

**IMPROVING RECYCLING SKILLS THROUGH PROJECT-BASED LEARNING AT
SMPN 3 GUNUNGSITOLI ALO'OA**

Serti Wika Zega¹, Eka Septianti Laoli², Arianto Lahagu³, Asali Lase⁴

¹²³⁴Program Studi Pendidikan Ekonomi, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Nias,
Nias, Indonesia

Correspondence Email: sertiwikazega0707@gmail.com

ABSTRACT

The waste problem at UPTD SMP Negeri 3 Gunungsitoli Alo'oa has a serious impact on students' learning comfort, such as disrupted concentration, decreased motivation, and the creation of an uncondusive classroom environment. This study aims to determine the improvement of students' abilities in creating recycled products through the implementation of the Project-Based Learning (PjBL) model. This is a Classroom Action Research (CAR) conducted in two cycles using a qualitative approach, employing observation techniques to evaluate the learning process, student activities, and final products. The results show that the teacher's ability to apply the PjBL model increased from 60.83% (fair) in the first cycle to 90.83% (excellent) in the second cycle. Student activity also improved from 64.72% to 86.33%. Students' ability to produce recycled products increased from an average learning outcome of 59.46% (57.14% mastery) to 74.64% (71.42% mastery) in the second cycle. These results indicate that the implementation of PjBL can enhance student ability and participation in Integrated Social Studies learning in class VII-1.

Keywords: Project-Based-Learning; school-waste; recycled-products; classroom-action-research; Integrated-Social-Studies

INTRODUCTION

Based on the author's observations and gathered information, many unused or reusable items at UPTD SMP Negeri 3 Gunungsitoli Alo'oa are still piling up and remain unutilized. This is evident from the school environment, which still contains scattered waste, potentially causing pollution and damaging the school's surroundings. A damaged school environment can become a source of disease transmission, disrupt aesthetics, lower comfort levels, and ultimately hinder the learning process. The abundance of waste is mainly due to each class having only one trash bin and the absence of waste segregation between organic and inorganic types. As a result, students often dispose of trash inside their desk drawers instead of using the bin directly. Contributing factors to this unhealthy school environment include limited availability of trash bins, low student awareness, and the lack of separate bins for organic and inorganic waste. These factors lead to students' lack of seriousness in learning, ultimately affecting their academic performance. Waste is the byproduct of daily human activities and/or natural processes in solid form, (Rahmawati et al., 2025). Most school waste comes from food packaging used by both teachers and students, as well as surrounding communities, and consists of both organic and inorganic types. Organic waste (also called wet or biodegradable waste) comes from living organisms, making it easy to decompose naturally, (Febriyanti et al., 2025). On the other hand, inorganic (dry or non-biodegradable) waste does not decompose easily and consists of non-organic compounds derived from non-renewable resources such as minerals and petroleum, or from industrial processes, (Sahara et al., 2025)

An interview with a 7th-grade student revealed that they had never learned directly how to process unused waste into reusable items. Teachers focused more on delivering curriculum content with minimal opportunities for students to engage in practical projects. This suggests that classroom instruction is heavily theory-based and lacks emphasis on practical skills like recycling. To improve students' learning quality and capabilities, it is necessary to apply effective learning models. A learning model is a framework used by teachers to plan lessons, structure materials, determine learning objectives, manage learning stages, and design classroom and learning environments, (Azizah et al., 2025). Asmara & Septiana, (2024) define a learning model as a conceptual framework that systematically describes learning methods to manage student experiences and achieve learning goals. Similarly, Rahmaniati, (2024) states that a learning model outlines systematic procedures for organizing learning to meet objectives and serves as a guide for lesson designers and teachers. In practice, however, such models are rarely used, resulting in monotonous learning where teachers dominate and students are less engaged. To address this, monitoring the teaching models applied is essential to ensure more effective learning and improved student outcomes. Many teachers struggle to choose the appropriate learning model, even though the choice significantly affects the learning environment, (Sitorus et al., 2025).

One effective model that encourages active student participation and skill development is Project-Based Learning (PjBL). This student-centered, innovative model positions the teacher as a motivator and facilitator while allowing students to take charge of their own learning, (Al Aziiz & Kurnia, 2024). PjBL involves project-based activities, which help students develop critical thinking and foster creativity, (Liesdiani, 2025). (AGUSTINA, 2024) defines PjBL as a model that emphasizes core concepts and principles of a discipline, involves students in problem-solving tasks, allows them to work independently, and culminates in the creation of meaningful, realistic student projects. PjBL engages students in solving open-ended challenges, encouraging not only hands-on activities but also the planning and design of their own learning process, (Fauziah et al., 2025). The advantages of PjBL include increased learning motivation, enhanced problem-solving skills, improved information-gathering capabilities, stronger collaboration, and experience in managing projects and allocating time and resources, (Habibah, 2024). These benefits make PjBL particularly suitable for fostering creative thinking during learning, as it emphasizes student involvement and practical problem-solving, (Fadhila et al., 2025). Moreover, PjBL motivates students toward independent learning, helping them become more active and capable of managing local resources while enjoying a more engaging learning environment, (Chaniago & Dafit, 2024).

Environmental issues, especially unmanaged waste at SMP Negeri 3 Gunungsitoli Alo'oa, can create an uncomfortable learning environment, reduce student focus, and hinder a conducive classroom atmosphere. One way to address this problem is through recycling activities. Recycling involves processing waste or used items into new products with practical value, thus reducing waste volume and creating a cleaner, healthier environment, (Ari et al., 2025). According to Hasanah & Naqiyah, (2025) recycling is the process of reusing unused waste materials into new, useful materials.

Meanwhile Njo & Sugondo, (2025) state that recycled products are the result of students' critical thinking in solving environmental problems around them, especially in project-based learning that emphasizes solving authentic daily-life problems.

Waste management can be carried out using the 3R approach (Reduce, Reuse, Recycle). The 3R waste management approach is a new paradigm that gives the highest priority to waste management practices focused on waste prevention, waste minimization by encouraging the reuse of materials, the use of biodegradable items, and the application of environmentally friendly waste disposal, (Mutaqien et al., 2025). The 3R principles in Social Studies learning refer to reducing, reusing, and recycling. The first principle, reduce, involves actions that reduce and prevent the generation of waste. The second principle, reuse, refers to reusing waste that is still usable for the same or different functions. The third principle, recycle, involves processing waste to become new products, (Wijaya et al., 2024).

The application of the Project-Based Learning (PjBL) model in the context of recycling enables students to learn collaboratively, creatively, and responsibly in addressing real-world issues around them, one of which is school waste management, (Mawaddah & Sudarsono, 2025). Recycling activities used as projects in learning can trigger students' direct involvement in each stage of the learning process. They are asked to observe the school environment, identify the dominant types of waste, design ideas for recycled products, collect recyclable materials, produce recycled items, and finally present their products. This process reflects the steps in PjBL, namely: determining essential questions, planning the project, implementation, monitoring, evaluation, and reflection. Through the implementation of recycling-based PjBL, students not only learn academic content such as Social Studies (for example, about the environment, creative economy, or entrepreneurship), but also develop 21st-century skills such as collaboration, communication, creativity, and problem-solving. Additionally, students cultivate social awareness and environmental responsibility from an early age, which is crucial for character development,(Danti et al., 2025). Thus, the integration of recycling activities and the Project-Based Learning model creates a holistic learning experience that touches upon students' knowledge, skills, and attitudes in a balanced manner.

Previous studies relevant to this research include one conducted by Astuti et al., (2024) entitled "The Implementation of Project-Based Learning Model in Recycling Activities." This study was motivated by the issue of waste management in the school environment, which affects cleanliness and learning comfort. Poor waste management has become a major issue as it contributes to environmental pollution, especially in schools. To address this issue, the researchers implemented the Project-Based Learning (PjBL) model in the environmental pollution topic, focusing on students' recycling activities. The purpose of this study was to describe the extent of achievement and effectiveness of PjBL in improving students' understanding and involvement in solving environmental problems, especially through converting waste into useful products. The study employed a descriptive qualitative method, and the results indicated that the application of PjBL increased students' awareness of the importance of waste management and enhanced their critical thinking and creativity in producing recycled products. As a result, students became more active and responsible in maintaining the cleanliness of the school environment.

Another relevant study was conducted by Utomo, (2024) entitled "The Effect of Project-Based Learning Model on High School Students' Ability to Create Recycled Products." This research was driven by the problem of plastic waste, which is difficult to decompose naturally and requires special handling, one of which is recycling. Plastic became the focus due to its significant impact on environmental pollution, thereby necessitating special attention in the school environment. In this context, project-based learning was chosen as the approach because of its many advantages, particularly in developing students' skills in producing tangible products. The aim of this study was to examine the extent to which the project-based learning model influences students' ability to create recycled products from plastic waste. This research used a quantitative method with a quasi-experimental design, specifically the nonequivalent control group design, and employed product assessment rubrics as instruments. The results showed that the project-based learning model had a positive impact on enhancing students' abilities to create recycled products, while also fostering creativity and environmental awareness.

RESEARCH METHODS

This research is a classroom action research (CAR) aimed at improving and enhancing the learning process in the classroom through the implementation of the Project-Based Learning (PjBL)

model. The study was conducted in two cycles, with each cycle consisting of the stages of planning, action implementation, observation, and reflection. This classroom action research was carried out to directly observe the effectiveness of applying PjBL in improving students' abilities in creating recycled products in Class VII-1 of UPTD SMP Negeri 3 Gunungsitoli Alo'oa during the even semester of the 2024/2025 academic year.

Data collection techniques were carried out through several methods: (1) observation, to monitor teacher and student activities during the learning process; (2) documentation, in the form of activity photographs as visual evidence of the actions carried out; and (3) learning outcome tests, consisting of essay questions to assess students' achievement in creating recycled products. Observations were used to obtain data on the learning process, while tests were used to obtain data on learning outcomes. The research instruments consisted of: (a) teacher observation sheets, to assess the implementation of project-based learning steps conducted by the teacher; (b) student observation sheets, to assess students' activeness and engagement during the learning process; (c) photographic documentation, as visual evidence of the activities; and (d) essay tests, to determine the extent of students' understanding and ability in applying learning through recycled product creation. The research informants were all 28 students of Class VII-1 at UPTD SMP Negeri 3 Gunungsitoli Alo'oa, along with the Social Studies teacher who also acted as the practitioner of the actions. The researcher also served as both the observer and practitioner throughout the learning process.

Table 1. Research Data Collection Table

No	Instrument	Cycle	Description
1	Teacher Observation Sheet	1 & 2	Assessing the implementation of PjB
2	Student Observation Sheet	1 & 2	Assessing student engagement
3	Documentation (Photos)	1 & 2	Supporting evidence of implementation
4	Learning Outcome Test	1 & 2	Assessing students' learning outcomes

The data presentation technique was carried out by organizing the results of observations and tests into descriptive form and tables. Each cycle's results were presented in a structured manner to facilitate comparison between Cycle I and Cycle II. The formulas used in the data analysis are as follows:

1. Teacher and Student Observationguru dan siswa:

$$Observation\ Result = \frac{Obtained\ Score}{Total\ Scorer} \times 100$$

Kriteria penilaian:

- 85–100 = Very Good
- 75–84 = Good
- 60–74 = Fair
- <60 = Poor

2. Student Learning Outcome Test:

$$Final\ Score\ NA = \frac{Total\ Obtained\ Score}{Maximum\ Score} \times 100$$

3. Percentage of Student Mastery:

$$Mastery\ Percentage = \frac{Number\ of\ Students\ Achieving\ Mastery}{Total\ Number\ Of\ Student} \times 100$$

4. Average Student Learning Outcome Score:

$$\bar{x} = \frac{\sum X}{N}$$

Explanation:

\bar{x} = Average score

$\sum X$ = Total of all scores

N = Total number of subjects

The average learning outcomes are classified based on the following criteria:

- 40 – 59 = Poor
- 60 – 74 = Fair
- 75 – 84 = Good
- 85 – 100 = Excellent

Action indicators in this research are divided into four main stages according to the classroom action research cycle:

- a. Action Planning: Designing lesson plans (RPP) based on PjBL, preparing student worksheets (LKS), observation sheets, documentation tools, and evaluation tests.
- b. Action Implementation: Carrying out the learning process using the PjBL model according to the planned steps and scenario.
- c. Observation: Monitoring the involvement of both teacher and students during the learning process.
- d. Reflection: Evaluating the results of the cycle to identify shortcomings and plan improvements for the next cycle.

The data analysis technique in this study uses descriptive qualitative data analysis, which involves describing and interpreting the observation and test data based on the percentage of achievement. The data from each cycle is analyzed to determine any changes or improvements in teacher activity, student activity, and learning outcomes. If the results in Cycle I do not meet the target, corrective actions are carried out in Cycle II. The success of the action is determined by the improvement of observation scores and learning outcomes that meet the minimum mastery criterion (KKM) of 65, with a minimum mastery percentage of 70%. Through this research method, it is expected to obtain a comprehensive picture of the effectiveness of the Project-Based Learning model in improving students' abilities to create recycled products in Integrated Social Studies learning.

RESULTS AND DISCUSSION

Research Results

The research conducted by the author at SMP Negeri 3 Gunungsitoli Alo'oa revealed that, based on the implementation of learning activities during Cycle I (Meeting I and II), there was an improvement. The results of the teacher observation sheet in Meeting I were 58.33%, while in Meeting II, it increased to 63.33%. Meanwhile, the results of the student observation sheet showed 64.28% in Meeting I and 65.17% in Meeting II, with an average of 64.72% for both meetings. The average student performance test score in Meeting I and II was 59.46%, with a mastery percentage of 57.14%.

Based on the observation and evaluation results in Cycle I (Meeting I and II), the learning process was still not effective in significantly improving learning outcomes, and student performance did not reach the predetermined target of 75% due to several weaknesses encountered during the process. Therefore, to address the shortcomings in Cycle I, several considerations were given by the observers to the researcher as input for improvement in Cycle II, including:

1. Student participation in learning was still low.
2. There was no monitoring of students' progress in project work.
3. Product design had not yet been developed.
4. The researcher's guidance during group discussions was insufficient.

To reflect the results of the observations and student performance assessments, the researcher needed to make the following improvements:

1. Encourage students to be more active in the learning process.
2. Monitor students' performance in project development.
3. Design the structure or model of the product to be made.
4. Provide better guidance to students during group discussions.

Based on the weaknesses above, it can be concluded that student learning outcomes in Cycle I were still lacking, hence the need for improvements in Cycle II. The purpose of these improvements was for the teacher/researcher to enhance student learning outcomes and skills in the subsequent cycle.

Based on the results from Cycle II, the average score of the teacher observation sheet in Meeting I and II was 90.53%, which is categorized as very good. This indicates that the teacher's ability to implement the project-based learning model had improved. The average score for student activity observation in Meetings I and II was 86.33%, which falls into the "good" category. This suggests that

students' ability to engage in the project-based learning model had also improved. The average student learning outcome in Cycle II was 74.64%, with a mastery percentage of 71.42%. Since the percentage of student mastery had reached the minimum target of 65%, this study concluded at Cycle II. Furthermore, the researcher presents a summary of the results obtained throughout the research process.

Table 2. Recapitulation of Research Instruments Results

No	Instrument	Cumulative Score		Description
		Cycle I	Cycle II	
A.	Observation Sheet			
	1. Teacher/Researcher Observation	60,83%	90,83%	
	2. Student Observation	64,72%	86,33%	
B.	Documentation	-	-	
C.	Learning Outcome Test	57,14%	71,42%	
	Average Reflection Result	60,89%	82,86%	-

Source: Processed Research Data, 2025

Based on the table above, it can be seen that the average percentage result of the teacher observation sheet in Cycle I was 60.83%, and in Cycle II, the average percentage increased to 90.83%. This improvement in the teacher observation scores from Cycle I to Cycle II demonstrates that the teacher's ability to implement the Project-Based Learning (PjBL) model significantly improved after addressing the weaknesses identified in Cycle I and based on feedback provided during consultations with the subject teacher (observer).

Meanwhile, the student learning outcome test in Cycle I achieved an average percentage of 64.72%, and in Cycle II, the percentage increased to 86.33%. Thus, the increase in observation scores between Cycle I and Cycle II proves that students' ability to engage in learning using the Project-Based Learning model has improved. After the completion of Cycles I and II, the researcher evaluated the percentage of student learning outcomes. In Cycle I, the percentage of students who achieved mastery was 57.41%, while in Cycle II it increased to 71.42%, surpassing the predetermined target of 65%. Based on the data above, the average reflection result in Cycle I was 60.89%, and in Cycle II it reached 82.86%.

Therefore, it can be concluded that there was a significant improvement in students' skills through the application of the Project-Based Learning model at SMP Negeri 3 Gunungsitoli Alo'oa in the 2024/2025 academic year.

Discussion

In accordance with the learning model implemented by the researcher during the learning process, the general answer that can be provided to address the main research problem is the application of the Project-Based Learning (PjBL) model. Through Project-Based Learning, students are expected to actively participate in the learning process, enabling them to solve problems encountered during lessons and assignments given by the teacher. This model also introduces students to real-world problem-solving within society and daily life. The aim is to equip students with the ability to demonstrate knowledge and skills in addressing interpersonal challenges, particularly those related to students' experiences during classroom learning.

In line with the main research question—namely, how is the implementation of the Project-Based Learning model at SMP Negeri 3 Gunungsitoli Alo'oa, and how is the ability of students to create recycled products?—it was found that students' ability to create recycled products improved. Students were able to produce new items from used materials, design project plans, develop step-by-step procedures for product creation, determine the types of used materials to be utilized, delegate tasks in group work, set a project timeline, demonstrate problem-solving skills, and evaluate their recycled products based on functionality, creativity, and usefulness.

Based on the analysis and interpretation of research findings previously presented, the application of the Project-Based Learning model to improve students' ability to create recycled products at SMP Negeri 3 Gunungsitoli Alo'oa yielded the following results: The teacher observation sheet during Cycle I, Meeting I showed a percentage of 58.33%, increasing to 63.33% in Meeting II, with an average of 60.83%. In Cycle II, teacher observation scores improved to 86.66% in Meeting I and 95% in Meeting II, with an overall average of 90.83%. This improvement between Cycle I and II illustrates that the teacher's competence in implementing the Project-Based Learning model

increased significantly. Meanwhile, student observation sheets in Cycle I showed 64.28% in Meeting I and 65.17% in Meeting II, averaging 64.72%. In Cycle II, the student activity scores increased to 83.03% in Meeting I and 89.64% in Meeting II, with an overall average of 86.33%. This increase reflects a growing effectiveness in students' engagement with the Project-Based Learning model.

According to the evaluation results, the average student learning outcome in Cycle I was 59.46% with a mastery percentage of 57.14%. In Cycle II, this improved to 74.64%, with a mastery percentage of 71.42%. This shows that the Project-Based Learning model was successful in improving students' abilities in the Integrated Social Studies subject (IPS) for Grade VII at UPTD SMP Negeri 3 Gunungsitoli Alo'oa. Thus, this research can be considered successful.

One of the key factors in the success of the learning process is how the teacher delivers instruction in the classroom. The teacher's role must be able to influence and motivate students through their personality and approach. For this reason, the Project-Based Learning model is highly effective as it involves students in active problem-solving, both individually and in groups, to reach a consensus and complete tasks provided by the teacher.

According to the theory explained by Liesdiani (2025), Project-Based Learning (PjBL) is a learning model that incorporates projects into the learning process. It emphasizes the need for hands-on practice to develop students' thinking skills, which not only fosters critical thinking but also boosts creativity. Similarly, Agustina (2024) describes Project-Based Learning as "a model focused on central concepts and principles of a discipline, involving students in problem-solving tasks and other related activities, allowing them to work autonomously in constructing their own learning, and culminating in the production of meaningful and realistic student projects."

In relation to previous research, this study aligns with that conducted by Astuti et al. (2024), titled "Implementation of the Project-Based Learning Model in Recycling Activities." This study was motivated by waste management issues in the school environment that affected cleanliness and learning comfort. Improper waste management became a significant concern due to its contribution to environmental pollution, particularly within schools. To address this problem, the researchers applied the Project-Based Learning model in the environmental pollution material, focusing on recycling activities carried out by students. The aim was to describe the level of effectiveness and achievement in applying PjBL to improve students' understanding and involvement in solving environmental issues, especially through processing waste into useful products. The study used a descriptive qualitative method and showed that PjBL enhanced students' awareness of waste management and encouraged critical thinking and creativity in creating recycled products. As a result, students became more active and responsible in maintaining school cleanliness.

Another relevant study was also conducted by Astuti et al. (2024), titled "The Effect of the Project-Based Learning Model on High School Students' Ability to Create Recycled Products." This research was driven by the problem of plastic waste, which is difficult to decompose naturally and requires specific handling, such as recycling. The focus on plastic stemmed from its significant environmental impact, especially in schools. Project-Based Learning was chosen for its many advantages, particularly in developing students' skills in producing tangible, meaningful outcomes. The purpose of this study was to examine the extent to which the project-based learning model influenced students' abilities to create recycled products from plastic waste. The study employed a quantitative method using a quasi-experimental design (nonequivalent control group design), along with a product assessment rubric. The findings showed that the project-based learning model had a positive effect on enhancing students' skills in creating recycled products, while also fostering creativity and environmental awareness.

From the comparison between the previously mentioned studies and the current study titled "Implementation of the Project-Based Learning Model on Students' Ability to Create Recycled Products at SMP Negeri 3 Gunungsitoli Alo'oa," several similarities and differences in approach and research scope can be identified:

- a. Similarities: All researchers focused on recycled products. The main goal was to improve students' abilities in creating recycled products and encourage their creativity in processing waste into reusable items.
- b. Differences: The studies varied in research methods, research locations, and the subjects involved.

CONCLUSIONS

The research conducted at SMP Negeri 3 Gunungsitoli Alo'oa demonstrated that the implementation of the Project-Based Learning (PjBL) model effectively enhanced both teacher performance and student outcomes in Integrated Social Studies (IPS) for Grade VII. As an innovative, student-centered approach, PjBL positioned teachers as facilitators and motivators, enabling students to work independently and creatively. The results showed significant improvements from Cycle I to Cycle II in teacher performance (from 60.83% to 90.83%), student activity (from 64.72% to 86.33%), and learning outcomes (from an average of 59.46% to 74.64%, with mastery increasing from 57.14% to 71.42%). These findings indicate that Project-Based Learning effectively strengthens students' understanding and skill development. Therefore, it is recommended that teachers adopt and further develop this model as a strategic variation in teaching IPS, continuously improve identified weaknesses, and that future researchers use this study as a reference for continued innovation in educational practices.

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