

Implementation of the Problem-Based Learning (PBL) Model to Improve Mathematics Learning Outcomes of Third-Grade Students

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ARMADA
JURNAL PENELITIAN MULTIDISIPLIN

e-ISSN: 2964-2981

ARMADA : Jurnal Penelitian Multidisiplin

<https://ejournal.45mataram.ac.id/index.php/armada>

Vol. 04, No. 06 Juni, 2026

Page: 1311-1316

DOI:

<https://doi.org/10.55681/armada.v4i6.2255>

Article History:

Received: Mei 13, 2026

Revised: Mei 23, 2026

Accepted: Juni 18, 2026

Abstract : This study aimed to improve the mathematics learning outcomes of third-grade students at SD GP Berea Tondano through the implementation of the Problem-Based Learning (PBL) model. The research employed a Classroom Action Research (CAR) design consisting of two cycles, with each cycle involving the stages of planning, implementation, observation, and reflection. The subjects of the study were 15 third-grade students consisting of 7 boys and 8 girls. Data were collected through observation and learning outcome tests. The data were analyzed descriptively by calculating the percentage of students' learning mastery in each cycle. The findings revealed that the implementation of the PBL model significantly improved students' mathematics learning outcomes, particularly on the topic of area and perimeter of squares and rectangles. In Cycle I, the average student score was 62.33, with a learning mastery percentage of 46.67%, indicating that many students had not yet achieved the Minimum Mastery Criteria (KKM). After improvements were made in Cycle II through better classroom management, intensive guidance, and the use of multimedia learning resources, the average score increased to 96, with 100% learning mastery achieved. These results indicate that the Problem-Based Learning model effectively enhances students' engagement, critical thinking, collaboration, and mathematics learning outcomes at the elementary school level.

Keywords: Problem-Based Learning, Mathematics Learning Outcomes, Classroom Action Research

Abstrak : Penelitian ini bertujuan meningkatkan hasil belajar matematika siswa kelas III SD GP Berea Tondano melalui penerapan model Problem Based Learning (PBL). Penelitian menggunakan desain Penelitian Tindakan Kelas (PTK) yang terdiri atas dua siklus, dengan setiap siklus mencakup tahap perencanaan, pelaksanaan, observasi, dan refleksi. Subjek penelitian adalah 15 siswa kelas III yang terdiri atas 7 siswa laki laki dan 8 siswa perempuan. Data dikumpulkan melalui observasi dan tes hasil belajar. Data dianalisis secara deskriptif dengan menghitung persentase ketuntasan belajar siswa pada setiap siklus. Hasil penelitian menunjukkan bahwa penerapan model PBL secara signifikan meningkatkan hasil belajar matematika siswa, khususnya pada materi luas dan keliling persegi serta persegi panjang. Pada Siklus I, nilai rata rata siswa sebesar 62,33 dengan persentase ketuntasan belajar sebesar 46,67 persen, yang menunjukkan bahwa banyak siswa belum mencapai Kriteria Ketuntasan Minimal (KKM). Setelah dilakukan

perbaikan pada Siklus II melalui pengelolaan kelas yang lebih baik, bimbingan intensif, dan penggunaan sumber belajar berbasis multimedia, nilai rata-rata meningkat menjadi 96 dengan ketuntasan belajar mencapai 100 persen. Hasil ini menunjukkan bahwa model *Problem Based Learning* efektif meningkatkan keterlibatan siswa, kemampuan berpikir kritis, kerja sama, dan hasil belajar matematika pada jenjang sekolah dasar secara menyeluruh dalam proses pembelajaran yang aktif, bermakna, terarah, dan sesuai kebutuhan siswa kelas.

Kata Kunci: *Problem Based Learning, Hasil Belajar Matematika, Penelitian Tindakan Kelas*

INTRODUCTION

Education is a conscious effort to guide, develop, and enhance students' basic abilities, both in formal and non-formal settings. The essence of education lies in the interaction between educators and learners. Education is fundamentally a long-term investment made by individuals to improve their own quality of life. The success of education is shaped by educated individuals who possess noble character. The progress and development of a nation depend largely on the success of its educational system. Education is a fundamental need for every human being who desires positive changes in life (Najoan, 2024: 921). Education and teachers have a very close and interdependent relationship. Teachers act as leaders in the learning process, while education is the process through which teachers transfer knowledge, skills, values, and insights to students (Cikka, H., 2020). Teachers are responsible for educating students using appropriate methods and strategies so that students can understand and master the subject matter. A harmonious relationship between teachers and students is essential in the educational process. Teachers who care for and understand their students are better able to help them overcome learning difficulties and motivate them to achieve their full potential (Hanaris, F., 2023). Teachers assist students in their social, emotional, and intellectual development. They do not merely deliver lessons but also serve as role models and sources of inspiration and motivation, encouraging students to overcome challenges and achieve academic success.

Teachers' efforts in the teaching and learning process are crucial in achieving predetermined learning objectives. Teachers must select appropriate approaches, strategies, and methods according to classroom conditions to ensure effective learning. Therefore, selecting a suitable learning model is essential. A learning model serves as a guideline or framework for teaching strategies designed to achieve instructional goals, including teachers' responsibilities in planning, implementing, and evaluating learning activities (Najoan, R. A., & Makawawa, J. C., 2025). Mathematics learning for lower-grade students should begin with various activities, such as counting using body parts like fingers and grouping concrete objects as counting tools. Teaching mathematical concepts and principles in concrete forms helps students, especially those with learning difficulties, understand the material more easily, as their academic achievement is often lower than their intellectual potential in reading, writing, and arithmetic (Legi, M. Y., 2021).

Mathematics is a universal science that underpins the development of modern technology and plays an important role in various disciplines, enhancing human reasoning abilities (Nabillah et al., 2020). Rapid advancements in information and communication technology are based on developments in number theory, algebra, analysis, probability theory, and discrete mathematics. Mastery of mathematics from an early age is essential to control and create future technologies. According to Sitompul (2021, cited in Latriani & Mada, 2024: 2221), mathematics is one of the subjects closely related to problem-solving in everyday life. Mathematics prepares students to face evolving life situations and challenges. However, students often experience difficulties in understanding and mastering mathematical concepts, especially in learning plane geometry.

Based on observations conducted in Grade III at SD GP Berea Tondano during mathematics lessons on plane figures, particularly in calculating perimeter and area, it was found that teachers

still rely on conventional approaches, primarily using verbal explanations and the blackboard as the main instructional media. This approach tends to make students feel bored and less interested in mathematics, resulting in suboptimal learning outcomes. Test results showed that out of 15 students, only 3 students (20%) achieved the Minimum Mastery Criteria (KKM), while 12 students (80%) did not meet the standard and required remedial instruction. Based on these problems, teachers are required to seek more appropriate teaching approaches and provide additional support to help students achieve the KKM and improve their understanding of geometric concepts. Teachers must apply effective learning models to enhance students' comprehension. One proven approach for improving learning outcomes is the Problem-Based Learning (PBL) model.

Problem-Based Learning (PBL) is a learning model that emphasizes presenting students with problem-based challenges, encouraging them to seek solutions and apply mathematical concepts in real-life contexts. PBL promotes active, creative, and engaged learning. Budiarti *et al.* (2023) define PBL as learning achieved through the process of understanding problem resolution, where problems are introduced at the beginning of the learning process. PBL represents a shift from teaching-centered to learning-centered paradigms, focusing on students rather than teachers (Mallu & Effendi, 2024). Muhartini (2023) explains that problem-based learning uses real-world problems as contexts for students to develop critical thinking and problem-solving skills while acquiring essential knowledge and concepts. Arends and Nilson (Hariadi *et al.*, 2018: 14) describe PBL as an instructional model that views schools as reflections of society and classrooms as laboratories for investigating real-life problems. However, in practice, PBL has not been widely implemented in elementary mathematics education.

Therefore, this study conducts classroom action research to apply the PBL model in mathematics learning, particularly on plane figures at the elementary school level. The research question addressed in this study is: How does the implementation of the Problem-Based Learning (PBL) model improve mathematics learning outcomes on the topic of area and perimeter of squares and rectangles among Grade III students at SD GP Bera Tondano?. Several previous studies support this research, including the study by Mada, Najoan, and Tarusu (2024), which found that PBL significantly improved higher-order thinking skills and learning outcomes, increasing mastery from 50% in Cycle I to 90% in Cycle II. Similarly, Lumenta, Rorimpandey, and Sumilat (2023) demonstrated that PBL effectively improved students' learning outcomes, achieving 95% mastery in Cycle II. Although these studies share similarities in using PBL to enhance elementary students' learning outcomes, this research differs fundamentally in its focus on specific material, namely the area and perimeter of squares and rectangles for Grade III students. Moreover, this study emphasizes intensive group guidance and the use of detailed learning media to address the unique characteristics of lower-grade students, such as limited focus and low self-confidence. Thus, this study contributes specifically to understanding the effectiveness of PBL in improving learning outcomes in abstract geometric concepts at the lower elementary level.

METHOD

This study employed a Classroom Action Research (CAR) design involving repeated interventions in real classroom settings. According to Suharsimi Arikunto (2009: 3), classroom action research is a close examination of learning activities in the form of deliberate actions that occur collaboratively within a classroom. This design consists of four stages: planning, implementation, observation, and reflection. Each cycle represents systematic steps undertaken to apply the Problem-Based Learning (PBL) model in order to improve elementary school students' mathematics learning outcomes, particularly in the topic of plane geometry. The research subjects were 15 third-grade students of SD GP Bera Tondano, consisting of 7 male and 8 female students. Data collection techniques included observation and learning outcome tests. Observation was conducted to gather data on teacher and student activities during the learning process, while tests were administered to measure students' cognitive learning outcomes after each cycle of action. The data obtained from observations and tests were analyzed using descriptive quantitative methods by calculating the percentage of students' learning mastery in each cycle. Learning mastery was calculated using the formula: $KB = T / Tt \times 100\%$, where KB represents learning mastery, T is the

total score obtained by students, and T_t is the maximum possible score. Learning was considered classically complete if the percentage of student mastery reached $\geq 75\%$.

RESULTS AND DISCUSSION

Research Results

This study is a Classroom Action Research (CAR) conducted in two cycles by implementing the Problem-Based Learning (PBL) model in Mathematics learning on the topic of area and perimeter of squares and rectangles in Grade III of SD GP Berea Tondano. Each cycle consisted of four stages: planning, implementation, observation, and reflection. The implementation of Cycle I began with careful planning, in which the researcher prepared lesson plans based on the Problem-Based Learning (PBL) model, learning materials, PowerPoint media, student worksheets (LKPD), and evaluation instruments. The learning process involved 15 students. The lesson started with classroom conditioning through prayer, attendance checking, and strengthening nationalism values by singing the song “*Satu Nusa Satu Bangsa.*” This was followed by the delivery of learning objectives and apperception activities to prepare students for learning.

During the core activities, which followed the PBL syntax, students were introduced to contextual problems through a story titled “*Budi and Ani’s Room Decoration Mission.*” Although the class initially became noisy due to differences of opinion among students, the teacher successfully managed the situation and organized students into groups to construct plane figures using origami paper. During the investigation phase, the teacher actively guided discussions and assisted students who encountered difficulties. However, during the presentation and evaluation stages, the class atmosphere became less conducive as many students were distracted, affecting their concentration. The lesson concluded with reflection and closing prayer. Observation results indicated an imbalance between teacher performance and student activity. Teacher performance reached 86.27% (Good category), but student activity remained relatively low. Many students lacked focus, confidence, and collaboration during group work. Consequently, the average student score in Cycle I was 62.33, with a mastery level of 46.67%, meaning only 7 out of 15 students achieved the Minimum Mastery Criteria (KKM) of 75.

Based on these findings, improvements were made in Cycle II, focusing on classroom management, intensified guidance, and the use of varied learning media such as instructional videos. The learning process became more interactive and engaging. Students showed greater enthusiasm, active participation, improved collaboration, and increased confidence in presenting their work. As a result, student learning outcomes significantly improved, with an average score of 96, and 100% of students achieved mastery, surpassing the established KKM. This demonstrated that the implementation of PBL in Cycle II was highly effective and successful. Overall, Cycle II results indicated a substantial improvement in learning quality, student engagement, and academic achievement. The classroom atmosphere became more dynamic, structured, and conducive, leading to optimal learning outcomes. Therefore, the research was concluded at Cycle II since the objectives had been fully achieved.

Discussion

The findings of Cycle I showed that the application of the Problem-Based Learning (PBL) model had not yet produced optimal results. Student engagement remained low, with many students lacking focus, confidence, and effective collaboration. These limitations negatively affected learning outcomes, as more than half of the students failed to achieve mastery. This indicates that initial implementation of PBL requires careful guidance, structured classroom management, and adaptation to students’ characteristics, especially in lower grades. Improvements were made in Cycle II by enhancing instructional strategies, utilizing multimedia learning tools, and providing more intensive guidance during group activities. These refinements led to notable improvements in student engagement, confidence, and collaboration. Students became more active, enthusiastic, and capable of solving problems independently. The learning atmosphere also became more conducive, which directly contributed to higher learning outcomes.

The significant improvement in student achievement aligns with previous studies, such as those by Mada, Najoan, & Tarusu (2024) and Lumenta, Rorimpandey, & Sumilat (2023), which demonstrated that the PBL model effectively enhances learning outcomes, critical thinking, and

student participation. Therefore, it can be concluded that the Problem-Based Learning (PBL) model is highly effective in improving mathematics learning outcomes, particularly in the topic of plane geometry for elementary school students.

CONCLUSION

This classroom action research concludes that the implementation of the Problem-Based Learning (PBL) model significantly improves teacher performance, student engagement, and mathematics learning outcomes on the topics of ^{**}area and perimeter of plane figures in Grade III of SD GP Berea Tondano. In Cycle I, the learning process had not yet achieved optimal results due to students' lack of focus, limited group collaboration, and low self-confidence, which led to unsatisfactory learning outcomes. However, through reflection and improvements in Cycle II such as the use of more engaging learning media, deeper presentation of learning materials, and more intensive teacher guidance substantial improvements were observed. This progress was also reflected in the teacher's enhanced ability to create a classroom atmosphere that was conducive, interactive, and appreciative. The success of this study is consistent with relevant theories and previous research findings, which indicate that the PBL model is effective in transforming conventional learning into a more meaningful learning experience. This is evidenced by the significant increase in students' mastery levels from Cycle I to Cycle II, achieving the expected standards of learning mastery. Overall, the PBL model has proven effective in strengthening students' critical thinking abilities and problem-solving skills through real-world contexts, thereby enabling the learning objectives to be achieved optimally.

ACKNOWLEDGEMENTS

The author expresses gratitude to Almighty God for the completion of this research. Sincere thanks are extended to the principal, the Grade III teacher, and the students of SD GP Berea Tondano for their support during the implementation of the research. The author also thanks the academic supervisor, family, and all parties who provided guidance, assistance, and motivation. May this research be beneficial in improving the quality of mathematics learning at the elementary school level.

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