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Improving Environmental Literacy Through the Utilization of Ecobrick Media for Second Grade Students at Tanjungrejo 4 Public Elementary School

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Abstract: This study aimed to improve the environmental literacy of second-grade students through the utilization of ecobrick media integrated with the Project Based Learning (PjBL) model at SD Negeri Tanjungrejo 4 in Malang City. The study was motivated by students' low understanding and implementation of environmental literacy, as reflected in habits such as littering, poor classroom cleanliness, and limited awareness of the surrounding environment. This research employed Classroom Action Research conducted in two cycles involving 23 students during the 2025/2026 academic year. Each cycle included planning, action implementation, observation, reflection, and evaluation stages. Data were collected through a pretest, Cycle I posttest, and Cycle II posttest measuring cognitive, affective, and behavioral indicators of environmental literacy. The findings showed a significant improvement in students' learning outcomes. The average pretest score increased from 36.22 to 64.78 in Cycle I and reached 84.74 in Cycle II. Learning mastery improved from 30.43% in the pretest to 73.91% in Cycle I and 91.30% in Cycle II. The n-gain analysis indicated that most students achieved a high category in Cycle II, demonstrating the effectiveness of the PjBL ecobrick project.

Keywords: Environmental literacy, *Ecobrick*, *Project Based Learning*, Classroom Action Research, Elementary school.

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INTRODUCTION

In today's era of globalization, education plays a very important role in preparing children to face dynamic global changes. It serves as an essential foundation for advancing the nation and improving the quality of human resources (Sari & Wulandari, 2025). Education serves as a fundamental tool amid the rapid advancement of technology to ensure that learning objectives can be achieved effectively. The primary purpose of education is not merely the transfer of knowledge, but also the development of students' understanding, character, attitudes, and awareness toward becoming better individuals (Jayayuni, 2025). Over the past five years, education in Indonesia has experienced very significant developments.

However, along with the development of the times, various shifts in behavior have also increasingly occurred within society (Purba et al., 2025). Students in the Industrial Revolution 4.0 era possess different characteristics compared to previous generations because they grow up in an environment heavily influenced by digital technology, which affects their mindset and habits. If these changes are not managed properly, they may negatively impact students' ways of thinking (Julismawati & Eliana, 2024). Several emerging problems have produced negative impacts, one of which can be observed in the declining concern for the surrounding environment, including the lack of understanding regarding the importance of maintaining classroom cleanliness (Sinaga et al., 2026).

In fact, classroom cleanliness is an important factor that supports the comfort and smoothness of the learning process. An unclean classroom environment can disrupt students' concentration, reduce motivation, and potentially trigger various undisciplined behaviors that may ultimately affect students' academic achievement and social development (Pratama et al., 2024). In addition to preparing students to adapt to their environment, education must also equip them with a sense of responsibility toward environmental sustainability (Janah et al., 2024). One of the elementary educational institutions that strives to promote environmental literacy among its students is SD Negeri Tanjungrejo 4, which is located in Malang City.

However, the observation results indicated that the understanding and implementation of environmental literacy among second-grade students were still very low. This finding emerged during the learning process, where students demonstrated poor

waste management behaviors, such as frequently littering within the school environment, including inside the classroom, showing little concern for cleanliness, and lacking a deep understanding of the importance of preserving the surrounding environment. These conditions were caused by students' limited understanding of environmental literacy. The existing problems affected the ineffective implementation of environmental education programs at SD Negeri Tanjungrejo 4 and were further supported by the lack of engaging learning media that could effectively promote environmental literacy. Therefore, one of the efforts implemented to improve environmental literacy was through the use of ecobrick learning media.

The results of a brief spontaneous interview regarding environmental literacy conducted with the second-grade teacher at SD Negeri Tanjungrejo 4 revealed that, in terms of knowledge, students had limited understanding of the importance and benefits of maintaining the environment. Consequently, when viewed from the implementation through real actions, it was evident that students' environmental awareness still needed to be improved. The results of the observations and spontaneous interviews conducted in the second grade at SD Negeri Tanjungrejo 4 were also consistent with the problems identified in the study conducted by (Yarasyimah & Rohman, 2026). Therefore, an effective learning strategy employing appropriate models and media is needed in the "Love the Environment" material to improve students' environmental literacy awareness.

The learning model used to broaden students' understanding, as well as to develop their skills and critical thinking abilities through direct learning experiences, was Project Based Learning (PjBL). This model was implemented to train and cultivate students' critical thinking habits in solving problems related to the lack of environmental literacy among students (Safirah et al., 2024). The study that supports this hypothesis is the research conducted by (Anggraini & Wulandari, 2021) which stated that the use of the PjBL model can improve students' environmental literacy through learning activities based on real-life projects and problem-solving experiences.

Students' environmental literacy skills are utilized to access, analyze, and apply environmental information critically in order to make decisions based on scientific knowledge and take positive actions related to environmental issues (Mawarni, 2024). Based on this rationale and supported by previous studies, this research aimed to improve

the environmental literacy of second-grade students at SD Negeri Tanjungrejo 4 through the utilization of ecobrick media.

METHODS

The method employed in this study was Classroom Action Research (CAR) developed by Kemmis and Taggart, which refers to research conducted by a teacher within a classroom setting (Arya et al., 2025), The purpose of its implementation was to solve students' learning problems, improve teachers' instructional methods, and enhance the overall learning process (Ani, 2018). This research was conducted at SD Negeri Tanjungrejo 4. The subjects of this study were 23 second-grade students in the 2025/2026 academic year. The Classroom Action Research was carried out in two cycles consisting of problem identification, action planning, action implementation, observation and data collection, reflection, cycle repetition, and reporting of results (Rahayu et al., 2025).

Each cycle and phase of the research was conducted collaboratively. During the learning activities, the stages of the Project Based Learning model were implemented, including determining the project, designing project completion steps, scheduling activities, implementing the project, and evaluating both the process and project outcomes (Dinda & Sukma, 2021). The research variable examined was the improvement of students' environmental literacy. The data collected in this study were quantitative data in the form of learning outcomes. To obtain accurate research findings, the instruments used were learning achievement tests consisting of a pretest, Cycle I results, and a posttest, each containing five multiple-choice questions and five short-answer questions related to students' understanding of the "Love the Environment" material to measure the extent of students' environmental literacy. The pretest aimed to determine students' initial knowledge regarding the environmental material, while the posttest aimed to measure students' final cognitive achievement related to the material.

The questions used to measure students' environmental literacy referred to three main indicators: cognitive, affective, and behavioral aspects. The cognitive component refers to students' knowledge and analytical abilities regarding environmental issues and problem-solving skills (Anggela & Rina, 2025). The affective component includes attitudes, appreciation, and motivation to behave in environmentally friendly ways (Inaku & Paputungan, 2022). Meanwhile, the behavioral component reflects the psychomotor

domain in which individuals not only understand environmental concepts theoretically but are also able to implement them through real actions (Zaldie & Hanif, 2025). Students' test data were analyzed by calculating scores based on the following criteria: correct multiple-choice answers = 2 points, correct short-answer responses = 4 points, and incorrect answers = 0 points.

The Minimum Mastery Criterion (KKM) represents the minimum score required to achieve grade C. Students were considered successful in the learning process if they achieved the KKM determined by the school, which was 75. This criterion refers to the study by (Panjaitan et al., 2021), which stated that learning is considered successful when at least 85% of students achieve scores equal to or above the KKM, or a minimum score of 75. To determine the improvement in students' learning outcomes, the normalized gain (n-gain) formula adapted from Hake (2002) was used (Latifah et al., 2025) .

The obtained n-gain results were then analyzed using the criteria presented in the following table:

Table 1. N-gain Criteria

N-gain Interval	
0,7	High
0,3-0,7	Moderate
0-0,3	Low

Adapted from: (Meltzer, 2002) in the study by (Coletta & Steinert, 2020)

Based on the n-gain score criteria, students' learning and knowledge related to environmental literacy were considered to have improved if the learning outcomes achieved an n-gain score greater than 0.3, which falls into the moderate or high category.

RESULTS

Based on the results of observations and brief interviews conducted with the classroom teacher before the research was carried out, it was found that students' environmental literacy was still low, indicating that they had not been able to implement environmental values in real-life situations. The steps implemented in this research were as follows:

1. Determining the Project

The selection of the project in this study was based on the need to improve students' environmental literacy skills through contextual, meaningful activities that actively involved student participation. The Project Based Learning (PjBL) model was chosen because it provides students with opportunities to learn through direct experiences, problem-solving activities, and the creation of tangible products relevant to daily life.

The project selected in this study was the ecobrick project, namely plastic bottles densely filled with non-organic plastic waste so that they can be reused as functional objects. The selection of the ecobrick project was based on several considerations. First, environmental issues, particularly plastic waste, represent real problems closely related to students' daily lives, thereby increasing their environmental awareness and concern. Second, the activity is easy to implement using simple materials readily available around students. Third, the project has the potential to integrate literacy skills, including reading, writing, and speaking literacy.

During the implementation, students were not only engaged in creating ecobricks but also involved in literacy activities. Students were encouraged to read various information sources related to the environmental impact of plastic waste, the process of making ecobricks, and their benefits. Furthermore, students were asked to write systematic reports on the ecobrick-making process, starting from the preparation stage to the final outcome. In addition, students presented their project results in front of the class, allowing them to develop their speaking and idea-delivery skills.

Through the ecobrick project, students were expected not only to gain new knowledge and skills but also to improve their literacy abilities comprehensively. The project also encouraged students to think critically, creatively, and develop a sense of responsibility toward the environment. Therefore, the selection of the ecobrick project within the PjBL model became a strategic step in achieving the predetermined learning objectives.

2. Action Planning

   At this stage, the researcher collaborated with the classroom teacher to design the instruments and materials required to conduct the Classroom Action Research in Cycle I and Cycle II. The following learning instruments were prepared.

Table 2. Comparison of the Use of Learning Instruments Prepared in Cycle I and Cycle II

Learning Instruments	Cycle I	Cycle II
Lesson Plan (RPM)	√	√
Student Worksheet (Large-group practice + partial steps)	√	-
Student Worksheet (Small-group practice + complete steps)	-	√
Environmental Literacy Observation Sheet	√	√

√ = implemented; – = not implemented

The learning instruments used in Cycle I were also utilized in Cycle II. The main differences were found in the ecobrick-making procedures and the group division activities included in the student worksheets (LKPD).

3. Research Schedule Arrangement

The preparation of the activity schedule in this study was conducted systematically to ensure that the implementation of the ecobrick project could run effectively, systematically, and in accordance with the predetermined learning objectives. The activity schedule was arranged by considering the allocation of learning time, the stages of the PjBL model, as well as students' abilities and needs.

The first step was identifying the stages of learning activities based on the syntax of Project Based Learning, namely: (1) determining essential questions, (2) project planning, (3) schedule arrangement, (4) project implementation and monitoring, (5) testing the results, and (6) evaluating the experience. Each of these stages was then elaborated into more detailed activities adjusted to the ecobrick project.

The second step was determining the time allocation for each stage of the activities. The researcher divided the activities into two learning cycles, with each meeting lasting two lesson hours (35 minutes each). This time allocation considered the complexity of the activities, such as the time required for collecting materials, the ecobrick-making process, and presentation activities.

The third step was arranging the sequence of activities chronologically. During the initial meeting, activities focused on introducing the issue of plastic

waste and the concept of ecobricks through reading literacy activities and discussions. The following meetings were used for project planning and implementation, including collecting materials and creating ecobricks. The final meeting focused on project completion, preparation of written reports, and presentation of students' work.

The fourth step was adjusting the schedule to students' abilities and classroom conditions. The researcher provided flexibility in time allocation when obstacles occurred, such as limited materials or differences in students' learning pace. This was important to ensure that all students could participate optimally in every stage of the activities. Through a well-planned and systematic schedule, the implementation of the ecobrick project within the PjBL model was expected to run optimally and effectively improve students' literacy skills.

4. Research Implementation

At the action implementation stage, the instruments prepared during the action planning stage were implemented according to each research cycle conducted. The following is a comparison of the implementation activities in Cycle I and Cycle.

Table 3. Comparison of the Implementation of Actions Conducted in Cycle I and Cycle II

Action Implementation	Cycle I	Cycle II
Duration	1 Meeting (2 Lesson Hours)	1 Meeting (2 Lesson Hours)
Activities	Conducted inside the classroom	Conducted inside and outside the classroom
Model	Project Based Learning (large groups)	Project Based Learning (small groups
Problem Stimulus	Infographics from the internet	Direct observation of the surrounding environment

Figure 1. Ecobrick Learning Media

a. Cycle I

In Cycle I, the learning process was conducted in one meeting with a duration of two lesson hours and focused on classroom-based activities. The model implemented was Project Based Learning with large-group arrangements. The stimulus provided to students consisted of infographics obtained from the internet. This implementation had several advantages, particularly in introducing students to contextual problems through engaging visual media.

However, several limitations were identified, including the lack of active participation from all students due to the large group arrangement, as well as learning experiences that remained limited to theoretical contexts. As a result, some students were not yet able to optimally understand the problems in depth or develop their literacy skills effectively.

b. Cycle II

` In Cycle II, improvements were implemented while maintaining the same duration; however, the learning activities were expanded to include not only classroom activities but also activities outside the classroom. The Project Based Learning model continued to be applied, but students were divided into smaller groups. This modification had a positive impact, as students became more actively involved in discussions and problem-solving activities.

In addition, the stimulus provided involved direct observation of the surrounding environment, enabling students to gain authentic and contextual learning experiences. This approach allowed students to develop their literacy skills more comprehensively through observing, recording, discussing, and presenting their findings.

The next stage involved the implementation of the "Love the Environment" learning material through the utilization of ecobrick media, followed by the evaluation of Cycle I learning outcomes by administering questions similar to those in the pretest to measure students' abilities after the learning process. In the following meeting, Cycle II was conducted and concluded with a posttest to determine students' final abilities. The duration of the tests and the questions administered were entirely identical throughout the research.

After obtaining data on students' initial knowledge, Cycle I results, and final outcomes, analyses of individual mastery and classical mastery were conducted. The indicator for individual mastery was based on the Minimum Mastery Criterion (KKM), which had been set at 75. Therefore, students were considered successful if they achieved scores greater than or equal to 75. In addition to individual mastery, students' achievement was also evaluated through classical mastery. Classical mastery, adapted from Trianto's model (2010), was considered achieved if at least 85% of the students obtained scores equal to or above the KKM.

Based on the three indicators cognitive, affective, and behavioral aspects toward environmental literacy the average score in Cycle II reached 84.74, while Cycle I obtained an average score of 64.78, and the pretest average score was 36.22. A significant improvement occurred from the pretest to Cycle I, followed by a further increase in Cycle II. These results indicate that the learning actions implemented were effective in improving students' learning outcomes. The comparison of environmental literacy test results of second-grade students at SD Negeri Tanjungrejo 4 in the pretest, Cycle I, and Cycle II is presented in the figure below.

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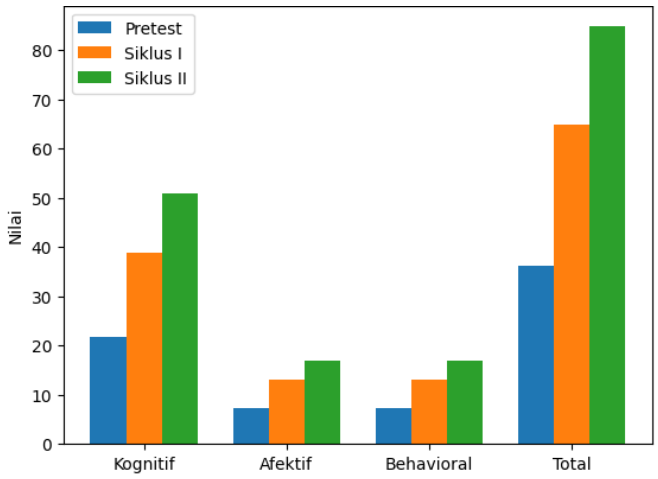


Figure 2. Mastery Diagram for Each Indicator

From the data presented in Table 4, the percentages of students who achieved individual mastery and those who had not yet achieved mastery are illustrated in the diagram in Figure 3 below.

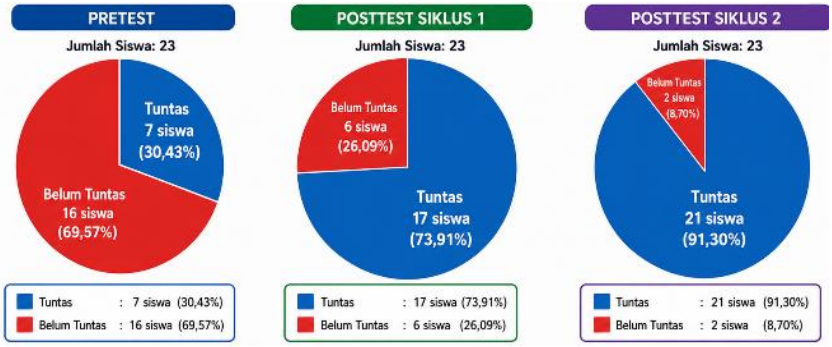


Figure 3. Individual Mastery Diagram

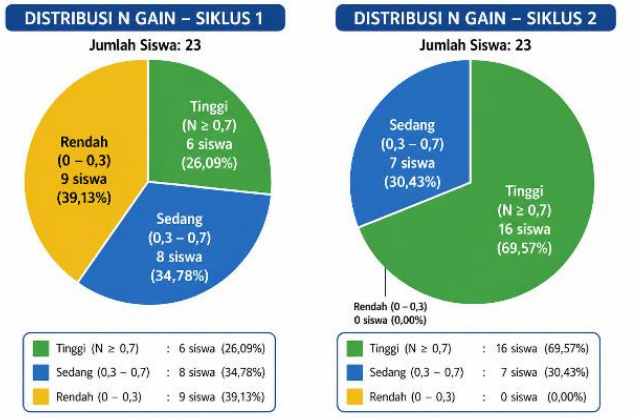
At the pretest stage, 69.57% of students had not yet achieved mastery, while only 30.43% achieved mastery. This indicates that most students still lacked understanding of the material and had not yet developed adequate environmental literacy before the learning intervention was implemented.

After the implementation of learning activities in Cycle I, a significant improvement was observed, where the percentage of students who had not yet achieved mastery decreased to 26.09%, while the percentage of students who achieved mastery increased to 73.91%. This finding indicates that the learning model applied had begun to produce a positive impact on students' understanding.

Furthermore, in Cycle II, the improvement in learning outcomes became more apparent, with the percentage of students who had not yet achieved mastery decreasing again to only 8.70%, while the percentage of students achieving mastery reached 91.30%. This demonstrates that the implemented learning actions were highly effective in improving students' learning outcomes.

Overall, it can be concluded that there was a highly significant improvement in learning mastery from the pretest to Cycle II, indicating that the implemented learning strategy was able to improve students' understanding optimally.

To determine the improvement in students' learning outcomes, the normalized gain (n-gain) formula was used. The obtained n-gain scores were then analyzed using criteria adapted from Meltzer's model (2002). The classification of students based on n-gain scores is illustrated in the diagram presented in Figure 4 below.



Gambar 4. Diagram Kriteria Murid Berdasarkan *n-gain*.

Pada siklus 1, sebagian besar murid masih berada pada kategori rendah, yaitu sebanyak 39,13% (9 murid). Sementara itu, kategori sedang mencapai 34,78% (8 murid) dan kategori tinggi hanya 26,09% (6 murid). Hal ini menunjukkan bahwa peningkatan hasil belajar murid setelah tindakan pada siklus 1 masih belum optimal, karena mayoritas murid belum mencapai peningkatan yang signifikan.

Pada siklus 2, terjadi perubahan yang sangat signifikan. Sebagian besar murid telah berada pada kategori tinggi, yaitu 69,57% (16 murid). Kategori

sedang sebesar 30,43% (7 murid), dan tidak ada lagi murid pada kategori rendah (0%). Hal ini menunjukkan bahwa seluruh murid telah mengalami peningkatan hasil belajar, minimal pada kategori sedang.

5. Evaluation

The evaluation in this study was conducted to assess the success of the ecobrick project implementation, both in terms of the process and the outcomes achieved by the students. Process evaluation aimed to determine the level of students' involvement, participation, and literacy development throughout the learning activities, while outcome evaluation focused on the quality of the products produced and the improvement in students' learning outcomes.

In the process evaluation, the teacher conducted observations during the activities by paying attention to several aspects, such as students' participation in discussions, ability to collaborate within groups, skills in seeking and understanding information, and ability to communicate ideas. The observation results indicated that at the beginning of the implementation, several students were still passive and lacked confidence in expressing their opinions. However, along with improvements made in the following cycle, students' participation increased significantly. The division into small groups and the provision of direct learning experiences through the ecobrick project encouraged students to become more active, confident in asking questions, and capable of collaborating effectively.

In addition, students' literacy skills also demonstrated positive development. Students began to show improved abilities in reading information more carefully, writing observation results more systematically, and presenting discussion outcomes orally in a clearer manner. This indicates that project-based learning contributed to the integrated development of literacy skills.

In the evaluation of project outcomes, assessments were conducted on the ecobrick products created, as well as on students' written reports and presentations. In terms of the products, most students were able to produce ecobricks that met the required criteria, such as density, neatness, and functionality. Regarding the written reports, students were able to prepare simple reports containing objectives, tools and materials, procedures, and activity results. Meanwhile, during presentation activities,

students demonstrated improvements in their ability to convey ideas and explain the processes they had carried out.

Furthermore, the evaluation results were also supported by the improvement in students' learning mastery from the pretest to Cycle II, indicating that the implemented project not only produced tangible products but also contributed to enhancing students' conceptual understanding.

Overall, the evaluation of both the process and project outcomes demonstrated that the implementation of project-based learning through ecobrick-making activities was successful and effective. This project not only improved learning outcomes but also developed students' literacy skills, collaborative abilities, and environmental awareness.

DISCUSSION

Based on the research that has been conducted, it was found that the implementation of Project Based Learning (PjBL) through the ecobrick-making project was able to significantly improve the environmental literacy of second-grade students at SDN Tanjungrejo 4. The improvements were demonstrated through cognitive, behavioral, and affective aspects. These findings indicate that project-based learning provides more meaningful learning experiences because students are directly involved in solving real-life problems closely related to their daily lives.

The low level of environmental literacy observed before the implementation of the study indicates that previous learning activities had not optimally provided concrete experiences related to environmental issues. Environmental concepts were understood only theoretically by students, resulting in environmental awareness behaviors not yet being implemented in daily life. This finding is consistent with previous research stating that environmental literacy is not limited to knowledge alone but also includes attitudes, awareness, and real actions toward the environment (Iduard et al., 2025). Therefore, a learning approach capable of connecting concepts with students' direct experiences is required, as similarly emphasized in the study conducted by (Suhermi et al., 2025).

The ecobrick-making project in this study was selected because it was considered an appropriate and effective strategy, as plastic waste issues represent contextual problems that are easily found in students' surrounding environments. A similar strategy

was also implemented in the study conducted by (Suryantini & Mahadewi, 2025). Through this activity, students were given opportunities to understand the impacts of plastic waste while simultaneously identifying simple solutions that could be directly implemented, as demonstrated in the study conducted by (Syarif et al., 2023). In addition to increasing environmental awareness, this project was also able to develop students' literacy skills through activities such as reading information, writing reports, engaging in discussions, and presenting project outcomes. This study is consistent with the findings of (Nada et al., 2025) which stated that learning should not only focus on final outcomes but also on students' thinking processes and communication skills.

The improvement in average scores from the pretest to Cycle I indicates that the implementation of project-based learning had begun to produce a positive impact on students' understanding. However, several challenges were still identified in Cycle I, such as unequal student participation due to the large-group arrangement and learning activities that were still centered inside the classroom. These conditions caused some students to be less active in discussions and in expressing their opinions. These findings indicate that the success of Project Based Learning is strongly influenced by group management and the learning experiences provided to students.

The improvements implemented in Cycle II produced a more optimal impact on enhancing students' environmental literacy. The use of small-group arrangements provided each student with greater opportunities to actively participate in learning activities. In addition, direct observation activities in the surrounding environment offered more authentic and contextual learning experiences compared to relying solely on infographic-based stimuli. These direct experiences helped students understand environmental issues more deeply, allowing their critical thinking skills and environmental awareness to develop more effectively. This finding is consistent with the view that contextual learning can increase student engagement because learning materials are connected to real-life situations experienced by students (Yolanda et al., 2024).

The improvement in learning mastery, which exceeded 85% in Cycle II, indicates that the implemented actions successfully fulfilled the criteria for classical mastery. In addition, the results of the n-gain analysis, which showed that the majority of students were categorized in the high category, indicate that the improvement in learning outcomes was not experienced only by a small number of students, but by almost all students

significantly. These findings demonstrate that Project Based Learning is capable of creating a more active, collaborative, and meaningful learning environment compared to conventional learning methods.

The improvement in environmental literacy skills observed in this study was also influenced by the integration of literacy activities at every stage of the project. This finding is consistent with the view of (Murtini & Widodo, 2020) which states that students not only receive information from teachers but also independently seek, read, understand, and process information. Such activities help students construct knowledge through direct learning experiences. According to (Kurniawati et al., 2025), the integration of literacy into project-based learning can simultaneously enhance students' critical thinking skills, creativity, and communication abilities. Therefore, the use of an ecobrick project in this study not only improves environmental understanding but also develops literacy skills in an integrated manner.

The findings of this study are also consistent with several previous studies showing that Project-Based Learning is effective in improving environmental literacy and student learning outcomes in elementary schools. Research conducted by (Susanti & Wardani, 2024) shows that the implementation of environmentally based PjBL can enhance students' awareness and active participation in maintaining the cleanliness of the school environment. Another study by (Sinaga et al., 2026) also found that the use of waste recycling projects can improve students' critical thinking skills and creativity. These consistent findings strengthen the evidence that project-based learning is an effective model for fostering environmental awareness from an early age in elementary education.

Overall, this study proves that the implementation of Project-Based Learning through an ecobrick project is effective in improving elementary students' environmental literacy. Project-based learning provides contextual learning experiences, increases students' active engagement, and develops literacy, collaboration, and environmental awareness in an integrated manner. Therefore, this learning model can serve as a relevant alternative to be applied in elementary education, particularly in topics related to environmental education.

CONCLUSION

Overall, it can be concluded that there was a highly significant improvement in learning outcomes from Cycle 1 to Cycle 2. The shift from a dominance of the low category to the high category indicates that the implemented learning interventions were highly effective in enhancing students' understanding. This study shows that environmental literacy improved because the ecobrick media made it easier for students to engage in problem-solving activities related to environmental issues.

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