

IMPLEMENTING PROBLEM-BASED LEARNING TO IMPROVE STUDENTS' LEARNING OUTCOMES : A CLASSROOM ACTION RESEARCH

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ABSTRACT This study was motivated by the low mathematics learning outcomes of seventh-grade students at SMP Negeri 1 Ujungbatu in the 2024/2025 academic year. The purpose of this research was to improve the learning process and enhance mathematics achievement through the implementation of the *Problem-Based Learning* (PBL) model. This classroom action research was carried out in two cycles involving 34 students (17 female and 17 male) with heterogeneous abilities. The study focused on student learning activities and learning outcomes. Data were collected through observation sheets and learning achievement tests, and analyzed both quantitatively and qualitatively in a descriptive manner. The results showed a significant improvement in the learning process and student achievement after the application of the PBL model. The percentage of students who met the Criteria for Achievement of Learning Objectives increased gradually from 32.4% at the baseline to 50% in the first summative test, and further to 61.8% in the second summative test. These findings indicate that the implementation of the PBL model not only enhanced student engagement in the learning process but also contributed positively to improving mathematics learning outcomes among seventh-grade students at SMP Negeri 1 Ujungbatu.

Keywords: problem-based learning, classroom action research, learning outcomes, mathematics education

ABSTRAK Penelitian ini dilatarbelakangi oleh rendahnya hasil belajar matematika siswa kelas VII-6 SMP Negeri 1 Ujungbatu pada tahun ajaran 2024/2025. Tujuan penelitian ini adalah memperbaiki proses pembelajaran sekaligus meningkatkan hasil belajar matematika melalui penerapan model pembelajaran *Problem-Based Learning* (PBL). Penelitian tindakan kelas ini dilaksanakan dalam dua siklus dengan subjek 34 siswa (17 perempuan dan 17 laki-laki) yang memiliki kemampuan heterogen. Fokus penelitian diarahkan pada peningkatan aktivitas siswa dan hasil belajar. Data dikumpulkan melalui lembar observasi aktivitas siswa dan tes hasil belajar, kemudian dianalisis secara deskriptif kuantitatif dan kualitatif. Hasil penelitian menunjukkan adanya peningkatan signifikan pada proses pembelajaran dan capaian hasil belajar setelah penerapan model PBL. Persentase siswa yang mencapai Kriteria Ketercapaian Tujuan Pembelajaran (KKTP) meningkat secara bertahap dari skor dasar sebesar 32,4% menjadi 50% pada tes sumatif siklus I, dan selanjutnya 61,8% pada tes sumatif

siklus II. Temuan ini mengindikasikan bahwa penerapan model PBL tidak hanya mampu meningkatkan keterlibatan siswa dalam proses pembelajaran, tetapi juga berkontribusi positif terhadap peningkatan hasil belajar matematika siswa kelas VII-6 SMP Negeri 1 Ujungbatu.

Kata-kata kunci: problem-based learning, penelitian tindakan kelas, hasil belajar matematika, pendidikan matematika

INTRODUCTION

Education is a systematic effort to enhance human resources by facilitating learning that supports the personal development of students (Pandiangan & Surya, 2020). In the educational context, learning plays a crucial role. Festiawan (2020) explains that learning is a conscious effort made by educators to deliver knowledge, organize, and create an effective learning environment through various methods so that students can engage in learning activities efficiently and achieve optimal learning outcomes. In line with this, Regulation of the Ministry of Education, Culture, Research, and Technology No. 12 of 2024 emphasizes the importance of learning processes that prioritize students' progress and achievement of learning objectives, evaluated through the *Criteria for Achievement of Learning Objectives*, which are collaboratively reflected upon with students.

Mathematics is a subject that plays an essential role in developing students' cognitive competencies. The National Education Standards Agency (BSKAP, 2024) establishes three main goals of mathematics education: (1) to understand mathematical facts, concepts, principles, operations, and relations and apply them flexibly, accurately, efficiently, and appropriately in problem solving; (2) to develop problem-solving skills, including understanding problems, designing mathematical models, solving models, and interpreting the solutions obtained; and (3) to cultivate an appreciation of the usefulness of mathematics in everyday life, including curiosity, interest, creativity, independence, perseverance, and confidence in solving problems. Based on these goals, mathematics learning must be managed effectively to achieve optimal outcomes.

Learning outcomes serve as key indicators of learning success, as they reflect the extent to which learning objectives have been achieved. Setyawati et al. (2019) state that learning outcomes provide essential information for teachers regarding students' progress, while Widyaningrum (2022) asserts that mathematics learning outcomes reflect students' ability to solve problems using mathematics. In schools, learning outcomes are evaluated based on the *Criteria for Achievement of Learning Objectives* set by each educational institution (Regulation of the Ministry of Education, 2022). For mathematics, the criterion set for seventh-grade students at SMP Negeri 1 Ujungbatu is 70.

However, preliminary data show that the mathematics learning outcomes of class VII-6 students remain low. Out of 34 students (17 male and 17 female), only 11 students (32.4%) achieved the criterion in the daily assessment on integers

(Mathematics Teacher of Class VII-6, 2024). This indicates that many students have not yet mastered mathematical concepts adequately. Interviews with the mathematics teacher revealed several contributing factors: students' low participation during learning activities, limited curiosity, reluctance to ask questions even when given opportunities, and difficulties solving contextual problems that differ from the examples provided by the teacher. Classroom observations further confirmed that students were passive, with only a few asking questions, while most struggled to understand explanations, which hindered their ability to solve problems.

Interviews with five students of varying abilities further supported these findings. Students perceived mathematics as difficult because it involved many formulas, and they reported that the teaching method relied heavily on lecturing and writing on the board, which made lessons monotonous. Students rarely reviewed the material at home, felt reluctant to ask questions, and accumulated misunderstandings over time. Consequently, the intended learning outcomes were not achieved.

These issues highlight the need for an instructional model that actively engages students in constructing their own knowledge and solving real-world problems. One relevant approach is *Problem-Based Learning* (PBL). Hidayat et al. (2019) emphasize that PBL can enhance students' learning activities through active involvement in addressing authentic problems. Surya (2017) highlights that PBL fosters critical thinking in finding solutions, while Dwi (2020) underscores the role of group work in strengthening conceptual understanding. Previous studies also confirm that PBL improves both learning processes and student achievement in mathematics (Surya, 2017; Mainake et al., 2021).

Based on these considerations, this study aims to improve the learning process and enhance students' mathematics achievement by implementing the *Problem-Based Learning* model in the topic of ratio for class VII-6 students of SMP Negeri 1 Ujungbatu during the 2024/2025 academic year.

METHODS

This study applied a Classroom Action Research (CAR) design, conducted in class VII-6 of SMP Negeri 1 Ujungbatu during the first semester of the 2024/2025 academic year. Classroom Action Research was chosen because it is directed at improving teaching and learning practices through systematic, cyclical stages of inquiry and reflection (Kemmis & McTaggart, 1988). The study was carried out collaboratively, with the researcher implementing the instructional intervention while the mathematics teacher served as an observer to document student activities and classroom dynamics.

The action research was implemented in two cycles, and each cycle consisted of two learning meetings followed by an achievement test. In line with Arikunto (2015), each cycle followed four main stages: planning, action implementation, observation,

and reflection. In the planning stage, instructional objectives, lesson plans, teaching materials, and assessment instruments were prepared according to the principles of Problem-Based Learning. During the implementation stage, lessons were carried out by applying Problem-Based Learning strategies in classroom activities. The observation stage involved collecting data on teacher performance and student participation using structured observation sheets. Finally, the reflection stage involved analyzing the outcomes of the cycle to identify successes and areas for improvement, which then informed the planning of the subsequent cycle.

The participants were 34 students in class VII-6, comprising 17 male and 17 female students with heterogeneous academic abilities. Several instruments were used to collect data, including teacher and student activity observation sheets, mathematics achievement tests administered in both cycles, and instructional materials consisting of the Learning Objectives Flow and Teaching Modules. The observation sheets provided qualitative data on the learning process, while the achievement tests yielded quantitative data on student performance.

Data analysis was conducted using both qualitative and quantitative approaches. Qualitative data from classroom observations were analyzed descriptively using the framework of Miles, Huberman, and Saldaña (2014), which includes data reduction, data display, and conclusion drawing or verification. Quantitative data were analyzed to evaluate students' mathematics achievement. This included assessing the percentage of students who achieved the Criteria for Achievement of Learning Objectives established by the school and organizing test results into frequency distribution tables to provide a clear summary of student performance after each cycle.

The success criteria of the intervention were defined in two ways. First, the learning process was considered improved if there was an increase in teacher and student activity from cycle I to cycle II, demonstrating greater engagement and interaction during instruction. Second, learning outcomes were considered improved if there was a measurable increase in the percentage of students achieving the Criteria for Achievement of Learning Objectives across cycles. Together, these indicators provided evidence of the effectiveness of implementing the Problem-Based Learning model in enhancing both the learning process and mathematics achievement.

FINDING AND DISCUSSION

The findings of this study were analyzed based on two primary data sources: observation sheets of teacher and student activities during the learning process, and mathematics achievement tests on the topic of ratios. These two data sources complemented each other to provide a comprehensive overview of both the process and outcomes of learning following the implementation of the Problem-Based Learning (PBL) model. Data analysis was carried out by comparing the results of Cycle

I and Cycle II to capture the progression of students' learning activities and achievement over time.

Observations conducted throughout the intervention indicated a significant improvement in teacher and student activities. In Cycle I, several weaknesses were still evident, such as the passivity of some students and their reluctance to ask questions. However, after adjustments were made in Cycle II, students' engagement increased consistently. Learners demonstrated greater enthusiasm for participating in lessons, actively engaged in group discussions, posed questions to the teacher, presented their group work, and contributed to drawing conclusions. This shift suggests that the implementation of PBL effectively encouraged students to take a more active role in constructing knowledge through interaction and problem-solving activities. Consequently, the classroom dynamic shifted from a teacher-centered to a more student-centered and participatory learning environment.

In addition to improvements in classroom activity, students' mathematics achievement also showed positive progress. Achievement was assessed using the Mastery Learning Criteria set at a minimum score of 70. At the baseline assessment, only 11 students (32.4%) achieved mastery. Following the implementation of Cycle I, the number of students meeting the criterion increased to 17 (50%). This positive trend continued in Cycle II, with 21 students (61.8%) attaining mastery. These results are presented in Table 1.

Table 1. Percentage of Students Meeting the Mastery Learning Criteria

Assessment Stage	Number of Students (≥ 70)	Percentage (%)
Baseline	11	32.4%
Summative Test I	17	50%
Summative Test II	21	61.8%

Table 1 demonstrates a steady increase in the percentage of students achieving mastery from baseline to Summative Test I, and further to Summative Test II. This indicates that the application of PBL had a meaningful impact not only on students' classroom engagement but also on their mathematics learning outcomes.

To provide a more detailed perspective, students' test results were further analyzed using a frequency distribution of scores. The results are summarized in Table 2.

Table 2. Frequency Distribution of Students' Mathematics Achievement

Score Interval	Category	Baseline	Summative Test I	Summative Test II
0–40	Emerging	1	–	–
41–65	Adequate	19	14	11

Score Interval	Category	Baseline	Summative Test I	Summative Test II
66–85	Proficient	10	11	13
86–100	Advanced	4	9	10

Table 2 reveals that at baseline, one student was in the lowest score interval (0–40). After the intervention, however, no students remained in this category in either Summative Test I or II. Improvements were also evident in the higher categories, with the number of students classified as “Proficient” increasing from 10 at baseline to 13 in Summative Test II, and those in the “Advanced” category rising from 4 to 10 over the same period.

Overall, these findings indicate that the application of the PBL model successfully reduced the number of students performing at lower achievement levels while simultaneously increasing the number of students attaining moderate to high achievement levels. In other words, the implementation of PBL not only fostered active participation in the learning process but also had a direct and positive effect on improving students’ mathematics achievement.

The findings of this study indicate an improvement in both teacher and student activities as well as students’ mathematics achievement following the implementation of the Problem-Based Learning (PBL) model through two cycles of action. This improvement is reflected in the increase of students achieving the mastery criterion from 32.4% at the baseline to 61.8% in Summative Test II. These results demonstrate that PBL is capable of fostering students’ active engagement in the learning process, ranging from asking questions and engaging in discussions to drawing conclusions. This condition aligns with Brousseau’s (2002) view that student interaction within the context of real-world problem solving can strengthen the connection between concepts and applications, thereby fostering a deeper understanding of mathematical content.

The improvement in learning outcomes observed in this study is consistent with several previous studies. Safitri (2023) reported a significant increase in mastery of probability learning outcomes through the application of PBL in a Classroom Action Research setting, rising from 30% to 65% after two cycles. Similarly, Asri (2015) found that the use of PBL in the topic of sets improved students’ learning outcomes from very low to sufficient by the second cycle. Comparable results were also reported by Setiawati et al. (2023), who found that the average mathematics score of high school students increased from 70 to 79, while the percentage of students achieving mastery rose from 37% to 87%. These findings confirm that PBL is not only relevant for specific grade levels or topics but can consistently provide positive impacts on mathematics learning across various contexts.

Furthermore, the findings of this study reveal that improved learning activities are closely linked to better learning outcomes. This supports the perspective of Anggraheni et al. (2024), who emphasized that PBL requires students to interact with real-life problems, thereby stimulating critical thinking and problem-solving skills. Sakir (2020) also highlighted that the application of PBL in Classroom Action Research settings enhances not only learning outcomes but also students' motivation and independence. Therefore, it can be concluded that the success of this study lies in the consistent implementation of cyclical actions, which provided opportunities for continuous improvement, enabling students' activities to become more optimal and their mathematics achievement to improve significantly.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results and discussion, it can be concluded that the application of the Problem-Based Learning (PBL) model was able to improve the quality of the learning process, enhance students' mathematics learning outcomes, and increase the percentage of students who achieved the Learning Objectives Achievement Criteria in Grade VII-6 of SMP Negeri 1 Ujungbatu during the first semester of the 2024/2025 academic year on the topic of Ratio. The implementation of PBL encouraged students to become more actively engaged in the learning process, including asking questions, participating in discussions, presenting group work, and drawing conclusions. Thus, PBL can be considered an effective alternative instructional model to improve both the learning process and mathematics learning outcomes.

In line with these findings, it is suggested that teachers consistently apply the PBL model as a learning strategy, particularly for mathematics topics that require problem-solving skills and critical thinking. Teachers should provide opportunities for students to engage in small group discussions before addressing questions to the teacher, thereby fostering independence and self-confidence. Additionally, student worksheets should be carefully designed with systematic and guiding steps to help students better understand contextual problems. For future researchers, it is recommended to expand the application of PBL to other mathematical topics or different educational levels, as well as to investigate its long-term impact on students' critical thinking skills and learning independence.

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