education Core Curriculum, which highlighted the application of knowledge for societal and personal benefit (MOE, 2010, 2017). As such, it was understandable that teachers aligned their teaching with the curriculum's standards and outcomes, as they were required to adhere to its guidelines.

Pedagogical Approaches in Environmental Education

The research findings highlighted several pedagogical approaches that high school teachers commonly used for EE. These approaches included problem-based learning, inquiry-based learning, lectures, project-based learning, and outdoor learning. These approaches aligned with the learning objectives that many teachers prioritized in EE, such as knowledge application, environmental values, and environmental knowledge.

However, many studies suggested that knowledge and attitudes alone were insufficient to adequately prepare students to become active citizens capable of addressing real-life environmental challenges (Jensen & Schnack, 1997; Kyburz-Graber, 2019). While lecture and inquiry-based learning were valuable for knowledge acquisition, they may not have fully met the broader goals of EE, particularly in terms of encouraging democratic participation and collaboration with other sectors in solving environmental issues (Division of Environmental Education, 2019; Earth5R, 2024).

Detailed discussions of each instructional approach are provided below:

UNESCO (2016) emphasized in the "Global Education Monitoring Report 2016: Education for People & Planet: Creating Sustainable Futures for All" that education was the most important mechanism for addressing environmental problems and improving environmental quality for sustainability. Consequently, EE played a crucial role in protecting and resolving environmental challenges. The findings, particularly the frequent use of problem-based learning, aligned with prior research such as Chen and Liu (2020) and Wahyudin and Malik (2019), which underscored the importance of using real-life problem scenarios to support students in identifying and understanding environmental issues. This approach developed students' critical thinking and problem-solving abilities (Wahyudin & Malik, 2019). Similarly, Kirsop-Taylor et al. (2021) explored the use of problem-based learning to integrate sociology and political ecology, promoting deep and meaningful learning. The high adoption rate of problem-based learning in this study could be attributed to its alignment with the intended EE objectives and the learning indicators in Thailand's Basic Education Core Curriculum (MOE, 2010, 2017).

Furthermore, project-based learning aligned with previous research highlighting the development of self-regulated learners who became sustainable environmental practitioners (Kricsfalusy et al., 2018). By engaging students in community-based projects to conserve natural

resources, this approach provided opportunities for applying knowledge in real-world contexts. Zhan et al. (2019) also demonstrated the effectiveness of project-based learning in developing primary school children's knowledge, willingness, self-efficacy, and pro-environmental behaviors related to water conservation.

Outdoor learning was consistent with research emphasizing experiential learning in EE (Cincera et al., 2020; Jose et al., 2017). Cincera et al. (2020) developed an environmental leadership program using field studies, which found that hands-on, on-site experiences increased learners' environmental leadership. Similarly, Jose et al. (2017) reported that outdoor learning experiences, such as drawing and describing their surroundings, helped students gain a deeper understanding of the environment and strengthened the connection between classroom learning and real-world experiences.

Inquiry-based learning had been shown to help students clearly identify environmental issues, asking questions, develop environmental literacy and higher-order thinking skills (Sompong & Jantrasee, 2023). However, This conventional science teaching approach may not lead students into taking action to solve environmental problems. It was primarily aimed at fostering scientific knowledge and habits of mind, which might not be sufficient for addressing complex environmental challenges and construct their visions for finding strategies toward the environmental challenges (Chen & Liu, 2020).

Environmental education encompassed a wide range of objectives, as highlighted by the Tbilisi Declaration (UNESCO, 1978). While knowledge was an essential component of environmental studies, it represented just one facet of the broader field. Teachers play a pivotal role as change agents, driving transformation in their students. They should design activities that enable learners to explore the root causes and consequences of environmental problems through hands-on experiences. Such activities not only deepen students' understanding of environmental issues but also equip them with the skills and mindset needed to address future challenges.

The findings showed that many teachers opted for lectures in teaching environmental topics, which might not have aligned with the urgent need to address environmental crises (Wahyudin & Malik, 2019). Despite the popularity of lectures, it was essential to acknowledge that this approach posed barriers to fostering hands-on, problem-solving methods in EE. While teachers may have been focused on preparing students for content-based exams, it was crucial to balance traditional content delivery with experiential learning in order to effectively address environmental challenges. The research findings were consistent with those of several scholars who noted that the main pedagogical approaches used in Thailand included inquiry-based learning, problem-based learning (Corpuz et al., 2022; Earth5R, 2024), and lectures. It is likely that teachers employed these approaches in teaching other topics as well, leading them to apply the same pedagogical approaches to EE.

Suggestions

Suggestions from EE Learning Objectives

The findings revealed three primary learning objectives for EE: knowledge application, environmental values, and environmental knowledge. However, the emphasis in the core curriculum on environmental issues for practical use may have limited the development of learners in other essential dimensions of EE, such as skill development and collaboration with other sectors. This focus may also be misaligned with international goals, which prioritize concrete actions to address environmental problems (UNESCO, 1978, 2016), and may not fully address the complexity of environmental issues that span multiple dimensions (Blythe & Harré, 2020; Wals & Benavot, 2017).

To mitigate these limitations, it would be advantageous for educational institutions and policymakers to consider a more comprehensive approach to EE. Such an approach should not only emphasize the application of knowledge but also prioritize the development of critical skills, foster collaborative partnerships with various sectors, and promote active engagement in solving real-world environmental challenges (Ardoin et al., 2020; Jensen & Schnack, 1997; Ketsing et al., 2023). By adopting this holistic perspective, schools could better prepare students to confront the multifaceted challenges posed by environmental issues and empower them to become active agents of positive change. This approach aligns with the broader goals of international EE frameworks and contributes to the creation of more sustainable and environmentally responsible societies.

Suggestions from EE Pedagogical Approaches

To better align EE with its objectives and the demands of the 21st century, it is recommended that teachers adopt pedagogical approaches that emphasize hands-on learning and collaboration with various sectors of society to address real-world environmental challenges (Jensen & Schnack, 1997; Kyburz-Graber, 2019; Sass et al., 2020). Such approaches not only equip students with practical problem-solving skills but also foster a sense of social responsibility and civic engagement. This study highlights the importance of considering a broader range of pedagogical methods in EE and stresses the need for a shift towards more action-oriented, capacity-building, and collaborative strategies to empower students to actively confront environmental issues.

In the context of EE in Thailand, it is recommended that a region-based curriculum be developed. This curriculum should not seek uniform implementation across all schools; instead, it should provide a framework that allows each school to adapt based on its specific context, such as size, location, and available resources. Additionally, specialized training for teachers in EE is essential to help them gain confidence in delivering lessons. Professional development programs should also focus on enhancing teachers' skills and knowledge in designing alternative approaches to EE beyond those currently in use, aiming to create meaningful improvements in environmental quality.

Suggestions for Future Research

It is crucial to explore pedagogical approaches that extend beyond knowledge acquisition and attitude formation. Approaches such as action project learning, Science, Technology, and Society (STS), the emancipatory approach, and place-based learning provide students with opportunities to collaborate with their communities, gain hands-on experience, and develop a deeper understanding of environmental issues, while simultaneously promoting action-based learning. However, the findings revealed that only a minority of teachers utilized or were familiar with these methods, leading to a disconnect between schools and the wider community. To bridge this gap, it is necessary for future research to investigate awareness and implementation of these experiential, action-oriented approaches in teaching EE among high school teachers.

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