

Local Resource Based Project For Learning Outcomes And Creativity In Coastal Schools: A Classroom Action Research

Pembelajaran Proyek Berbasis Sumber Daya Lokal untuk Hasil Belajar dan Kreativitas di Sekolah Pesisir : Penelitian Tindakan Kelas

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Abstract	Article Information
<p>Science learning in coastal schools often remains teacher-centred and weakly connected to the local environment, even though students interact daily with authentic examples of force, work, and simple machines. Although Project-Based Learning (PjBL) has been widely reported as effective in science education, empirical studies that examine its implementation in remote coastal schools with limited facilities and authentic use of local resources are still limited. This study aimed to improve students' learning outcomes and creativity through local resource-based PjBL on the topic of Work, Force, and Simple Machines. The study employed classroom action research conducted in two cycles following the Kemmis and McTaggart model (planning, action, observation, and reflection). The participants were 20 eighth-grade students of SMP Negeri 30 Raja Ampat. Data were collected through learning outcome tests, creativity observation sheets, interviews, documentation, and field notes, then analysed using descriptive statistics, N-gain, and interactive qualitative analysis. The mean learning outcome increased from 67.80 in Cycle I to 89.35 in Cycle II with an N-gain of 0.67 (moderate), while creativity increased from 69.50 to 87.65 with an N-gain of 0.60 (moderate). The findings indicate that local resource-based PjBL made science learning more contextual, participatory, and meaningful, while strengthening students' ability to connect scientific concepts with their coastal environment.</p>	<p>Keywords: classroom action research; coastal schools; creativity; learning outcomes; project-based learning</p>
<p><i>Pembelajaran IPA di sekolah pesisir masih sering didominasi pendekatan berpusat pada guru dan belum optimal mengaitkan konsep dengan lingkungan sekitar, padahal siswa berinteraksi langsung dengan contoh nyata usaha, gaya, dan pesawat sederhana dalam kehidupan sehari-hari. Meskipun berbagai penelitian telah melaporkan efektivitas Project-Based Learning (PjBL) dalam pembelajaran IPA, masih terbatas studi yang mengkaji implementasinya pada sekolah pesisir terpencil dengan keterbatasan sarana dan pemanfaatan sumber daya lokal secara autentik. Penelitian ini bertujuan meningkatkan hasil belajar dan kreativitas siswa melalui PjBL berbasis sumber daya lokal pada materi Usaha, Gaya, dan Pesawat Sederhana. Penelitian menggunakan Penelitian Tindakan Kelas dua siklus mengikuti model Kemmis dan McTaggart yang meliputi perencanaan, tindakan, observasi, dan refleksi. Subjek penelitian adalah 20 siswa kelas VIII SMP Negeri 30 Raja Ampat. Data dikumpulkan melalui tes hasil belajar, lembar observasi kreativitas, wawancara, dokumentasi, dan catatan lapangan, lalu dianalisis menggunakan statistik deskriptif, N-gain, dan analisis kualitatif interaktif. Rata-rata hasil belajar meningkat dari 67,80 pada Siklus I menjadi 89,35 pada Siklus II dengan N-gain 0,67 (kategori sedang), sedangkan kreativitas meningkat dari 69,50 menjadi 87,65 dengan N-gain 0,60 (kategori sedang). Temuan ini menunjukkan bahwa PjBL berbasis sumber daya lokal menjadikan pembelajaran IPA lebih kontekstual, partisipatif, dan bermakna serta membantu siswa menghubungkan konsep sains dengan realitas lingkungan pesisir.</i></p>	<p>Kata kunci: penelitian tindakan kelas; sekolah pesisir; kreativitas; hasil belajar; pembelajaran berbasis proyek</p> <p>History Manuscript received : 22/04/2026 Revised : 23/04/2026 Accepted : 28/04/2026 Published : 30/04/2026</p>

A. INTRODUCTION

Science learning at the junior high school level not only aims at mastering concepts but also develops scientific thinking skills, creativity, and problem-solving abilities that are relevant to students' life contexts. Within the framework of the Independent Curriculum, learning is expected to provide meaningful, contextual learning experiences and encourage students to build knowledge through active interaction with their surroundings. The greatest challenges arise in remote coastal schools that often face limitations in laboratories, media, access to technology, and formal learning resources. This condition causes science learning to tend to rely on verbal explanations and written exercises, so abstract concepts such as work, force, and simple machines are less connected to students' life experiences.

SMP Negeri 30 Raja Ampat is a coastal school with a unique geographical condition. Community activities around the school, such as using pulleys to lift loads, levers to move objects, and inclined planes at the dock, provide authentic examples of simple machine concepts. However, this potential has not been systematically utilised in science learning, making it difficult for students to connect theory with local reality, resulting in unstable learning motivation and underdeveloped scientific creativity. In fact, learning that links concepts with local resources can strengthen material relevance, increase participation, and help students see science as knowledge close to their own lives. The use of an ethnoscience-based Project Based Learning model can be an innovative solution to address this challenge, as PjBL has been proven effective in enhancing students' understanding and motivation through real-life projects, while the integration of ethnoscience connects scientific concepts with local wisdom (Irawan et al., 2023) (Yulia et al., 2025). This approach has the potential to enhance students' conceptual understanding, scientific process skills, conservation attitudes, and creative thinking abilities (Muliadi et al., 2022).

Project-Based Learning (PjBL) is one of the relevant models to address these needs because it places students as designers, implementers, and evaluators of projects based on real problems. Various studies have shown that PjBL has a positive impact on science learning outcomes, creative thinking skills, and student learning engagement. Meta-analysis (Nurhasnah et al., 2022) shows that PjBL has a positive effect on science learning, whereas (Bahari, 2025) It has been reported that PjBL has a high effect on science learning outcomes and creative thinking skills. On the other hand, the integration of local context or local wisdom is also reported to enhance the meaningfulness of learning, as students learn through resources that are familiar and relevant to their socio-ecological environment.

Nevertheless, an empirical gap is still evident. Most PjBL research has been conducted in schools with relatively adequate facilities, using prepared teaching materials or media, and mostly focusing on general urban settings. Although various studies have reported the effectiveness of PjBL in science learning, there are still limited studies examining its implementation in remote coastal schools with limited facilities and authentic use of local resources. Further exploration is needed regarding the adaptation and implementation of the PjBL model that fully utilises the richness of natural and cultural coastal resources to optimise learning outcomes (Sholahuddin et al., 2023) (Tamimiya & Suryadarma, 2019). Furthermore, there has been little classroom action research that simultaneously examines the improvement of student learning outcomes and creativity through projects based on the everyday practices of coastal communities on the topics of effort, force, and simple machines.

The novelty of this research lies in three aspects. First, the study was conducted in a remote coastal school with limited facilities, positioning PjBL as an adaptive strategy rather than merely an innovative classroom model in well-equipped settings. Second, the designed projects

authentically utilised local coastal resources, such as bamboo, reclaimed dock wood, boat planks, and simple mechanical practices familiar to the students. Third, the research not only assessed cognitive improvement but also students' creativity as a result of designing, testing, and presenting simple science products. Based on this background, this study aims to: (1) describe the implementation of PjBL using local resources on the topics of Work, Force, and Simple Machines; (2) improve students' learning outcomes; and (3) enhance students' creativity in coastal schools.

B. METHOD

This study uses the Classroom Action Research (CAR) model Kemmis and McTaggart (Kemmis et al., 2014) which was carried out in two cycles. Each cycle included four stages, namely planning, action, observation, and reflection. The research was conducted in the odd semester of the 2025/2026 academic year at SMP Negeri 30 Raja Ampat, Southwest Papua. Subjek penelitian adalah 20 siswa kelas VIII yang terdiri atas 10 siswa laki-laki dan 10 siswa perempuan. Pemilihan kelas didasarkan pada hasil observasi awal yang menunjukkan bahwa siswa masih mengalami kesulitan memahami materi Usaha, Gaya, dan Pesawat Sederhana, terutama ketika diminta mengaitkan konsep dengan fenomena pesisir di sekitarnya.

The research subjects were 20 eighth-grade students consisting of 10 boys and 10 girls. The class selection was based on initial observations showing that students still had difficulty understanding the material on Work, Force, and Simple Machines, especially when asked to relate concepts to coastal phenomena in their surroundings. Before the action, the researcher conducted initial observations, a learning needs analysis, and prepared learning devices. Each cycle consisted of two meetings, with each meeting lasting 2×40 minutes. Thus, the total actions took place over four meetings, excluding pre-action activities and final analysis. The PjBL structure in each cycle followed these stages: (1) orientation of problems and essential questions based on coastal phenomena; (2) project planning and division of group roles; (3) preparation of work schedules and identification of local tools and materials; (4) project implementation and teacher monitoring; (5) product testing; and (6) presentation, feedback, and reflection. In Cycle I, students created simple tools representing the concepts of pulleys, levers, and inclined planes from local materials. Reflection on Cycle I indicated that some students were still passive, task distribution was uneven, and product presentations were not optimal. Therefore, in Cycle II, improvements were made through clearer role distribution, the obligation for all members to present, and the addition of a product testing session. Research data includes both quantitative and qualitative data. Quantitative data consists of student learning outcome scores and student creativity scores for each cycle. Qualitative data consisted of student activities during learning, brief interview results, product documentation, and field notes. To maintain traceability of the process, the sequence of actions and data collection points are presented in Figure 1.

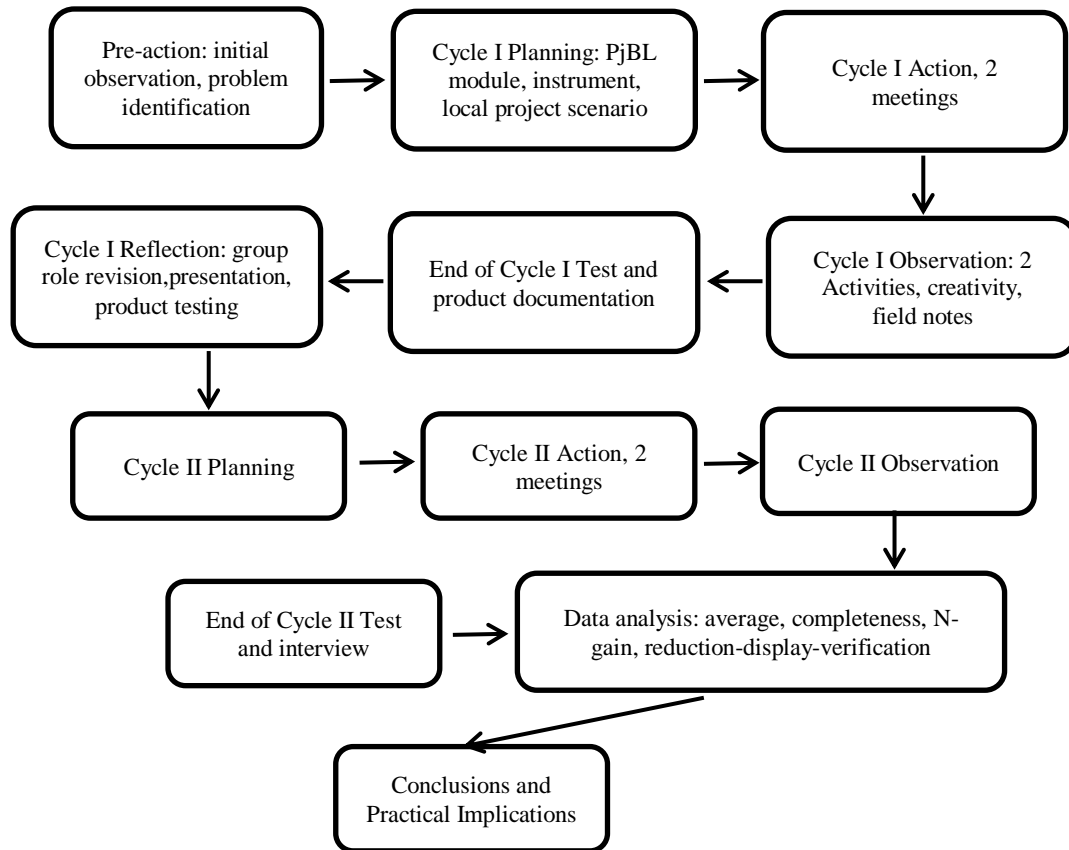


Figure 1. Two-Cycle PTK Flow And Data Collection Points

The research instruments consist of: (1) a learning outcomes test on the material of Force, Work, and Simple Machines; (2) a creativity observation sheet; (3) a student activity observation sheet; (4) an interview guide; and (5) a field note/documentation format. The creativity observation sheet was developed based on four creativity indicators: fluency, flexibility, originality, and elaboration. Each indicator is detailed into several operational descriptors that observe students' ability to propose ideas, modify designs, use local materials innovatively, and refine products. The learning outcomes test is designed based on competency indicators for the material on force, work, and simple machines, including conceptual understanding, application, and contextual problem-solving.

Quantitative analysis was conducted by calculating the average score for each cycle and the magnitude of improvement using normalized gain (N-gain), which is $(\text{cycle II score} - \text{cycle I score}) / (100 - \text{cycle I score})$. The N-gain interpretation criteria refer to Hake, which are high (≥ 0.70), medium ($0.30 - 0.69$), and low (< 0.30). Qualitative analysis using an interactive model Miles, Huberman, dan Saldaña (Miles Matthew B. & Huberman A. M., 2020) which is operated through three steps: data reduction (selecting field records, interview results, and documentation relevant to the research focus), data presentation (arranging findings in narratives, tables, and images), and drawing/verifying conclusions to see the pattern of changes in each cycle. Source and technique triangulation are used by comparing the results of observations, tests, interviews, and documentation.

The N-gain calculation results were then interpreted based on the improvement level criteria as presented in Table 1.

Table 1. N-gain Interpretation Criteria

N-gain Value Range	Improvement Category
$\geq 0,70$	High
0,30 – 0,69	Medium
$< 0,30$	Low

(Source :Hake, 1998)

C. RESULTS AND DISCUSSION

The implementation of actions over two cycles showed that applying Project Based Learning (PjBL) by utilising local coastal resources had a positive impact on improving learning outcomes, creativity, and student activities. These results are explained in an integrated manner with the discussion as follows.

Implementation of PjBL Based on Local Resources

Die implementering van PjBL in twee siklusse toon 'n toenemende gestruktureerde leerproses. In Siklus I is studente nog in die aanpassingsfase by projekgebaseerde werkpatrone. Sommige groepe wag steeds op instruksies van die onderwyser, taakverdeling is nog nie gebalanseer nie, en die aanbieding van projekuitslae betrek nog nie alle lede nie. Nietemin begin studente belangstelling toon wanneer die projek gekoppel word aan gereedskap en praktyke wat vir hulle bekend is, soos bamboei katrolle vir nettrek simulasiere, houtheftome om gewigte op te lig, en skuins vlakke gemaak van ou bootplanke. In Siklus II het verbeterde leerstrategieë 'n tasbare impak. Onderwysers beklemtoon die rol van elke lid, voeg produkte toetsingsessies by, en vereis dat alle groepslede hul resultate aanbied. These changes make learning interactions more lively, discussions more focused, and students more confident in linking physics concepts to their coastal experiences. Pedagogically, the improvements in Cycle II indicate that the success of PjBL in coastal schools is determined not only by the model, but also by how teachers manage collaboration, group accountability, and inter-cycle reflection.

Student Learning Outcomes

The average student learning outcomes increased from 67.80 in Cycle I to 89.35 in Cycle II. Based on the N-gain calculation, the increase was 0.67, which falls into the medium category. This data indicates that local resource-based PjBL is effective in enhancing students' conceptual understanding of Work, Force, and Simple Machines materials.

Table 2. Average student learning outcomes and N-gain

Cycles	Average	N-gain	Category
Cycle I	67,80	-	Enough
Cycle II	89,35	0,67	Very Good

The students' learning achievement scores in cycle I and cycle II showed a significant improvement. The average student score in cycle I was 67.80, then increased to 89.35 in cycle II. The details of the average scores are shown in Figure 1 and Table 2.

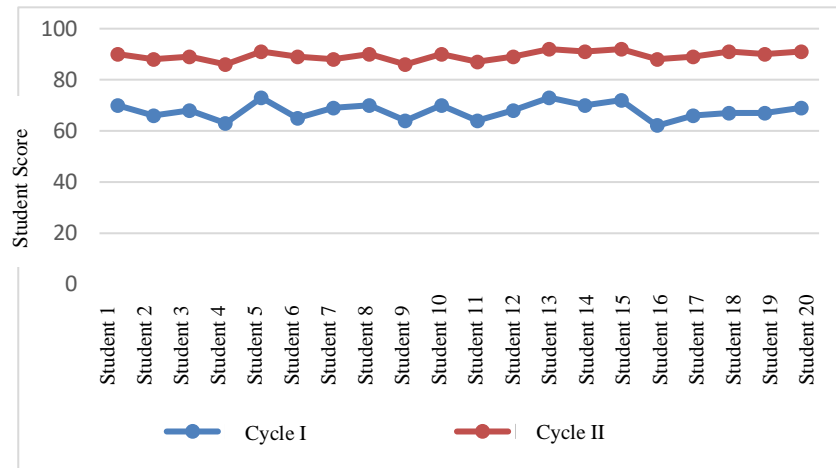


Figure 2. Student Learning Outcome Improvement Chart

This improvement indicates that students can better understand the material on Work, Force, and Simple Machines after participating in project-based learning. Theoretically, these results align with Vygotsky's constructivist principles (1978) and Dewey's learning by doing theory (1938), which explain that knowledge is easier to comprehend when students are directly involved in real activities. During the project phase, students not only hear the concepts of force and simple machines but also create tools such as bamboo pulleys, wooden levers, and inclined planes from boards sourced from the coastal environment..

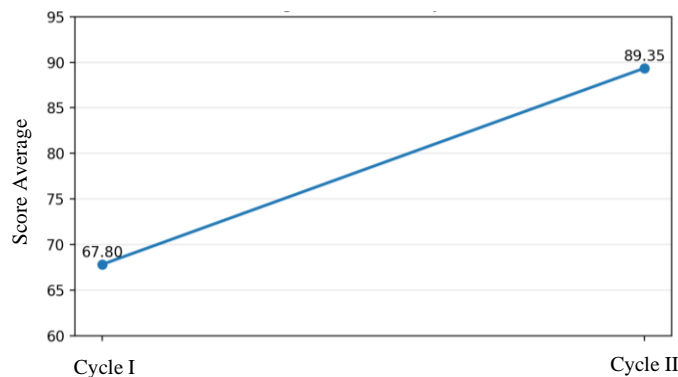


Figure 3. Average Improvement In Student Learning Outcomes

This improvement can be read not only as a numerical difference but as an indication that students are experiencing a shift in their learning approach. In Cycle I, many students still understood concepts partially and were unable to explain the relationship between force, effort, and mechanical advantage in simple machines. When the learning was transformed into a project requiring them to design, make, and test tools from local materials, abstract concepts moved into real situations that could be observed, touched, and directly evaluated. In other words, the improvement occurred because PjBL connected conceptual representation with students' concrete experiences in the coastal environment.

The effectiveness of PjBL in coastal schools is also influenced by how closely the project context relates to students' lives. In environments with limited laboratory facilities, local resources serve as a natural laboratory. Students do not rely on manufactured tools, but instead use materials they are familiar with and can manipulate themselves. This condition reduces

learning barriers, increases ownership of the project, and strengthens the transfer of concepts from the classroom to everyday life. These findings are consistent with (Rusly et al., 2025) which shows that coastal-based PjBL enhances students' science literacy, and affirms that integrating PjBL with coastal local wisdom strengthens higher-order thinking skills (Winarni et al., 2026).

The research findings also support the results of the meta-analysis (Nurhasnah et al., 2022) dan (Bahari, 2025) which positions PjBL as a model with a positive impact on science achievement. However, this study adds a contextual dimension that this effectiveness can still be achieved in remote coastal schools with limited facilities. From a Bioeducation perspective, these results intersect with (Haerullah et al., 2025) which highlights the importance of local potential as a learning context, as well as (Nurhidayah et al., 2025) which emphasises that the success of the learning model is apparent when students are actively involved in the process of constructing meaning.

Students Creativity

Student creativity also increased significantly. The average creativity score rose from 69.50 in Cycle I to 87.65 in Cycle II. An N-gain value of 0.60 indicates an improvement in the medium category.

Table 3. Average Student Creativity And N-Gain

Cycles	Average	N-Gain	Category
Cycle I	69,50	-	Quite Creative
Cycle II	87,65	0,60	Very Creative

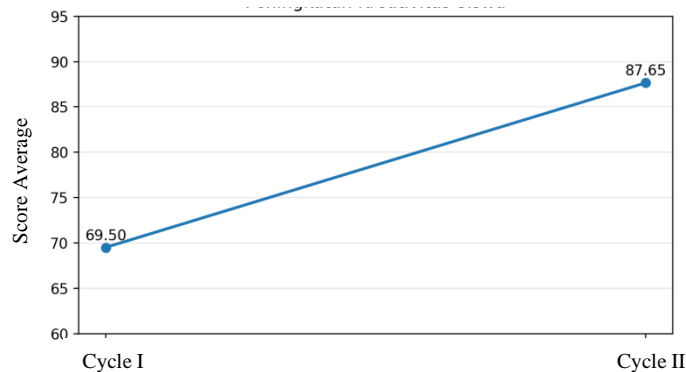


Figure 4. Increase In Students' Average Creativity

The increase in creativity arises because PjBL requires students not just to follow instructions, but to produce functional solutions. In Cycle I, group products were still rather uniform and many ideas came from the teacher's examples. After improvements in Cycle II, students began to modify designs, choose more appropriate materials, and add elements of refinement when testing the tools. This shows the development of fluency, flexibility, originality, and elaboration as the core of creativity.

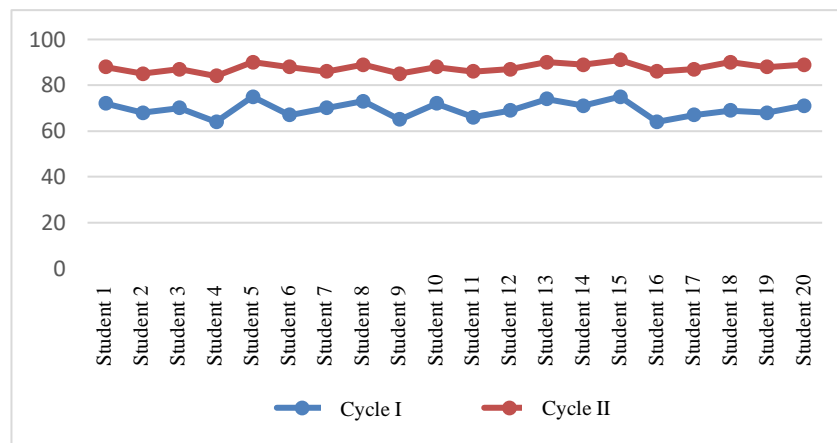


Figure 5. Enhancement of Student Creativity

In greater depth, creativity increases because the coastal context opens up a wide space for exploration. Students do not work on projects that are abstract or far from their experiences, but on issues they see every day. When students are asked to make simple tools from bamboo, leftover dock wood, or boat planks, they must connect conceptual knowledge with material limitations, the tool's function, and work efficiency. This process encourages divergent thinking, decision-making, and evaluation of product quality. This approach aligns with the Process Standards of Ministry of Education Regulation No. 65 of 2013, which emphasises the development of contextual work through project-based learning (Widyaningsih & Yusuf, 2019), and encourages creative thinking abilities that have not been optimally developed in conventional learning (Handayani, 2019). The integration of ethnoscience in PjBL also has the potential to address students' lack of knowledge about the relationship between science concepts and everyday life, a problem often encountered in conventional learning (Dewi et al., 2024).

These results are in line with Pangestu et al (2024) who reported that project-based learning affects learning outcomes, motivation, and creativity in science learning, as well as Muhendra (2026) who showed the relationship between creativity, collaboration, and conceptual understanding in project-based learning. In a local context, Ramdiah et al., (2020) affirmed that the integration of local wisdom can enhance the relevance of biology/science material and foster deeper meaning. Other studies also report an increase in students' creativity through environment-based PjBL with a moderate N-gain category, reinforcing that PjBL is an effective learning model for fostering creativity, especially when linked to the real environmental context of students (Aisyah and Hadiyanti, 2025). This increase in creativity indicates that coastal environments function as natural laboratories that encourage exploration and innovation.

Student Activity and Engagement

Observations indicate that student activity increased from one cycle to the next. In Cycle II, almost all students participated in discussions, task distribution was more balanced, and presentation confidence improved. This change is important because project-based learning does not work optimally if students are only active during the production phase but passive during the argumentation and reflection phases. The requirement for all members to present in Cycle II proved to help students articulate the scientific rationale behind the design of the tools they created.

PjBL appears to be more effective in coastal schools because the project context is close to the students' socio-ecological experiences. This is supported by research showing that PjBL based on the potential of the local coastal environment, such as mangroves and marine

ecosystems, can significantly enhance environmental literacy, science process skills, and students' conceptual understanding (Sukri, 2023). In addition to the learning model factor, the proximity of the context, the availability of local materials, and the legitimacy of students' daily experiences also influence increased engagement. Thus, the advantage of PjBL in this study is not merely due to the presence of a project, but because the project is based on authentic coastal realities that can be collectively negotiated by the students. Increased student activity occurs because project-based learning encourages students to work in real contexts that are close to their lives. This approach also fosters students' activeness and curiosity about local environmental issues, encouraging them to actively engage in the conservation and sustainable management of natural resources (Fidawati et al., 2025). The use of coastal phenomena, such as pulleys on fishing boats, levers on docks, and inclined planes on cargo transfer paths, makes it easier for students to understand concepts while also motivating them to reconstruct knowledge through the creation of simple products.

The implementation of Project Based Learning significantly enhances students' learning activities through direct involvement in discussions, experiments, and the presentation of project results (Abdillah et al., 2026). In addition, science learning based on the local context can overcome the limitations of laboratory facilities commonly faced by remote schools, while also promoting social interaction, collaboration, and students' learning responsibility, especially in schools with limited learning resources (Aisyah and Hadiyanti, 2025). Overall, the increase in student activity and engagement in this study not only contributed to the improvement of cognitive learning outcomes, but also promoted the development of 21st-century skills such as collaboration, communication, and problem-solving. However, it is also important to note that a teacher must be creative and innovative in selecting and determining a learning model that suits the environmental conditions in order to actively engage students during the learning process, enabling them to achieve the competencies expected in accordance with the learning objectives (Yusuf et al., 2021).

Practical Implications

For science teachers, this finding shows that contextual learning does not always depend on modern laboratories. Teachers can map local activities, traditional tools, and surrounding materials as learning resources to build simple projects aligned with learning outcomes. Resource-based PjBL can be replicated through three practical steps, namely identifying relevant local phenomena, designing realistic projects with available materials, and providing a presentation-reflection space so that students not only create products but also understand the scientific concepts.

For coastal schools, this research suggests the importance of turning the surrounding environment into a learning ecosystem. Schools can develop a local context bank for science learning, strengthen collaboration with the local community, and focus on providing learning tools that are truly needed for contextual science exploration. This strategy is not only economical but also reinforces the school's identity and the relevance of education to the lives of coastal communities.

D. CONCLUSION

Locally resource-based PjBL has proven effective as a contextual learning approach to improve learning outcomes, creativity, and student engagement in coastal schools with limited facilities. The increase in average learning outcomes from 67.80 to 89.35 with an N-gain of 0.67 and the increase in creativity from 69.50 to 87.65 with an N-gain of 0.60 indicate that projects

utilising local tools and phenomena help students transform abstract concepts into concrete and meaningful learning experiences.

Practically, science teachers can replicate this approach by starting with a local problem or activity close to the students' lives, then translating it into a simple project that requires design, testing, and presentation of results. For coastal schools, this study confirms that limited facilities are not a barrier to providing meaningful science learning if the surrounding environment is used as a learning resource. Further research is recommended to involve more classes or schools, include long-term retention measurements, and test similar models on other science topics relevant to the coastal context.

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