Cultivating Eco-Literacy: A Project-Based Approach to Environmental Education in Urban Schools

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Abstract: Eco-literacy among younger generations is essential to support sustainable development. Social studies education in schools plays a crucial role in developing this competency. This article aims to analyze how project-based learning can enhance eco-literacy. The research design employed is a one-group pretest-posttest experimental approach involving 26 students as research subjects. The study was conducted in a private school located on the border between Surabaya and Sidoarjo. It was chosen for its densely populated residential area, where eco-literacy skills are particularly necessary for students. The instruments used to assess eco-literacy consist of three types: an essay test to evaluate knowledge, observation sheets to determine attitudes, and a rubric to measure skills through student-produced work, along with a worksheet to track learning process outcomes. The findings demonstrate that project-based learning in social studies significantly improves students' eco-literacy. Additionally, it fosters increased student engagement, critical thinking, and creativity in responding to environmental issues in their surrounding.

1 INTRODUCTION

21st-century education must place more emphasis on learning innovation. According to Information and Communication Technologies (ICT), learning innovation is included in the 4C content: communication, collaboration, critical thinking, problem-solving, and creativity. Framework adds 21st-century interdisciplinary topics to traditional subjects relevant to several important issues. Which includes a global understanding of environmental awareness, citizenship, health, politics, finance, multiculturalism, and economics (Trilling & Fadel, 2009). The framework for 21st-century learning enriches conventional interdisciplinary subject areas by integrating crucial contemporary issues. These include awareness of global challenges, comprehension of environmental and ecological systems, financial literacy, health education, and civic responsibility. (Penca, Barbanti, & Cvitanovic et al., 2024). In this era of globalization, students are not only emphasized in the cognitive dimension but other dimensions must also be emphasized in the learning process (Alazmi, H.S. 2022; Zajda, 2021). The importance of environmental education, how to care for the environment, how students are aware of the surrounding environment, and how students can face problems. Problems in the surrounding environment (Dillon & Herman, 2023). Education that instils in students a sense of concern for the surrounding environment is still very minimal (Rachmawati, 2021).

The environmental crisis is the main issue in world community debate today. Every individual sympathizing with the continuity of life will continue looking for solutions to the ecological crisis (Afifah & Rofiah, 2020). According to IPBES 2018, every year, 680,000 hectares of forest are lost in the largest region of Southeast Asia (walhi.or.id, 2021). Indonesia's natural conditions are in a phase that requires special attention. Companies are increasingly exploiting forests in Kalimantan and Papua, engaging in deforestation to convert these regions into zones for extractive industries, leading to ongoing environmental degradation and misuse. Research conducted by Walhi (the Indonesian Environmental Forum) obtained data showing that an

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area of 159,000,000 hectares was included in extractive industry investment permits. Corporations currently hold control over 82.91% of the land area and 29.75% of the sea area. The rapid development in this era has led to escalating environmental degradation. Environmental damage refers to the continuous process of deterioration or decline of natural ecosystems. (Tahir, 2017). With the decreasing condition and level of the natural environment, sustainable development education is necessary to improve and create a generation that cares about protecting the environment (Setyaningrum & Gunansyah, 2020). Eco-literacy aims to enhance and modernize public awareness regarding the significance of global ecological knowledge (Kurniasri, 2019). It defines eco-literacy as creating environmental education and prosperity by minimizing natural damage and preserving nature.

Efforts to solve problems in social studies learning can be carried out with several learning models to attract students to be able to find solutions to problems, one of which is using project-based learning techniques, with learning techniques that can be described when the teacher presents a problem in which there is a problem (Almulla, 2020). Social issues that are often encountered in everyday life (Mohajan, 2020). Besides that, the teacher asks questions to stimulate students' thinking about solving problems. This project-based learning can be supported by utilizing technology. The project-based learning model is an educational pattern carried out in two directions. Effective learning patterns can be seen in interactions between teachers and students (de la Torre-Neches, Rubia-Avi, Aparicio-Herguedas, & Rodríguez-Medina, 2020). This learning process uses a student-centred model; the teacher as a facilitator makes it easier for students to actively solve problems and build their knowledge collaboratively (Jusita, 2019). The project-based learning model emphasizes problem analysis within the school environment. In social studies education, this approach fosters environmental awareness and character development. By integrating various social sciences, social studies provides essential knowledge and skills that are directly applicable to students' everyday lives (Sund, & Gericke, 2020). Social studies learning has problematic issues that can increase awareness of environmental care. One of the focuses of social studies learning in ecological matters is ecology material, the relationship between humans and nature (Uralovich, Toshmamatovich, & Kubayevich, et al., 2023). Social studies learning creates learning that can provide understanding, knowledge, and concern for the social environment. Solving environmental problems is carried out complexly through project-based learning by presenting daily life problems and questions to stimulate student creativity (Kurniawan, 2022).

Implementing project-based social studies learning is highly urgent to provide an understanding of environmental awareness. Students face rapid developments in this era of globalization, and ecological literacy can guide them in dealing with environmental problems. Based on the pre-survey results, "students at Muhammadiyah 2 Taman Middle School also have quite low levels of eco-literacy; not a few students are less sensitive regarding environmental awareness. The second result states that Muhammadiyah 2 Taman Middle School is also a technology-literate school" (Bachtiar, personal communication, August 7, 2023). Based on this, technological developments in this research are also used to complement project-based learning. Technological developments can significantly produce many innovations and variations to change learning (Judge, 2023). It is a tool that develops environmental literacy skills for solving problems, materials, and oneself as an individual and part of society. From the problems above, the researcher aims to find out that project-based social studies learning has a significant influence on increasing the eco-literacy of Muhammadiyah 2 Taman Middle School students.

2 RESEARCH METHODS

This study employs a one-group pre-test and post-test design, where a pre-test is administered prior to the intervention, followed by a post-test after the intervention. The research took place between February 15 and February 22, 2024. The population consisted of all 174 seventh-grade students enrolled at SMP Muhammadiyah 2 Taman during the 2023–2024 academic year. A purposive sampling technique was applied to select 26 students from Class VII-B as the research sample

Researcher data was collected twice: 1) At the beginning, the Class that was the research sample was given a test with five essay questions regarding the material of getting to know the surrounding environment to determine the student's initial knowledge. Furthermore, in the end, after being given treatment or treatment to discover differences in students' knowledge abilities, the questions given were tested in classes that were not given treatment. 2) Documentation is carried out to determine the research's activities.

The data analysis was conducted descriptively, assessing the feasibility of the instrument through validity, reliability, difficulty level, and discriminative power tests. The five essay questions underwent validation, with results confirming all items as valid, having an r-value greater than 0.42, and demonstrating reliability with a Cronbach's alpha coefficient of 0.74. A paired-sample T-test, preceded by a normality test, was conducted to assess the differences in student outcomes before and after the treatment. Additionally, an N-Gain test was performed to quantify the extent of the treatment's impact.

3 RESULTS AND DISCUSSION

This research is part of pre-experimental research conducted at SMP Muhammadiyah 2 Taman. Data obtained that researchers can take includes e-literacy in the knowledge and attitude aspects, which are measured using essay tests, as well as the skills aspect, which the products produced by students' measure. The learning process was carried out over five meetings: an initial test, three treatment sessions, and the final test. This project-based social studies learning process aligns with Vygotsky's learning theory, which is closely related, especially to developing students' understanding and skills. This learning process refers to constructivism (Zone of Proximal Development), which means the distance between a person's ability to complete a task independently and the ability that can be achieved with the help of more skilled people. In this learning project, the teacher becomes a facilitator and a "scaffolder." Besides the teacher, several students are also "scaffolders," namely students who are group leaders. They assist students or friends when needed to help them achieve project goals (Rohmah, 2021).

Learning Process

Implementation of the project-based social studies learning process begins with determining the topic by asking students basic questions related to environmental problems. Students gather according to their respective groups that have been formed to make a project plan and prepare a schedule for making the project. Next, students prepare a project schedule with an agreement made by the teacher and students. Next, in the project implementation process, the teacher supervises each group.

The next step after the project has been completed and a product has been produced is for each group to make a presentation with the project evaluation step. They explain the results of the project that has been carried out, namely the project to reprocess used goods around their environment using the 3R concept. They also describe the stages of making the product, the product description, the product advantages and disadvantages, and the benefits of the resulting product. In this activity, the teacher assists students by checking activity sheets, checking records of difficulties produced by students, and providing input and examples of follow-up plans for students. Checking notes on problems is carried out, starting with students preparing the project plan and the project schedule. Project assessment is carried out by the teacher, who makes observations.

In contrast, students carry out the project, from the initial syntax to the presentation process and the product results for each group. This assessment is carried out using the measuring tool created, namely the project assessment rubric. It evaluates implementing the project-based social studies learning model, carried out by students actively with direction and guidance, with the teacher being the student facilitator.

Social studies learning using a project model involving students' knowledge, which is formed through students' independent personal experiences and can increase their sense of empathy towards the surrounding environment, must be carried out continuously. Students can understand what they do, whether it is good or bad. Project-based social studies learning in groups can create experiences and positively affect the learning process so that students can get to know the surrounding environment better and be aware that they have a responsibility to protect the environment. A good project work process will also positively impact student activities and vice versa. Project-based social studies learning can positively affect students' learning processes. Project-based social studies learning can also significantly affect students' knowledge, attitudes, and skills before and after the teaching.

Providing material packaged in worksheets by teachers through project-based social studies learning in the material of getting to know the surrounding environment is done by offering problems regarding environmental damage by carrying out project-making activities using used goods, which is an effort in contextual learning that links the material to everyday life. They resulted in student interest and fostered students' knowledge, attitudes, and skills to protect the surrounding environment. Project learning shows that this model can encourage students to engage in meaningful learning activities. Students can construct their knowledge to overcome the problems they experience (Tinenti, 2018). With this, the project-based social studies learning model is based on

Vygotsky's constructivist approach. This learning theory uses a scientific approach, one of which uses a project-based learning model that emphasizes learning in the field and involves the active role of students. Project-based social studies learning for improving students' eco-literacy is based on Vygotsky's theory, where students are grouped to solve a problem while working on a project by finding various ideas from each student to produce something new in the form of a product. The constructivist approach used in this research focuses on the concept of constructivism (Zone of Proximal Development). Students can learn concepts well if they are in the ZPD. Students work in ZPD; if individuals cannot solve the problem, they can use the help of adults or peers. Teachers are advised to use scaffolding in learning (Rohmah, 2021).

Constructivist learning emphasizes student activity through freedom so that students can explore their understanding widely and understand what they are learning by applying the concepts that students know, which will later be used in everyday life. Each individual's knowledge is not simply transferred; they will be understood by themselves. The advantage of this theory is that learning focuses on students (student-centred learning), and the teacher only acts as a facilitator. In this theory, learning is not only obtained from lessons but can also be obtained through discussions, experiences, and lessons from the surrounding environment. Apart from that, knowledge is formed from a person's interactions with other people. Learning activities become active and creative due to previous knowledge. Knowledge obtained by students outside of school can also be linked to the new knowledge they acquire to create connections between old and new knowledge.

The learning process includes an analysis of aspects of students' knowledge, attitudes, and skills in eco-literacy. This aspect analysis is carried out by looking at the student assessment process. Assessment of student learning processes is obtained by eco-literacy indicators, namely aspects of knowledge, attitudes, and skills. In the knowledge aspect, the evaluation is taken from the pre-test and post-test in the form of essay questions; the attitude aspect is taken from the student's worksheet, which has been adjusted to the indicators; and the skills aspect is taken from the assessment of products that have been made by the students in the form of handicraft products and posters, in addition to There is also the value of each individual's presentation skills.

Students' Eco-literation

The results of the learning process scores for Class VII-B students will be presented in a bar chart as follows:

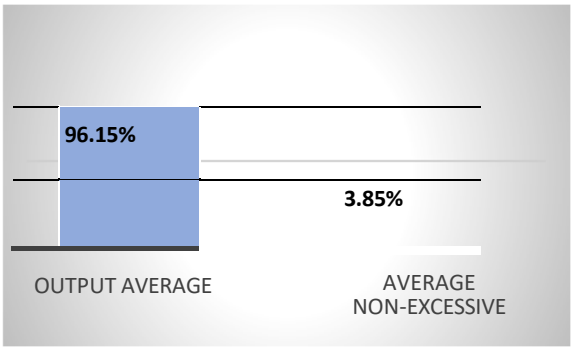

Figure 1. Equal Aspect of Eco-literation

Based on the group learning process scores that have been given during the learning process, it can be seen that student achievement in the learning process has two achievements: students with an average pass score have a percentage of 96,15%, while students with an average incomplete score have a rate of 3,85%, and there are no students who have low scores. The five questions that will be tested have been processed using the normality test assisted by SPSS version 21, as seen from the Shapiro-Wilk test at a significance level of >0,05, namely 0,064 for the pre-test and 0,060 for the post-test.

Table 1: Normality Test

Class	Amount	Test Type	Significance Value	Information
VII-B	26	Pre-test	0,064	Normally distributed
		Post-test	0,060	Normally distributed

The results of student research can be seen at what level of student achievement. The following is an analysis of the eco-literacy aspect: 1) Eco-literacy ability in the knowledge aspect. The results processed by researchers in the knowledge aspect were obtained from the results of the pretest-posttest knowledge test questions. Knowledge aspect data was obtained at the beginning of the meeting when students had not yet received treatment to determine the student's initial abilities. The final data regarding the eco-literacy variable was obtained after a treatment or learning process. The pre-test and post-test knowledge aspects results were produced from a test with five essay questions. These

five essay questions represent five indicators of knowledge aspects: having basic knowledge of ecological principles, the ability to analyze environmental problems, providing solutions to and having concern for fellow humans and the environment. Mean pretest-posttest value (attached). The average knowledge aspect of students' eco-literacy is shown in the following table:

Table 2. Average Eco-literacy Knowledge Aspects of Students

No	Category	Mark
1.	Highest Pre-test	85
2.	Lowest Pre-test	25
3.	Pre-test Average	69.38462
4.	Highest Post-test	95
5.	Lowest Post-test	80
6.	Posttest Average	89.53846

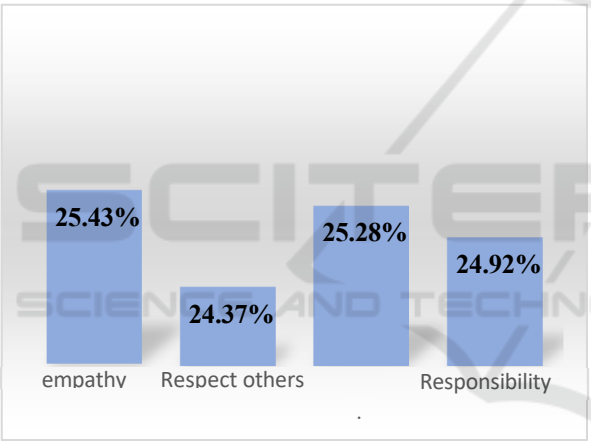

Figure 2. Students' Eco-literacy Achievement in the Attitude Aspect

The data table held by the researchers shows that the social studies learning model based on project-based learning in the material of getting to know the surrounding environment to increase the eco-literacy of junior high school students has increased. The average pre-test score was 69.39, while the post-test score was 89.54. 2) Eco-literacy ability: attitude aspect. In the research data, the attitude aspect is taken from the worksheets scores, which are students' reflections on the learning process. Worksheets is given at the second meeting of student treatment in project-based learning in social studies. In this attitude aspect, there are five essay questions with four indicators, namely: there is a sense of empathy, instilling an attitude of respect for the environment, not taking away other people's rights, and upholding the principles of fairness. The student's achievement in eco-literacy in the attitude aspect can be seen in the picture below.

Based on the picture above, the data held by researchers shows that the social studies learning model based on project-based learning in the material of getting to know the surrounding environment to increase the eco-literacy of junior high school students has increased. The student achievement score in the attitude aspect of the empathy indicator was 25.43%, respect for others (the environment) was 24.37%, the fairness indicator was 25.28%, and the non-exploitation indicator was 24.92%. By the attitude aspect chart, it can be seen that the empathy indicator has a high significance value. Before providing project-based social studies learning to improve eco-literacy, students had low empathy for the surrounding environment. The Class was proven by observations that many students still threw trash carelessly. However, after being given treatment, students' attitudes towards the environment experienced positive changes. 3) Eco-literacy ability, skill aspect. In the research data, the skill aspect is taken from the value of craft products prepared by students. The products produced are handicrafts and posters as output from project-based social studies learning. There are two indicators in this aspect of skills: utilizing existing resources by paying attention to ecological principles and making the best use of existing energy. Students' achievement in e-literacy skills can be seen in the diagram below.

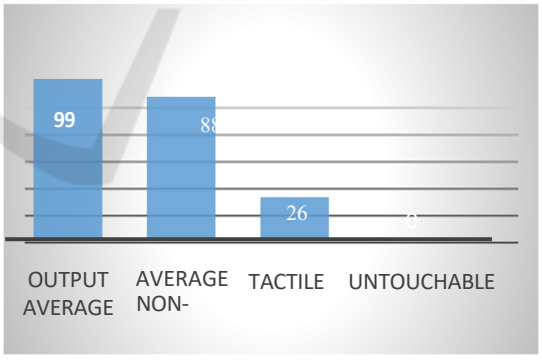

Figure 3. Students' Achievement in the Eco-literacy Skills Aspect

Based on the diagram above 4.4, the data held by researchers shows that the social studies learning model based on project-based learning in the material of getting to know the surrounding environment to increase the eco-literacy of junior high school students has increased. The student achievement score in the skills aspect, which has a complete category, is at a percentage of 381%, while the attitude of students

who have an incomplete category is only at a rate of 338%. The completeness value in the skills aspect here is seen in the products they have made and in how they present the products they have made. Again and again, the completeness value refers to the standard reference. Students who score below the standard are in the incomplete category, and vice versa. Students who score above the standard are in the complete category. The increase in eco-literacy aspects is measured using the N-Gain test, where each element has indicators that have increased in both aspects of knowledge, attitudes, and skills. The following is a description of how to improve each component of eco-literacy for Muhammadiyah 2 Taman Middle School students:

Table 3. N-Gain score test

Class	N	Average	Information
VII-B	26	0,51	Currently

The output results of the N-Gain score from the test above show a score of 0.51, which shows that the magnitude of the effectiveness of this research according to the N-Gain score criteria is that it has a medium effect.

First, students are measured using pre-test and post-test tests in the eco-literacy knowledge aspect. The knowledge aspect of eco-literacy here has five indicators, namely: (a) have basic knowledge of ecological principles; (b) can analyze environmental problems; (c) can provide solutions to environmental problems; and (d) have concern for fellow humans and the environment. (e) Utilize existing resources by paying attention to ecological principles. These five indicators are included in the pre-test and post-test questions. The increase in the students' eco-literacy knowledge aspect can be seen in giving tests after treatment or a post-test, with an increase in the post-test average of 89.53, with the highest score being 95 and the lowest score being 80.

The increase in knowledge has experienced significant changes from the existing indicators, which can be proven from each indicator before and after being given treatment. The result is confirmed by previous research (Aripin & Putri, 2021). Increasing student eco-literacy in the first and second stages shows that students can be motivated by project learning, foster cooperation between students, be able to manage existing resources, improve communication skills among students, be able to provide experience and be able to coordinate a joint project and involve students in learning by taking in information. The learning atmosphere becomes enjoyable.

Second, in the attitude aspect, the students' eco-literacy attitudes are measured using tests. The tests used are on the worksheets that each group already has. Worksheet questions include how students have empathy and a sense of caring for fellow humans and the surrounding environment, respect for others, fairness, and responsibility. The student achievement score in the attitude aspect of the empathy indicator was 25,43%, respect for others (the environment) was 24,37%, the fairness indicator was 25,28%, and the non-exploitation indicator was 24,92%. Improvement in this aspect can also be seen from test results and observations of students' attitudes towards their environment.

Students who were previously indifferent to the environment were very serious, but after being treated with project-based social studies learning, students gradually experienced a change in their attitudes; this was confirmed by previous research on Tyas (2022), who explained that the attitude or heart aspect contains the concept of eco-literacy, which shows a person's empathetic attitude towards the living creatures around them. This attitude aspect is measured using interview results that align with the attitude aspect indicators. Based on the research results, most students are in a good category, which means that habituation activities at school and home can help students have an empathetic attitude and care about the environment. Meanwhile, some students are still confused about determining a fair attitude and not taking other people's rights for personal gain. These two points are related to the knowledge of eco-literacy, where students should understand their rights and the rights of living creatures around them.

Third, Improvement of skill aspects. The results of student products measure students' eco-literacy skills. The products here have a 3R concept: reduce, reuse, and recycle. Each group makes a mandatory project, namely a handicraft, and a choice project between a video or a poster. Each student takes this assessment, including how they behave in working with the team and their seriousness in completing the project. It is also seen in the work assessment rubric, which includes accuracy content, knowledge gained, and product attractiveness. The increase in this skill aspect can be seen from the skill aspect diagram, namely that the highest score in this student's skill is 99, while the lowest score in this student's skill is 88.

Meanwhile, the average completion score for students, when presented, is at a percentage of 38,1%, while the average incomplete percentage is 33,8%. It can be seen that the average student completion score is

in a good range here. Therefore, project-based social studies learning for improving eco-literacy is based on Vygotsky's constructivism. This learning theory uses a scientific approach, one of which uses a project-based learning model that emphasizes learning in the field and involves the active role of students.

The influence of project-based social studies learning in increasing the eco-literacy of Muhammadiyah 2 Taman Middle School students experienced significant changes. Hypothesis testing at the significance level α = 0,05; the significance value was smaller than 0,05, so H0 was rejected, and Ha was accepted. This means that in H0, there is no significant difference in the eco-literacy competence of Muhammadiyah 2 Taman Middle School students before and after participating in project-based social studies learning. Meanwhile, in Ha, there is a significant difference in the eco-literacy competence of Muhammadiyah 2 Taman Middle School students after implementing project-based social studies learning.

Table 4. Hypothesis Results

Data	Paired Sample T Test T test sig. (2-tailed)	Information
Pretest-posttest	0,000	Different

(Source: Data processed by researchers, 2024)

Based on Table 4, it can be seen that the hypothesis results using the paired sample T-test shows a significance value of 0.000<0.05, so it can be interpreted that this means that at H0, There is no significant difference in the eco-literacy competence of Muhammadiyah 2 Taman Middle School students before and after participating in project-based social studies learning. Meanwhile, in Ha, there is a significant difference in the eco-literacy competence of Muhammadiyah 2 Taman Middle School students after implementing project-based social studies learning. Project-based social studies learning for improving students' eco-literacy is based on Vygotsky's theory, where students are grouped to solve a problem while working on a project by finding various ideas from each student to produce something new in the form of a product. The constructivist approach used in this research focuses on the concept of constructivism (Zone of Proximal Development). Students can learn concepts well if they are in the ZPD (Margolis, 2020). Each individual's knowledge is not simply transferred; each they are understood by themselves. The advantage of this theory is that learning focuses on student-centred learning; student-centred only acts as a facilitator

In this theory, learning is not only obtained from lessons but can also be obtained through discussions, experiences, and lessons from the surrounding environment. Apart from that, knowledge is formed from a person's interactions with other people. Learning activities become active and creative due to previous knowledge. Vygotsky's theory emphasizes the importance of interaction and scaffolding (learning assistance), which is the basis for designing learning activities that involve collaboration and real projects related to the environment. At the start of the research, many students had a limited understanding of the relationship between social and ecological aspects of everyday life. However, after participating in project-based learning, their eco-literacy was significantly increased. Here are some key findings from this research:

Theoretical and Practical Understanding: project-based social studies learning allows students to connect theory with practice. For example, when learning about ecosystems and sustainability, students are involved in a project to plant trees in the school environment. Through this activity, they understand the concept of ecosystems and see the positive impacts of their actions. Ecological theory and application test scores increased from an average of 69,39 to 89,54 after project implementation.

2) Collaboration and social interaction: based on Vygotsky's theory, social interaction is the key to the learning process. Students work in groups to plan and implement environmental projects, such as plastic waste reduction campaigns or composting. This interaction allows them to share knowledge and skills and get support from peers and teachers. Observation results show increased student involvement and active participation in group discussions.

3) Scaffolding and Teacher Guidance: The teacher acts as a facilitator who provides scaffolding to students. In project-based learning, teachers help students design projects, provide guidance, and provide constructive feedback. The scaffolding approach aids students in cultivating critical thinking and problem-solving abilities necessary for addressing environmental challenges. Student feedback indicates that teacher support significantly facilitates their success in completing project tasks.

4.) Environmental Awareness and Attitude: project-based learning combined with Vygotsky's approach promotes positive attitudes and environmental awareness changes. Through reflection and discussion after the project, students demonstrated increased awareness of the importance of individual action in protecting the environment. The concluding survey indicated that 80% of students acknowledged

the significance of minimizing carbon footprints and expressed a commitment to incorporating eco-friendly practices into their everyday routines

5) Enhancing Eco-literacy Skills: Eco-literacy encompasses knowledge and skills for applying ecological principles. Student-led projects, like creating a school garden or managing a recycling program, offer practical experience in sustainable resource use. These skills include planning, managing, and evaluating environmental projects, all of which improve significantly based on the results of the final project assessment. Overall, this research shows that project-based social studies learning using Vygotsky's theory effectively increases students' eco-literacy (Ninsiana, Septiyanan, Suprihatin, 2024; Setyowati, Purwanto, & Sarifah, 2024). This approach increases theoretical knowledge of environmental issues and develops practical skills and a positive attitude towards environmental conservation. Therefore, this research confirms the importance of integrating project-based learning and Vygotsky's theory in environmental education (Piotrowska, Cichoń, Sypniewski, & Abramowicz, 2022; Siregar, Luali, & Vinalistyosari, et al. 2024; Williamson, 2023). This approach provides a comprehensive and meaningful learning experience, encouraging students to become active and responsible agents of change in preserving the environment.

The effectiveness of the results of project-based social studies products in increasing the eco-literacy of students at Muhammadiyah 2 Taman Middle School is also no less important because this is the head of the project-based social studies learning process. Project-based social studies learning at Muhammadiyah 2 Taman Middle School produces creative products that reflect students' understanding of concepts. Eco-literacy skills, and in the process, students experienced confusion about what products they would make, even though they had been given the option to make products with the 3R concept, namely recycle, reduce, and reuse, and create digital posters. The students were confused, so they made just two products: goods with the 3R concept and digital posters.

The following is a description and analysis of several products produced by students: environmental digital posters. Students are asked to create posters that raise ecological issues around them and provide warnings about protecting the environment. This product is designed to raise awareness about environmental problems such as pollution, deforestation, and pollution. The poster shows students' creativity in combining factual information with interesting visual elements. Critically analyze ecological challenges and propose actionable solutions tailored to the specific environmental context. This demonstrates a heightened awareness of the significance of preserving ecological equilibrium (Faeni, 2024). 3R Concept Craft Products: Students are asked to make crafts with the 3R theme (reduce, reuse, and recycle).

Students are asked to make waste items around their homes into useful items. It is also an effort to protect the environment by reducing waste. This product is designed to increase awareness about littering, appropriate use of goods, and environmental issues. Analysis of these projects shows that students understand the concept of eco-literacy and are motivated to take concrete actions that contribute to ecological sustainability (Setyowati, Purwanto, & Sarifah, 2024). This craft-making project shows that students are committed to protecting the environment and can find innovative ways to overcome environmental problems. Project-based social studies learning products produced by Muhammadiyah 2 Taman Middle School students reflect a significant increase in their understanding of eco-literacy. Digital posters about the environment and craft products with the 3R concept show that students cannot only understand ecological concepts but can also apply them to real projects that positively impact their environment. Analysis of these products reveals that project-based learning effectively increases students' eco-literacy and allows them to learn actively, critically, and creatively.

It is recommended to undertake a longitudinal study to evaluate the enduring impact of project-based learning (PBL) on students' eco-literacy. While existing research demonstrates notable short-term advancements in eco-literacy, future investigations could focus on the persistence of these outcomes over time. This would involve examining whether students maintain pro-environmental attitudes, critical thinking abilities, and ecological comprehension after the PBL intervention concludes, as well as tracking their application of these skills in higher education or within their communities.

Longitudinal data could offer deeper insights into the retention and practical use of eco-literacy knowledge across various settings. Additionally, exploring how PBL shapes long-term environmental awareness and behavior could enhance understanding of its broader educational impact. Assessing the adaptability and scalability of PBL in diverse school environments would further support its implementation and effectiveness on a wider scale.

4 CONCLUSIONS

Research at SMP Muhammadiyah 2 Taman shows that implementing the project-based social studies learning process is going well and smoothly. The influence of project-based social studies learning shows significant changes in increasing students' eco-literacy. Observations revealed active engagement, increased creativity, and effective teamwork. The pre-test and post-test results show increased students' understanding of ecology and environmental issues. Project-based learning effectively increases students' eco-literacy by deepening conceptual understanding and developing critical thinking skills and practical application abilities. Relevant real-life projects help students internalize ecological concepts and be motivated for pro-environmental action. The results of project-based social studies learning products effectively increase the eco-literacy of Muhammadiyah 2 Taman Middle School students. This method encourages students to be active, critical, creative, and responsible for the environment.

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