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Education to Develop Appropriate Environmental Education Processes in Extended Schools

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Abstract

In today's technology-driven era, there is a growing interest in understanding the impact of environmental issues and frequent lethal natural disasters. Many countries are taking steps to promote environmental awareness by incorporating environmental education into school curriculums. This study focuses on developing management tools to support this effort. By using the theory of multiple intelligences and conducting a strengths, weaknesses, opportunities, and threats (SWOT) analysis, school authorities aim to empower students to take care of their communities and the environment. The research results indicate that the developed model is effective, with E1/E2 = 81.51/82.11, surpassing the condition of 80/80. Additionally, evaluation of the learning unit format revealed significant improvement in post-learning scores (average = 24.63, standard deviation = 2.11) compared to pre-learning scores (average = 5.90, standard deviation = 2.43) at a significance level of 0.05.

Keywords: extended school, environmental education, integrated education

1. Introduction

Education is important for developing personnel and being the basis for designing other parts because no matter what part is developed, it must begin with human development. Therefore, human development can occur in many forms, but education is the most important aspect. Thus, in education, national development must be parallel to human development. However, in situations where IT has been developing significantly, we see a picture of a more diverse future in education. From the original meaning of the word education vertically, it has become defined as "Learning" that is viewed as education. It is human beings' right, duty, and opportunity to design education according to their experiences, interests, and conditions. Learning content includes various resources, such as online media, community, and family, and learning can occur at any time, anywhere.

The National Education Act of BE 2542 (1999) and additional amendments no. 2, 2002, Issue 3, 2010, and Issue 4, 2019 cover education in Thailand. The act aims to develop Thai people physically, mentally, and intellectually complete, with knowledge, morality, ethics, and a culture of living happily with others and responding to local needs. It emphasizes the importance of educational opportunities in primary schools, thus creating expanded education opportunity schools (Ministry of Education, 2024), which are schools that offer primary education and expanded classes in areas far from schools that offer secondary education. The aim is for youth who have completed primary school and Year 6 students who are unable to travel to study in secondary schools to have the opportunity to continue their studies at the junior high school level, opening or expanding opportunities for youth in remote areas to have a solid higher educational foundation (Munthum & Petchroj, 2021). Many scholars support and highlight the importance of expanded school opportunities, demonstrating this policy's benefits and positive impacts. For example, Chafee (2021) described the positive effects of expanded learning opportunities, noting that organizations and communities recognize the benefits of such opportunities. Other community organizations in the city have partnered with high schools to create the Woonsocket Expanded Learning Opportunities Initiative to provide multiple paths to graduation for high school students by creating rigorous, individualized, standards-based, and student-focused programs that involve teachers, community educators, and students in learning. Raffo and Alan (2007) presented research on expanding educational opportunities for rural youth that may be unequal to those in urban areas. They argued for the need to match processes and examined the dynamics of the urban context. They suggested that with the recent development of the education policy of full-service expanded schools, a government approach to reducing educational inequalities might be able to address such inequalities.

Expanding educational opportunities focuses on providing inclusive and sustainable education, which aligns with the UN's 17 Sustainable Development Goals (SDGs) that 193 UN member states adopted in 2015 and aim to achieve by 2030. Under one goal, there will be sub-goals called sub-goals (Targets), which have a total of 169 sub-goals and development Indicators: 232 indicators (a total of 244 indicators but 12 duplicates) (SDG & Team, 2024). The goal of SDG 4 is to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. Therefore, expanding educational opportunities at the School of Opportunity focuses on ensuring that all children can access education from early childhood to secondary level at no cost, increasing the number of youths and adults who have vocational skills training, and eliminating gender inequality in higher education (National Economic and Social Development Council (NESDC), 2024). Saini, Sengupta, Singhg et al. (2023) studied the relationship between the effects of one SDG indicator (or more) on other indicators. Relevant factors are critical to achieving the goals (or SDG 4 factors). Their findings will help regulators take preventive measures while modifying existing policies and ensuring SDG 4's effective enforcement. This will help solve problems related to other SDGs later. The results of the experiment showed that every indicator is significantly related. Surattana and Rattanawadee (2022) conducted research related to SDG 4 to link the importance of education to UNICEF, which shares the same overarching goal of helping educational institutions develop community-wide strategies for environmental sustainability. In 2018, 20% of the world's children were not enrolled in school. More than half of the youth have poor literacy and numeracy skills. This study aims to discuss the link between SDG 4 and education. Research from several countries has shown the importance of education and future expectations. We found that educational content is relevant, emphasizing the ability to learn consciously and intellectually. In addition, equal rights for people of all genders is an issue in which education plays an important role. The world attaches importance to expanding educational opportunities, especially sustainable education.

Teaching and learning in the School for Expanding Educational Opportunities will focus on students learning about topics with ideas for creating future careers, such as agricultural science, or topics that can be used for further study. This is a matter that administrators of educational institutes pay attention to and organize education in this way (Fund, 2019). However, in an era that has advanced to the widespread use of IT, everyone has access to databases and can create big data efficiently. Environmental education teaches people about the issues that impact the environment and the actions they can take to improve and sustain it. It involves using techniques, methods, or processes to develop people's consciousness about environmental problems, have a good attitude, and solve environmental problems (ADEQ, 2020). Therefore, providing knowledge about environmental education within schools, especially schools that expand educational opportunities, is essential because it will create ideas and raise young students' awareness. According to the National Environmental Education Foundation (NEEF, 2024), environmental education in schools is important. Educators hope to provide lessons and experiences that enable students to learn about and understand their environment. Environmental education is successful when students understand environmental concepts, identify cause-and-effect relationships, and understand the meaning of their actions. Mashaba et al. (2022) focused on determining learners' environmental education knowledge and skills in primary schools in South Africa. They used a qualitative approach to collect data from eight sites in the North Tshwane District of Gauteng Province. The sample consisted of teachers, learners, and nonteaching staff working in schools. The results of the interviews indicated that this course provides learners with adequate environmental education knowledge in social sciences and natural sciences. The schools had a garden, tree nursery, tree garden, and a clean environment around them, which allowed the students to receive adequate environmental education knowledge and contribute to maintaining a clean environment in their communities.

Education is important, and all youth must have access to stable and sustainable education and expanded educational opportunities, especially if they live in rural areas. Educated youth will be the leading force in developing the country. Moreover, school subjects do not focus on environmental studies, even though it is necessary in an era of increasing environmental problems. Therefore, in this study, we present research objectives to develop ways to integrate environmental education into teaching and learning in schools, especially schools that expand educational opportunities for students. Increasing awareness and understanding of environmental issues promotes a sense of responsibility and motivation to act. Improved health and well-being can promote sustainable practices. Furthermore, environmental education can positively affect the environment by reducing the impact of human activities.

2. Related Work

2.1 Environmental Education

Only through environmental studies can individuals become equipped with the right mindset and knowledge to make a real difference. The world faces unprecedented environmental challenges, and we must act fast to preserve

our planet for future generations. Therefore, we must prioritize environmental education and encourage people to be agents of change. With the proper knowledge, attitude, and determination, we can all participate in preventing and solving environmental problems.

Environmental education is a crucial process that involves creating awareness and concern about the environment and developing skills to tackle its challenges. It is not enough to provide knowledge about environmental problems; individuals must also possess a conscious and positive attitude and be committed to solving current problems and preventing future environmental issues individually and collaboratively. The definition highlights the importance of developing knowledge and attitudes in individuals to become a significant force in preventing and solving environmental problems (UNESCO, 1978). UNESCO has promoted the Belgrade International Declaration, which has set the following six objectives to develop individuals' potential to prevent and solve environmental problems (Piyachan, 2017):

1) Awareness: Be alert about the overall environment and related problems. It is important to stay vigilant and aware of the surrounding environment and any issues that may be associated with it.

2) Knowledge: It is important to have a basic understanding of the overall environment, related problems, and one's responsibilities and roles.

3) Attitudes have social values that concern the environment and inspire participation in protecting and improving it. Be environmentally conscious and strive to protect and enhance the environment.

4) Skills can solve environmental problems. People must learn and practice these skills repeatedly to establish consistency in the long term. It may encompass various skills such as a holistic perspective, ethical considerations in environmental aspects, integration skills, and promotion of participation.

5) Evaluation ability is environmental measures and education related to political-ecological factors, economics, society, ethics, and education.

6) Participation is about developing responsibility, recognizing the urgency of environmental problems, and taking action to solve related problems.

As the educational process has changed, environmental education has become interdisciplinary, with teaching that emphasize students' important role in learning, planning, and accepting the results. In addition, environmental education is a lifelong, continuous education process (World Wildlife Fund, 2024).

2.2 Expansion Opportunity Schools

The issue of inequality in education exists not only in Thailand but also around the world. It is a long-standing problem stemming from disparities in various areas, such as differing school quality and incomplete education. In remote areas, a lack of scholarships, economic hardships, and epidemics have deprived Thai youths of their fundamental right to receive education and excluded them from the education system. To solve the problem of educational inequality, the government, private sector, and civil society should participate in finding solutions to reduce the educational inequality gap. The problems are twofold: (a) problems with education in Thai society, such as low-quality basic education, shortage of teachers, lack of labor, unemployed students, poor quality of higher education, and lack of research, innovation, and development; (b) inequalities in Thai education, such as the learner's domicile and environment and their family's social and economic status and culture and lifestyle.

The government has implemented policies to address educational inequality as follows:

1) Providing measures to reduce inequality, such as policies to support children and youth in accessing basic education and assistance with tuition fees.

2) Offering support to parents by indirectly assisting children and youth in accessing better educational opportunities and helping parents understand the importance of education and encouraging them to support their children's studies.

3) Expanding the school size to accommodate more students and provide equal education. This can help reduce differences in educational achievement, ensure equal teaching standards for students, and improve the quality of schools. Schools should provide primary education and extend their services up to middle school. Additionally, schools should expand their extracurricular activities to help children and youth develop diverse skills alongside academic skills, providing them with a chance to relax. Increasing the number of teachers per student and allocating more funds for education can also improve access to quality education for youth.

Therefore, expanding educational opportunities is a crucial policy of the Ministry of Education. It aims to develop human resources to improve the quality of life and contribute to the nation's development. After completing Grade

6, students can continue their studies at the junior high school level, providing a strong foundation for higher education. There are over three million students, marking an 80% increase from 2016 (CHEEWID, 2024; Education Council, 2017). Teaching and learning in schools have evolved after the outbreak of COVID-19. Previously, the focus was on either teacher-centered or student-centered approaches. However, the current context requires a new way of learning involving a blended learning approach. This allows students at the basic education level to set goals, learn self-assessment, use knowledge, and reflect for self-development. Research has shown that teaching and learning often neglect environmental education, which has become increasingly important post-COVID-19 (Ketsri & Chansirisira, 2021).

3. Method

The research framework in Figure 1 outlines the three phases of the study. Phase 1 involves studying and determining the number of schools and student samples used in the research and utilizing the research model of action research and development research. This phase aims to integrate action research and development research. Phase 2 focuses on developing and creating tools for the research by devising a model that integrates environmental education based on the theory of multiple intelligences. Finally, Phase 3 involves analyzing the results of evaluating the effectiveness of the integrated environmental education model, based on the theory of multiple intelligences, for students in schools that expand educational opportunities.

3.1 Phase1

Study environmental education in expanded opportunity schools using a questionnaire to evaluate the effectiveness of the integration model of environmental education based on the theory of multiple intelligence for students in expanded educational opportunity schools in Nakhon Pathom Primary Education District 2 (Figure 2).

Population and sample:

The research *population* comprised four groups of participants:

1) Junior high school students from the extended educational opportunity schools in the Nakhon Pathom Primary Educational Service Area 2, which includes four districts: Nakhon Chai Si, Sam Phran, Bang Len, and Phutthamonthon. According to a survey conducted on June 10, 2010, 3,951 junior high school students across 22 schools in this area enrolled for the academic year 2010.

2) Academic teachers from the same extended educational opportunity schools in the area, totaling 22 individuals, during the academic year 2012.

3) 22 junior high school English teachers from the extended educational opportunity schools within the same region.

4) School directors of the extended educational opportunity schools in the same area, also numbering 22 individuals.

The sample used in this research consisted of two groups: the first group studied the situation and evaluated opinions as basic information for innovation development, and the second group evaluated innovation efficiency, as detailed below.

Group 1 comprised 22 academic teachers in the opportunity expansion school of the Office of the Primary Education Area 2, Nakhon Pathom, in 2012. We selected them because they were knowledgeable about the school's academics. Group 2 comprised 22 English teachers in the same educational area, also selected for their expertise and experience in teaching English and their ability to disseminate environmental knowledge to students. Group 3 comprised three directors from Wat Kok Phra Chedi School, Nakhon Chai Si District; Wat Phai Hu Chang School, Bang Len District; and Ban Khlong Yong School, Phutthamonthon District. We selected these schools to measure innovation efficiency. The final group comprised first-semester lower secondary school students from the academic year, specifically those enrolled in opportunity expansion schools within the same educational area. The selection process involved the following steps:

Step 1: Yamane's (1967) in equation 1 determined the sample of opportunity expansion students from the Nakhon Pathom Primary Educational Area 2. This formula estimates the population proportion with a confidence level of 95% using the calculation specified in the formula.

$$n = \frac{N}{1+N(e^2)} \quad (1)$$

Where n = required sample size.

N = Number of members of the target population.

e = 5% error (0.05).

So, if e = 0.05, N =3,951 then n = 364

Step 2: After calculating and obtaining a suitable sample group, the researcher selects a quota sample based on the membership criteria, ensuring that the selection aligns with the proportional representation of students (Edwards, 2024).

Step 3: Once the proportion of the sample group is determined, random sampling is conducted using the odd-numbered students in the classroom. The appropriate sample size for this research is 364 out of 3,951 students.

The second group is the sample group used to evaluate the efficiency of innovation. We used the accuracy and reliability of the data to be a good representative of the sample group. We used the data verification process in terms of time, person, and place from three districts according to the following selection steps:

Step 1: Take the list of all four districts in the Office of the Primary Education Area 2, Nakhon Pathom, and do a simple random sampling by drawing lots. The results were Nakhon Chai Si District, Bang Len District, and Phutthamonthon District.

Step 2: We randomly selected the list of all three districts by drawing lots for one school per district. The results were Wat Kok Phra Chedi School, Nakhon Chai Si District; Wat Pai Hu Chang School, Bang Len District; and Ban Khlong Yong School, Phutthamonthon District.

Step 3: Select a sample group of 30 lower secondary school students from opportunity expansion schools within Primary Education Area 2. We preferred this voluntary sample group due to its natural composition, which aligns with neutrality principles. Such a sample often leads to highly accurate research results because varying levels of education do not influence it, and it consists of individuals with homogeneous characteristics (McMillan, 1996).

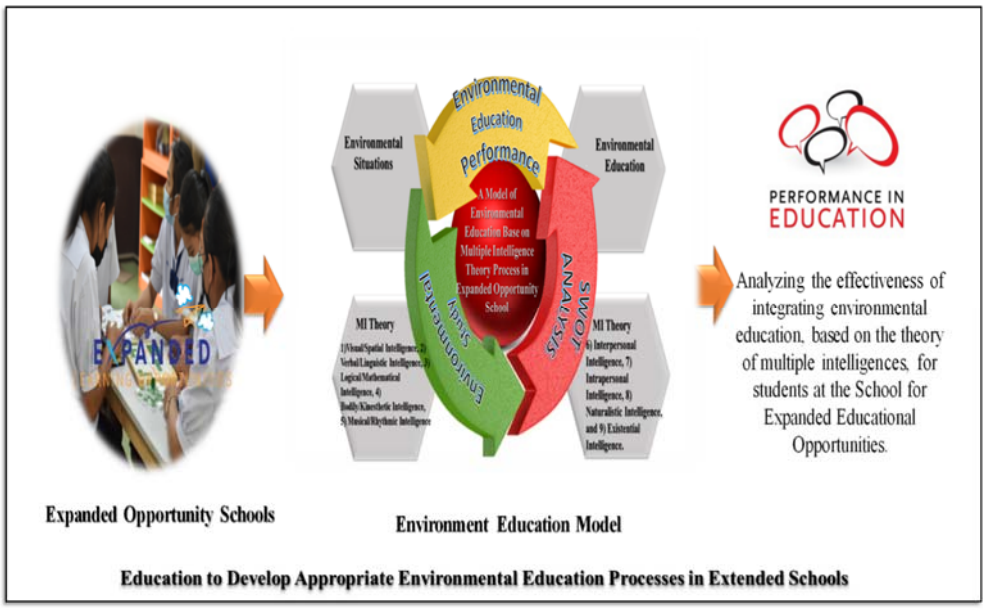

Figure 1. Framework of education to develop appropriate environmental education processes in extended schools

Figure 1 illustrates the model of this research. It focuses on students interested in environmental education within the context of an opportunity expansion school. The process involves integrating environmental education based on the theory of multiple intelligences, which includes nine distinct types of intelligence: (a) visual/spatial intelligence, (b) verbal/linguistic intelligence, (c) logical/mathematical intelligence, (d) bodily/kinesthetic intelligence, (e) musical/rhythmic intelligence, (f) interpersonal intelligence, (g) intrapersonal intelligence, (h) naturalistic intelligence, and (i) existential intelligence. To help students achieve the goals of environmental education and effectively communicate knowledge relevant to their community's environmental situation, especially in preparation for entering the ASEAN community in the future, the model comprises three key components:

1) **An Environmental Study** is essential before developing an integrated environmental education model based

on the theory of multiple intelligences. This model aims to expand educational opportunities for students. This study focuses on four key aspects of the environmental situation.

Aspect1: *Environmental study* in the community. By surveying the situation in the community, we found that the community has pollution problems caused by chemical residues resulting from agriculture that pollute the soil, water sources, and air. In addition, the community disposes of garbage indiscriminately, and technological advancement causes cultural problems. Aspect 2: Environmental education management: Students learn environmental education well. Aspect 3: Environmental learning management integrated with other subjects, such as English for communication, is reasonable. Aspect 4: Integrating environmental education with other subjects taught in schools, such as English for communication, found that most teachers adhere to the curriculum by setting content consistent with the basic education core curriculum. Students' lack of curiosity and interest causes most school integration problems. In addition, evaluation often uses assessment by testing.

2) **Environmental Education Performance** aims to foster understanding within the community, promoting a sense of care and responsibility toward environmental issues and related challenges. Through a community learning process led by educators, learners develop awareness, knowledge, understanding, and positive attitudes. They also gain participation skills and the ability to evaluate current problems and implement solutions while actively preventing potential future issues. This collaborative effort encourages individuals to work together in addressing these challenges.

3) **SWOT Analysis** is a tool for essential strategic planning and analyzing an organization's current situation and work processes. It creates strategic opportunities or new ideas in the future by analyzing four factors: strengths, weaknesses, opportunities, and threats. The goal is to develop competitive capabilities and find advantages in work, whether by closing weaknesses, finding opportunities to promote strengths, or even stopping work. Based on in-depth interviews with students and teachers at opportunity expansion schools and research findings related to the knowledge and understanding of environmental education among the sample group, including information about various pollutants in the community.

Once the researcher has obtained the population number and identified the target schools for the research, they will create a questionnaire to collect data on the environmental education situation at the expanded opportunity school. The questionnaire will include the following sections: Part 1: General information of the respondents. Part 2: Opinions of middle school students at the expanded Opportunity school regarding the current conditions and challenges in integrating environmental education into the school curriculum. Part 3: Evaluation of environmental education, including awareness, knowledge, attitude, skills, evaluation ability, and participation. Part 4: Guidelines for integrating environmental education into the school's curriculum to expand opportunities.

3.2 Phase2

The second phase is to conduct a SWOT analysis based on the principles of the opportunity expansion school and the concept of environmental education. A SWOT analysis is a tool designed to assess an organization's internal strengths and weaknesses and external opportunities and threats to develop competitive strategies (Gurel & Tat, 2017). The sample group will consist of four groups: middle school students, academic teachers, English teachers, and school directors, all of whom are from the educational opportunity expansion school of the Nakhon Pathom Primary Educational Service Area Office 2, which consists of Nakhon Chai Si District, Bang Len District, Sam Phran District, and Phutthamonthon District (Figure 2). To obtain the number of sample groups mentioned above for the SWOT analysis, we used a random sampling method, namely purposive sampling, to gather various perspectives. The sample totaled four groups: three school directors, 22 teachers, 364 students, and parents from 22 schools with expanded educational opportunities.

This phase involved in-depth interviews to gain insights and rich experiences from target groups. We used an in-depth interview as a data collection tool because it yielded more detailed information than other methods (Rutledge & Hogg, 2020). Additionally, we utilized non-participant observation. We conducted some interviews simultaneously and others individually. We used triangulation to ensure data reliability by incorporating multiple information sources.

Figure 2. Map of Nakhon Pathom Province showing Nakhon Pathom Primary Education Area 2 consisting of BangLen, Phutthamonthon, SamPhran, and Nakhon ChaiSi districts

3.3 Phase3

In Phase 3, we used the data obtained from Phases 1 and 2 for action research and developmental research to guide the integration of environmental education into schools and expand opportunities for the sample group. The integration approach at the school for expanded educational opportunities involves using questionnaires to gather student opinions on teachers, conducting in-depth interviews, developing environmental education integration models, assessing opinions, and creating tools for integrating environmental education in schools. We based this approach on the theory of multiple intelligences and aimed to provide learning units for students to sustainably preserve the environment in the community and the school.

3.4 Data Analysis

In Phase 1, we analyzed quantitative data using a questionnaire to examine and analyze the problems and needs for the efficiency evaluation model for integrating environmental education according to the theory of multiple intelligences in schools. In contrast, we employed descriptive statistics for quantitative data analysis of expanded opportunities to 22 schools using questionnaires and structured interviews with 364 junior high school students, 44 teachers in teaching practice, and three school directors. We then evaluated the effectiveness of the model for integrating environmental education based on the concept of the theory of multiple intelligences with a sample of 30 junior high school students, which we obtained voluntarily from Khok Phra Chedi School, Nakhon Chai Si District; Ban Khlong Yong School, Phutthamonthon District; and Phai Hu Chang School, Bang Len District, in Nakhon Pathom Province.

In phase 2, we used content analysis to examine qualitative data. Initially, we transcribed, coded, and analyzed the interview data to identify themes, subthemes, strengths, and weaknesses. Integrating environmental education in schools expands opportunities and summarizes it as a guideline for developing learning units to achieve learning in all aspects, including relationships, logic, analytical thinking, understanding patterns and relationships with other things, and categorizing assumptions and conclusions. The results from developing this learning unit will lead to self-understanding according to the theory of multiple intelligences, which will include learning and

understanding feelings, values, beliefs, awareness, thinking, self-confidence, effective planning, understanding of the ecosystem, awareness of life and the influence of nature, love of nature, and sensitivity to changes in the environment. Experts validated this approach.

4. Results

We divided the research results obtained from the use of tools in the research methodology into sections consisting of personal information, basic information about the opportunity expansion school, current situation regarding the community environment, learning level of environmental studies, a model for integrating environmental education according to the theory of multiple intelligences, and quality assessment and evaluation of the effectiveness of the integration model developed in this research.

4.1 The Situation of Environmental Education in Expanded Opportunity Schools

Based on the study and analysis of the current environmental issues in the community, which mainly involve agricultural activities, we have summarized the frequency and percentage of responses from the questionnaire regarding the community's opinions and situation on environmental issues. Table 1 presents the summarized data detailing various pollution concerns.

Table 1. Frequency and percentage of respondents regarding situations and opinions about the environment in the community regarding pollution in various aspects

Environment	Teacher Num	%	Students Num	%
Soil pollution situation				
1. The community uses agriculture.	41	93.20	245	67.30
2. The soil in the community has chemical residues.	23	52.30	154	43.00
3. Rice is the most widely grown and sold crop.	24	54.50	146	40.20
4. The use of agricultural chemicals is a cause of soil pollution problems in communities.	37	84.19	177	48.60
Water Pollution situation				
1. The community uses tap water.	23	52.30	293	80.50
2. Used for consumption.	38	86.40	279	76.60
3. Households manage wastewater by releasing wastewater into municipal sewers.	23	52.30	110	30.20
4. Wastewater in the community has a foul odor.	23	52.30	148	40.70
5. The use of agricultural chemicals is a cause of water pollution problems in communities.	26	59.10	119	32.70
Air pollution situation				
1. Chemical contaminants in the air cause air pollution.	18	40.90	178	48.90
2. The use of agricultural chemicals is a cause of air pollution problems.	19	43.20	128	35.20
Garbage pollution situation				
3. Indiscriminate garbage disposal is a source of solid waste pollution.	16	36.40	180	49.50
4. Houses are the cause of garbage pollution problems.	25	56.80	149	40.90
Cultural situation				
1. Buy daily consumer products from community stores.	25	56.80	149	40.90
2. Collect money by depositing it in the bank.	23	52.20	403	83.50
3. Most family expenses are food.	27	61.30	234	64.30
4. The method of deciding everyday problems relies on appropriate reasoning.	35	79.50	171	47.00
5. Families with conflicts use methods of family discussion and understanding among the family.	44	100.00	306	84.00
6. Advancements in technology cause problems in the community.	20	45.50	146	40.10

Based on the findings in Table 1, we summarize the analysis as follows. In the community, the majority of the residents are involved in agriculture (67.30%), particularly rice farming (40.20%), which contributes to the presence of chemical residues in the soil (43.00%). We also identified agricultural chemicals as the community's primary cause of soil pollution (48.60%). The analysis of environmental concerns in the community revealed that most people use tap water (80.50%) for consumption (76.60%) and dispose of household wastewater into drains (30.20%), resulting in a foul smell (40.70%). We identified agricultural chemicals as the leading cause of water pollution (32.70%). Additionally, chemical mixtures in the air (48.90%) mainly cause air pollution, particularly agricultural chemicals (35.20%). As for waste pollution, the research indicated that indiscriminate waste disposal

(49.50%) and household waste (40.90%) are significant sources of pollution. Besides the pollution issue mentioned earlier, there are various opinions about the environment in the cultural community. The analysis shows that most community members (28.00%) purchase daily consumer goods from local shops. They save the rest of their money in banks (83.50%). The majority of family expenses (64.30%) are on food. When problems arise, people use appropriate reasons to address them (47.00%). In times of conflict, individuals tend to confront each other and strive to reach a mutual understanding (84.00%). Additionally, they believe that technological advances (40.10%) are the leading cause of cultural problems in the community.

After studying and analyzing opinions on the environment and environmental issues in different communities, we also looked at students' interest in environmental education at the opportunity expansion school. This included analyzing six environmental education objectives: awareness, knowledge, attitude, skills, participation, and the ability to evaluate and use the results of this research to develop a model for delivering environmental education knowledge. From the research results shown in Tables 2 and 3, the results of the classification of the number and percentage of students according to the environmental education learning level are as follows:

Table 2. Results of classifying the number and percentage of students according to the learning level of environmental studies

Environmental Studies Learning	$\bar{X}$	**S.D.**
Awareness		
1. Humans are a significant cause of the destruction of natural resources and the environment.	4.01	0.88
2. Advances in science and technology are one of the reasons for environmental degradation.	3.42	0.90
3. Humans destroy natural resources and the environment both directly and indirectly.	3.96	0.94
Awareness $\bar{X}$ *= 3.79 and S .= 0.90*		
Knowledge		
1. Dust from burning waste affects global warming.	4.31	0.89
2. The causes of river pollution include the release of untreated wastewater, which leads to a decline in water quality.	3.99	0.88
3. Culture, traditions, and values influence human activities and natural resource consumption.	3.70	0.90
Knowledge $\bar{X}$ *= 4.00 and SD = 0.89*		
Attitude		
1. Environmental problems cause public health problems.	3.87	0.91
2. Conservation of natural resources helps reduce environmental problems.	4.24	0.91
3. Cultivating positive attitudes, values, and habits toward the environment helps all citizens preserve it.	4.18	0.89
Attitude $\bar{X}$*=4.09 and S.D.=0.90*		
Skill		
1. Capable of analyzing problems and examining community needs to identify environmental issues.	3.89	0.77
2. Able to protect and preserve the environment, making the community more livable.	4.02	0.77
3. Capable of preserving natural resources and the environment for sustainable development.	3.98	0.82
Skill $\bar{X}$ *= 3.96 and SD = 0.78*		
Participation		
1. Participating in identifying the causes of environmental issues in the community leads to solving problems and collectively conserving the environment.	3.92	0.86
2. Involving the community and society in caring for and preserving natural resources provides a sustainable solution to environmental problems.	3.95	0.96
3. Engaging in policymaking and planning serves as a solution to addressing the community's natural resource and environmental issues.	3.85	0.84
Participation $\bar{X}$ *= 3.90 and SD = 0.88*		
Evaluation Ability		
1. Deforestation is the destruction of natural resources and the environment, which affects the human way of life.	4.08	0.96
2. Urban growth without proper planning and urban development is a significant cause of environmental problems.	3.80	0.92
3. Humans are part of nature. The constant use of energy by humans affects both themselves and the environment.	4.11	0.95
Evaluation Ability $\bar{X}$ *= 3.99 and SD = 0.94*		

Table 3. Results of classifying the number and percentage of teachers according to the learning level of environmental studies

Environmental Studies Learning	$\bar{X}$	S.D.
Awareness		
1. Humans are a significant cause of the destruction of natural resources and the environment.	4.81	0.44
2. Advances in science and technology are one of the reasons for environmental degradation.	4.34	0.64
3. Humans destroy natural resources and the environment both directly and indirectly.	4.77	0.42
Awareness $\bar{X}$ = 4.64 and SD = 0.34		
Knowledge		
1. Dust from burning waste affects global warming.	4.56	0.54
2. The causes of river pollution include the release of untreated wastewater, which leads to a decline in water quality.	4.70	0.55
3. Culture, traditions, and values influence human activities and natural resource consumption.	4.44	0.61
Knowledge $\bar{X}$ = 4.46 and SD = 0.37		
Attitude		
1. Environmental problems cause public health problems.	4.52	0.59
2. Conservation of natural resources helps reduce environmental problems.	4.79	0.40
3. Cultivating positive attitudes, values, and habits toward the environment helps all citizens preserve it.	4.59	0.58
Attitude $\bar{X}$ = 4.63 and SD = 0.42		
Skill		
1. Capable of analyzing problems and examining community needs to identify environmental issues.	4.13	0.63
2. Able to protect and preserve the environment, making the community more livable.	4.22	0.67
3. Capable of preserving natural resources and the environment for sustainable development.	4.25	0.68
Skill $\bar{X}$ = 4.20 and SD = 0.60		
Participation		
1. Participating in identifying the causes of environmental issues in the community leads to solving problems and collectively conserving the environment.	4.38	0.65
2. Involving the community and society in caring for and preserving natural resources provides a sustainable solution to environmental problems.	4.36	0.68
3. Engaging in policymaking and planning serves as a solution to addressing the community's natural resource and environmental issues.	4.18	0.72
Participation $\bar{X}$ = 4.31 and SD = 0.61		
Evaluation Ability		
1. Deforestation is the destruction of natural resources and the environment, which affects the human way of life.	4.61	0.57
2. Urban growth without proper planning and urban development is a significant cause of environmental problems.	4.65	0.60
3. Humans are part of nature. The constant use of energy by humans affects both themselves and the environment.	4.70	0.63
Evaluation Ability $\bar{X}$ = 4.65 and SD = 0.54		

Therefore, Table 4 summarizes the environmental education learning level of the research group (teacher and student) based on six objectives: awareness, knowledge, attitude, skills, participation, and evaluation ability, with details as follows.

Table 4. Overall learning level of environmental education among teacher and student respondents

	Learning Environmental studies	Teacher		Student	
		$\bar{X}$	S.D.	$\bar{X}$	S.D.
1.	Awareness	4.64	0.34	3.79	0.90
2.	Knowledge	4.46	0.37	4.00	0.89
3.	Attitude	4.63	0.42	4.09	0.90
4.	Skill	4.20	0.60	3.96	0.78
5.	Participation	4.31	0.61	3.90	0.88
6.	Evaluation ability	4.65	0.54	3.99	0.94
7.	Overview of learning about environmental studies	4.48	0.48	3.95	0.88

Based on the results in Tables 2, 3, and 4, we confirmed that most of the participants who were students had a reasonable level of environmental education learning ($\overline{X}$ = 3.95, SD = 0.88), skills ($\overline{X}$ = 3.96, SD = 0.78), and

assessment ability ($\overline{X}$ = 3.99, SD = 0.94), which showed that they needed to enhance their learning in the areas that were lacking the most. However, when considering the research results of the teachers, we found that the level of environmental learning was at an excellent level ($\overline{X}$ = 4.48, SD = 0.48).

4.2 The SWOT Based on the Principles of the Opportunity Expansion School and the Concept of Environmental Education

Based on in-depth interviews with students and teachers at opportunity expansion schools and research findings related to the knowledge and understanding of environmental education among the sample group, including information about various pollutants in the community as presented in Tables 1–4, we can conduct a SWOT analysis based on the concept of environmental education. This analysis will guide the development of an environmental education integration model for opportunity expansion schools based on the theory of multiple intelligences. Table 5 presents the results of the SWOT analysis.

Table 5. Results of the SWOT analysis

SWOT ANALYSIS	
Strength:	Weakness:
1. The school environment expands opportunities, and the community is conducive to developing environmental education because most of the society is still semi-agricultural.	1. Because it is a semi-urban and semirural society, there are industrial factories and housing developments, so pollution can quickly occur. In addition, people who come to live in new communities are often outsiders, so it is not easy to create awareness of environmental conservation.
2. Students, teachers, and school directors are eager to learn and cooperate in the educational environment and have a mind to further develop for sustainable development.	2. The school used for this research is an expanded opportunity school, so the students only have junior high school students. This may be a problem with the lack of continuity in environmental education.
3. Parents, community leaders, students, and community residents are jealous of resources and aware of the toxic effects of pollution, such as air and water pollution, especially from factories. Everyone is looking for ways to prevent and learn about the environment to be developed and applied in the community.	3. From the survey and in-depth interviews, we found that the majority of air pollution comes from chemicals in the air (40.90%), followed by bad smells (25.00%) and dust (20.50%). As for the cause of air pollution problems, we found that most of them come from using agricultural chemicals (43.20%), followed by industrial plants. (38.60%), livestock farming (9.10%), and odors from garbage (6.80%). So, air pollution is a more difficult environmental management issue than other types of pollution.
4. The school is located in a semi-urban, semirural society. Therefore, most people living in this community are educated and accept and use modern information technology, including social media, and are alert to the environment in the community.	4. This is because some communities where the school expands opportunities are urban. Therefore, solid waste management is problematic. From the survey, we found that more people in the community dispose of garbage indiscriminately, which has become the source of waste pollution (49.50%), and garbage generated from households that is toxic waste (40.90%), which may cause water pollution (there are many natural water sources).
5. The learning units developed are easy to understand and learn. They can be used to conserve, care for, and restore the environment in the community. They can also be developed further, which will create sustainability in the future.	
Opportunity:	Threat:
1. The world, especially Thailand, places great importance on the SDGs. Moreover, the goals that answer and support the youth's ideas about environmental education are SDG3, SDG4, SDG14, and SDG15, which Thailand has announced as national agendas and educational agencies. Then, everyone gives importance to these things.	1. Thailand's economy is growing, society is becoming more urbanized, and many industrial factories are emerging, especially small industries that coexist with residential areas, quickly causing pollution and creating conservation awareness. Then, the environment may be challenging.
2. Public and private agencies are aware of and attentive to the environment, which results in support, opportunities to express their opinions, and funding to study and conserve it.	2. The greenhouse effect impacts the world, and El Niño results in air fluctuations and diminishing resources that may affect the traditional approach to learning to preserve the environment. Adaptive methods may be necessary to respond quickly to the constantly changing world.
3. Because society in the 21st century uses IT widely, social media plays an increasing role. AI can be integrated with education, thus providing knowledge related to the environment. Accordingly, studies can be made simpler and more extensive.	

Thus, through analyzing and studying environmental education in expanded opportunity schools, identifying community pollution issues, evaluating the learning levels of students and teachers in these schools, and conducting a SWOT analysis, we aim to use this data to develop a model for environmental education based on the theory of multiple intelligences, as illustrated in Figure 3.

4.3 Results of the Quality Assessment of the Integrated Environmental Education Model Based on the Concept of the Theory of Multiple Intelligences for Students in the School for Expanding Educational Opportunities

The tools used to collect data in this research consisted of the following five steps:

1) A questionnaire on opinions of junior high school students in the expanded educational opportunity schools on the current situation and problems of integrating environmental education with the theory of multiple intelligences, with the index of item-objective congruence (IOC) equal to 0.93.

2) Opinion questionnaires for teachers to expand educational opportunities regarding the current conditions and problems of integrating environmental education, with the IOC equal to 0.95.

3) Structured interviews for directors in schools to expand educational opportunities regarding learning styles, types of content, formats for organizing teaching activities, teaching materials, measurement, and evaluation, with the IOC equal to 1.00

4) Table 6 shows the results of finding the efficiency of the environmental education integration model according to the theory of multiple intelligences, which, according to the specified criteria, is 80/80.

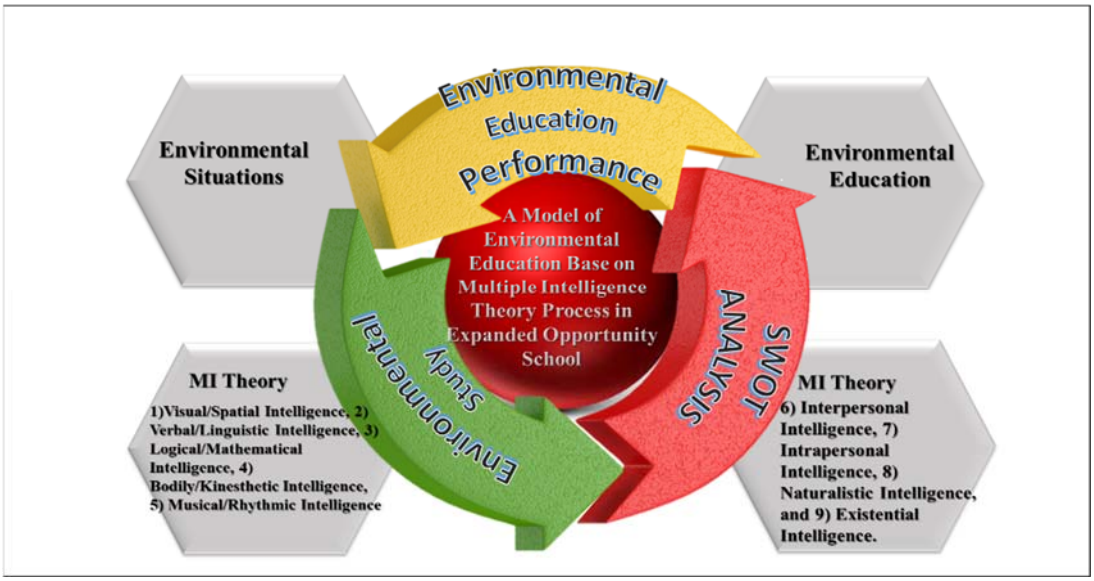

Figure 3. Model of environmental education based on the Multiple Intelligence Theory process in expanded opportunity schools

Table 6. Effectiveness of the integrated environmental education model based on the theory of multiple intelligences

Course performance		Average achievement score	
E_1	E_2	Pretest	Posttest
81.51	82.11	5.90	24.63

From Table 6, the results show that the environmental education integration model developed by the researcher has the efficiency of the process, and the efficiency of the results E1/E2 is equal to 81.51/82.11, which is higher than the set criteria of 80/80.

5) The evaluation form of experts' opinions on the integrated environmental education model based on the theory of multiple intelligences has the highest level of content validity, which is $\bar{X}$ = 4.60, SD = 0.55, and the highest level of construct validity, which is $\bar{X}$ = 3.97, SD = 0.55, which is consistent with set assumptions.

4.4 Results of the Evaluation of the Efficiency of the Integrated Environmental Education Model Based on the Concept of the Theory of Multiple Intelligences for Students in the School for Expanding Educational Opportunities

We evaluated the efficiency of an integrated environmental education model based on the concept of multiple intelligences for students with educational opportunities using a sample group of 30 students from three schools. These schools are the educational opportunity expansion schools of the Office of the Primary Educational Service Area 2, Nakhon Pathom, and include Wat Khok Phra Chedi School, Wat Phai Hu Chang School, and Ban Khlong Yong School. The integrated environmental education model aims to align with the educational reform approach by organizing activities focusing on learners. It emphasizes process skills alongside morality and ethics to instill desired characteristics in learners, allowing them to learn from subjects of interest and apply their knowledge to daily life. The integration model for learners is diverse. It includes various activities to allow them to practice, express their opinions and abilities, learn with others, exchange knowledge, and combine and connect knowledge and content. This results in learners gaining comprehensive knowledge and developing qualities such as responsibility, diligence, honesty, patience, a love for work, and the ability to work happily with others. We measured and evaluated the results by observing individual and group behaviors during various learning activities as well as through achievement tests and presentations of environmental problems in the community in subjects that involve joint activities. Table 7 presents the evaluation of the effectiveness of an integrated environmental education model in joint student activities based on the theory of multiple intelligences. The table shows a comparison of student performance before and after learning, showing that the average scores for all activities were higher after the learning process.

Table 7. Analysis of differences in learning averages in the integrated environmental education model based on the theory of multiple intelligences for students before and after studying

Activity	**Sources measuring academic achievement**					
	Before studying			**After studying**		
	$\bar{X}$	**S.D.**	**%**	$\bar{X}$	**S.D.**	**%**
Environment problems	3.00	1.44	30.00	7.66	1.09	76.67
Environment Education	4.36	1.95	43.66	7.83	1.17	78.33
Total	7.36	3.39	36.83	15.49	2.26	77.50

Table 7 presents the difference in the average learning outcomes of the integrated environmental education model based on the theory of multiple intelligences for students before and after participating in group activities. We observed that students achieved similar average scores for the activities in both areas. Overall, the learning achievement test score increased ($\bar{X}$ = 15.49, SD = 2.26) by 77.50%. We measured both academic achievement and satisfaction levels with an integrated environmental education model that included activities based on the theory of multiple intelligences. The study involved 30 students, as shown in Table 8.

Table 8. Results of the analysis of differences in academic achievement averages based on multiple intelligences theory

Satisfaction	**N**	$\bar{X}$	**S.D.**	**Satisfaction level**
Content	30	3.82	0.78	High
Activities	30	3.84	0.56	High
Benefits	30	3.84	0.71	High
Total	30	3.83	0.49	High

Table 8 shows the average satisfaction of students toward the appropriateness of environmental education according to the theory of multiple intelligences; the integration model is at a high level ($\bar{X}$ = 3.83, SD = 0.49) with a high level of satisfaction in all aspects. The analysis of qualitative data from the experiment on the integrated environmental education model, based on the theory of multiple intelligences, revealed that students had expanded opportunities to develop knowledge and understanding through diverse and engaging learning activities. This approach allowed students to express themselves naturally, participate in group processes, and develop awareness, attitudes, and values that support the environment. Emphasizing students as important and focusing on learning from actual practice, learning management provided students with various knowledge and experiences, helping them develop expressiveness, knowledge creation, critical thinking, group processes, skills, and evaluation

abilities.

5. Discussion and Conclusion

As society's lifestyles have changed, people use natural resources in various ways, leading to wastage and causing numerous environmental problems such as biodiversity loss, climate change, plastic waste, and air pollution, especially PM2.5 dust. Therefore, the Thai government aims to implement environmental policies aligned with the SDGs (Bangkokbiznews, 2024). Educational institutions are expanding educational opportunities because most schools are in semi-urban, semirural environments with mixed industrial and agricultural factories. Therefore, in this research, we developed this problem into a learning unit to integrate environmental education in schools to expand educational opportunities based on the theory of multiple intelligences.

Based on research involving 364 lower secondary school students, 44 teachers, and three school directors, through structured interviews and evaluation of an integrated environmental education model based on the theory of multiple intelligences, we found that the participants were primarily female students (59.50%) compared to male students (40.50%). Most were 14 years old (73.40%), with an average age of 14.15. We found that the main agricultural activity was rice planting (40.20%), leading to soil with chemical residues (43.00%), and we identified the use of agricultural chemicals as the cause of soil pollution problems (48.60%). The community mainly used tap water (80.50%) for consumption and household use (76.60%), while they commonly discharged wastewater into drainage pipes (30.20%), resulting in foul-smelling wastewater (40.70%). Furthermore, the community's use of agricultural chemicals was the primary cause of water pollution issues (32.70%). Air pollution caused chemical contamination (48.90%), with agricultural chemicals being the leading cause of pollution problems (35.20%). In the community, people indiscriminately discard waste, contributing to pollution (49.50%). Housing is also a significant cause of waste pollution problems (40.90%). People purchase daily consumer goods from local shops (28.00%) and save their remaining money in the bank (83.50%). The majority of family expenses go toward food (64.30%). When problems arise, the community responds appropriately to address them (47.00%), and in cases of conflict, people tend to communicate and reach an understanding (84.00%). People tend to believe that technological advancement is the root cause of cultural issues in the community (40.10%). In terms of environmental education, we observed that students have the lowest awareness of environmental education ($\overline{X}$ = 37.00, SD = 0.90), followed by participation ($\overline{X}$ = 3.90, SD = 0.88), skills ($\overline{X}$ = 3.96, SD = 0.78), and evaluation ability ($\overline{X}$ = 3.99, SD = 0.94).

Based on the multiple intelligence's theory, the integrated environmental education model synthesis has identified several environmental issues in the community. These include soil contamination from agricultural chemicals, unpleasant odor and chemical pollution in wastewater, air pollution from agricultural chemicals, and widespread littering contributing to garbage pollution. Furthermore, cultural issues in the community stem from technological advancements. We used the multiple intelligences theory to promote self-understanding and understanding of nature. We observed that students lack awareness, participation, skills, and assessment abilities in environmental education. Therefore, we aim to improve learning in these areas. To address these concerns, we applied the multiple intelligences theory explicitly regarding logical-mathematical intelligence and interpersonal intelligence. The assessment of the effectiveness of the integrated environmental education model, which is based on the theory of multiple intelligences and is utilized for students in expanded educational opportunity schools, indicates that the integration model was successful (E1/E2 = 81.51/82.11). It also demonstrated the highest level of content validity ($\overline{X}$ = 4.60, SD = 0.55) and strong structural validity ($\overline{X}$ = 3.97 SD = 0.55). Post-study achievement with the integrated environmental model based on the theory of multiple intelligences showed higher scores after studying ($\overline{X}$ = 24.63, SD = 2.11) compared to before studying ($\overline{X}$ = 5.90, SD = 2.43), which was statistically significant at the 0.05 level and aligned with the hypothesis. Furthermore, students expressed high satisfaction with the integrated model ($\overline{X}$ = 3.83, SD = 0.49).

1) Analysis and discussion of the environmental situation and opinions within the community regarding the management of environmental education for students at schools aimed at expanding educational opportunities

The analysis of current data and opinions regarding environmental issues in the community has revealed that many farmers engaged in rice cultivation are experiencing soil pollution. This pollution is primarily attributed to chemical residues resulting from agricultural chemicals, which account for 48.60% of the pollution problems reported in the community. This finding aligns with Thaysnit's (2021) study of heavy metal contamination in rice field soil. Applying chemical fertilizers, herbicides, and pesticides in rice farming is common to enhance growth and increase yields. However, this practice leads to the accumulation of various chemicals in the soil of cultivation areas. Some of these substances have low degradability, causing them to persist in the soil for extended periods. Consequently, heavy metals such as copper, zinc, cadmium, and lead accumulate in the soil over time. The

interviews with the Wat Pai Hu Chang School and Ban Khlong Yong School administrators indicated that the pollution problem is primarily due to chemical contamination. In contrast, we found that most communities rely on tap water for consumption and discharge household wastewater into the drainage system, resulting in a foul odor. Agricultural chemicals are responsible for approximately 32.70% of the community's water pollution issues. This finding is consistent with the Pollution Control Department's (Pollution, 2024) research, which estimates that people discharge about 80% of the water in households and buildings as wastewater, calculated based on the population or building area. Furthermore, the administrators of Wat Pai Hu Chang School and Ban Khlong Yong School mentioned that the wastewater discharged into the Tha Chin River is primarily attributable to agricultural activities and, to some extent, to household wastewater. In terms of air pollution problems, we found that chemical contamination in the air caused most of these problems, and the use of chemicals in agriculture was the cause of 35.20% of air pollution problems. In terms of garbage, indiscriminate littering (49.50%), especially from houses (40.90%), caused this problem, which was consistent with Buntip's (2022) finding that the cause of the increase in garbage was the increase in the population and households. Cultural issues have emerged due to rapid technological advancements, significantly affecting the daily lives of people in the community. Charoen (2022) highlighted the impact of digital learning and innovations on educational changes, particularly with the rise of online teaching, which may hinder interpersonal interactions. Additionally, Thumthong (2022) noted that the quality of teachers' learning management has diminished, creating burdens that affect both teaching and learning time. Teachers are concerned about adapting to this new format, fearing that students' learning outcomes may decline. Suteetorn (2021) examined the positive and negative effects of social media usage among teenagers. With teenagers spending nearly half of their day on social media, there is a significant risk of negative consequences, including addiction, which can adversely impact their brain health, physical health, mental well-being, and social interactions stemming from the dangers associated with social media use. The impacts discussed above stem from the location of Nakhon Pathom Province, a metropolitan area with distinct urban and rural characteristics situated close to Bangkok. Convenient transportation routes contribute to swift economic and social development across various sectors.

Regarding students' level of environmental education learning, we found that they have the least ecological awareness ($\bar{X}$ = 3.7, SD = 0.90) followed by participation ($\bar{X}$ = 3.90, SD = 0.88) and skills ($\bar{X}$ = 3.96, SD = 0.78), which can be seen as having the least environmental awareness. In contrast, the objectives of environmental education give priority to awareness. Chuenwng (2020) showed that awareness and acceptance are essential in creating awareness of environmental conservation. The author researched wastewater management in the community. Knowledge, awareness, and understanding of wastewater management in the community affect the acceptance of wastewater management systems. These three variables relate to knowledge, understanding, awareness, and acceptance of wastewater management systems in the community. Kamaruddin (2016) conducted research to demonstrate that community participation and awareness in environmental projects significantly improve decision-making regarding protecting the environment and natural resources. This process is critical because it enables communities to voice their opinions on issues that impact their lives, contributing to effective environmental management within a framework of shared understanding. Kamaruddin's research has led to the concept of environmental education as a learning process and creating an understanding that results in people having awareness and determination to solve the problems that occurr and prevent new problems that will arise as a basis for living and coexisting in the community, society, country, and the world, respectively.

Therefore, from the study of the situation and opinions about the environment in the community, we can summarize the management of environmental education learning of students in the school for expanding educational opportunities as follows: 1. Agricultural occupations, especially rice cultivation that uses fertilizers and pesticides, cause soil pollution, which results in agricultural chemical residues. 2. People in the community dumping wastewater from household consumption into the municipal drainage system and from agricultural chemicals into natural water sources cause water pollution. 3. Burning agricultural chemicals in the air and burning agricultural weeds cause air pollution. 4. Indiscriminate littering due to population growth and lack of environmental awareness, especially from households, causes waste pollution. 5. Environmental problems in the community due to the importance of technological advancement in entering the IT era result in extravagant consumption. 6. Regarding students' level of environmental education learning in schools with expanded educational opportunities, we found that they had the least environmental awareness, which depended on the inculcation of the family and community in terms of creating awareness and receiving positive news in terms of environmental conservation awareness to create the determination to solve and prevent problems.

2) Synthesis of an integrated environmental education model based on multiple intelligences theory for school students with expanded educational opportunities

Based on the theory of multiple intelligences, we successfully constructed the integrated environmental education model, with an average score of 81.52% and 82.11%, which met the 80% and 80% criteria. It was the most consistent with the content (content validity $\overline{X}$= 4.60, SD = 0.55) and consistent with the structure (construct validity $\overline{X}$ = 3.97, SD = 0.55). The conclusion is that the constructed model is practical, and teachers can use it effectively for teaching and learning. The steps in constructing the model were as follows: Step 1: Gather basic information by reviewing relevant documents, theories, and research. This includes collecting current data on environmental conditions using questionnaires and conducting school interviews to expand educational opportunities. Step 2: Develop an integration model based on the basic information and the current environmental conditions assessed in Step 1. This model will utilize learning from real experiences as a foundation for teaching and learning. Experts will review it to ensure its accuracy and appropriateness, making it ready for use in educational settings. Step 3: In the implementation phase, teachers will integrate the model into their teaching materials across various subjects. They will verify the accuracy of the content to determine whether the model meets expectations and provide feedback for further enhancement. Step 4: Evaluate and improve the integration model based on the feedback received. Several examples highlight this approach in exploring concepts and research related to creating an integration model consistent with this study. For instance, Chanchang (2020) presented research on integrated teaching management to develop high-level thinking skills through practical learning experiences. This integrated teaching management is a crucial guideline for reforming learner-centered education, moving from traditional lecture formats to a more hands-on approach. Learners engage in integrated teaching and learning that blends content within a specific discipline or multiple disciplines. This method emphasizes the learning process more than the final product, enabling students to practice and enhance their thinking, decision-making, and collaboration skills. Additionally, it supports learners in generating their knowledge. Srisapan et al. researched the integrated learning management model to develop learning in the 21st century for students of the Northeast Sports School. They found that the integrated learning management model to build learning in the 21st century obtained by the open system approach for administration with the integration of single factors included factors that facilitate success. These include (a) input factors, namely the desired characteristics of learners in the 21st century, teacher leadership, curriculum, media and technology, and educational quality management and assessment; (b) process, namely step 1: knowledge framework creation; step 2: implementation; step 3: outcome evaluation; (c) output, namely success according to the factors; and (d) feedback, namely reflection of problems and suggestions for implementation at each step. However, the integrated teaching and learning model with environmental education in this research is also consistent with the teaching and learning management for schooling with SDG 4, which states, “Quality Education: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” because the developed model can manage teaching and learning for students. The teaching and learning model require adjusting to suit the situation and changes in the world in line with the development guidelines for Thailand 4.0. Teachers should refrain from giving homework to students so that they have time to learn, do appropriate activities and promote development according to their age, encourage collaborative learning, organize learning formats to meet the needs of students, and let students learn what they want to know. Learning management focuses on allowing students to gain direct experience with the practice and promoting learning by creating creativity and problem-solving. This is consistent with Sinthuwongsanont (2023), who presented research on education with the SDGs.

3) Evaluation of the effectiveness of the integrated environmental education model based on the multiple intelligences theory for students in extended educational opportunity schools

The comparison of achievements before and after implementing an integrated environmental education model based on the theory of multiple intelligences showed that the post-learning ($\overline{X}$ = 24.63, SD = 2.11) scores were significantly higher than the pre-learning scores ($\overline{X}$ = 5.90, SD = 2.43) at a statistical significance level of 0.05. This finding is consistent with the initial hypothesis. We found that students expressed high satisfaction with the integrated model of environmental education based on the theory of multiple intelligences. We evaluated overall satisfaction positively ($\overline{X}$ = 3.83, SD = 0.49), and this included high levels of satisfaction regarding the content ($\overline{X}$ = 3.82, SD = 0.78), activities ($\overline{X}$ = 3.84, SD = 0.56), and production ($\overline{X}$ = 3.84, SD = 0.71). These results were consistent with Garcia’s (2021) research on integrating a learning management system (LMS) to enhance teaching assessment. The author thoroughly evaluated how an LMS can assist in teaching practices from data collected from 26 students at Rizal Technological University’s College of Education in the Philippines. The author employed a quasi-experimental design alongside a normative survey. The findings indicated that the respondents had a positive attitude toward incorporating the LMS into their teaching methods. Although they performed poorly on the pretest, their scores significantly improved on the posttest. Furthermore, the research revealed no significant differences in performance between the experimental and control groups during the pretest and posttest phases. However, there was a notable difference in pretest and posttest scores within and between the experimental and

control groups' scores. Suarlin (2023) presented a study that combined environmental education with an ecological care model in schools. The results indicated high levels of student satisfaction and successfully raised awareness about sustainability among students, effectively aligning with the educational goals outlined in the SDGs. The study revealed that assessments conducted before and after the intervention significantly improved participants' environmental knowledge and awareness. Students developed a deeper understanding of ecological issues such as climate change, biodiversity loss, and pollution, resulting in positive changes in their attitudes and behaviors toward environmental conservation. Additionally, teachers reported increased confidence and capability in incorporating ecological topics into their teaching methods.

6. Recommendations

In future research, scholars should promote environmental education awareness in any school or educational institution according to ecological education guidelines for sustainable development. not just the study of environmental education with the environment or nature studies but also because of the use of natural media or events that occur as case studies so that students can connect and apply knowledge, principles, and various theories gained in the classroom with real things for answers. Questions based on the subject framework are not enough. What is more important is to combine content and activities into a holistic system that will create a sustainable teaching and learning process. The development of teaching and learning formats and innovations within the system should prioritize integrating observation, application of knowledge, and problem-solving in daily life accurately and appropriately. Teachers should enhance the learning system through systematic teaching to address weaknesses, leverage strengths, and operate on the principle of integration. Future research should focus on developing standards for environmental management education for sustainable development in schools. This could involve expanding educational opportunities and developing a curriculum to promote the learning and management of ecological studies. Components for facilitating the teaching and management of ecological studies in schools through expanded educational opportunities should be considered.

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