

Efforts to Improve Student Learning Outcomes in Mathematics Subjects Using the Problem-Based Learning (PBL) Model for Class V of Budi Murni 2 Catholic Private Elementary School, Medan

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ABSTRACT

This study aims to improve the mathematics learning outcomes of fifth-grade students of Budi Murni 2 Medan Private Catholic Elementary School through the application of the Problem-Based Learning (PBL) model. The background of this study is based on the low student learning outcomes in the material of comparing quadrilateral characteristics caused by conventional learning methods that do not actively involve students. This research is a Classroom Action Research (PTK) conducted in one cycle with the stages of planning, action implementation, observation, and reflection. The method used is mixed methods, with quantitative dominance supported by qualitative data. Data collection techniques include learning outcome tests, observation, questionnaires, interviews, and documentation. The results showed a significant increase in student learning outcomes after the application of the PBL model. In addition, students' participation, motivation, and social skills also increased, indicated by their activeness in group discussions and the ability to solve problems independently. Learning becomes more fun and interactive, creating a conducive classroom atmosphere and encouraging student creativity. Based on these results, the application of the Problem Based Learning model can be used as an alternative innovative learning method to improve the quality of mathematics learning in elementary schools.

INTRODUCTION

Education is a fundamental aspect in building civilization and improving the quality of human resources. Through education, it is expected that each individual can develop the ability to think, behave, and adapt to the demands of the times. One of the main objectives of education is to improve student learning outcomes as an indicator of the success of the learning process. In the Merdeka Curriculum, mathematics is one of the important subjects that plays a role in training logical, analytical, and problem-solving skills relevant to everyday life. However, in reality, there are still many students who have difficulty learning math. This can be seen from the low student learning outcomes, especially in the material on comparing quadrilateral characteristics. Initial observations conducted in class V of Budi Murni 2 Medan Catholic Private Elementary School showed that most students scored below the Minimum Completion Criteria (KKM) on the material. Students seemed less active in the learning process, tended to be passive, and experienced boredom because the learning methods used by teachers were still conventional, such as lecturing and giving assignments without actively involving students in the learning process.

The low math learning outcomes are also caused by the lack of variety in the learning methods applied in the classroom. Monotonous methods make students less motivated and do not give them the opportunity to think critically and creatively. In fact, in learning mathematics, students should not only memorize formulas, but also understand concepts and be able to apply them in the context of everyday life. To overcome this problem, an innovative learning model is needed that is able to increase students' active involvement. The Problem-Based Learning (PBL) model is one of the relevant alternatives used to improve mathematics learning outcomes. PBL places students as the main subject in the learning process, where they are given real problems that must be solved collaboratively. Thus, students are encouraged to think critically, creatively, and be able to work together in groups.

Through the application of the PBL model, it is expected that students can better understand mathematical concepts in depth, be active in the learning process, and experience improved learning outcomes. The teacher acts as a facilitator who guides students to find solutions to the problems given. Thus, the application of the PBL model not only improves students' cognitive abilities but also forms a positive attitude towards mathematics lessons. Based on these problems, the researcher felt the need to conduct a class action research with the title: "Efforts to Improve Student Learning Outcomes in Mathematics Subjects by Using the Problem-Based Learning (PBL) Model in Class V of Budi Murni 2 Medan Catholic Private Elementary School".

LITERATURE REVIEW

Definition of Learning Outcomes

Learning outcomes are changes in behavior that occur in students after participating in the learning process. According to Sudjana (2021), learning outcomes include cognitive, affective, and psychomotor abilities obtained by students as a result of learning experiences. Learning outcomes can be seen

from an increase in understanding of concepts, problem-solving skills, and changes in attitudes and values adopted by students. In the context of mathematics, learning outcomes are measured by students' ability to understand concepts, apply formulas, and solve problems correctly.

Learning Mathematics in Primary School

Mathematics learning in elementary schools has an important role in forming the basis of students' logical and analytical thinking skills. According to Ansari (in Putri, 2021), mathematics learning should not only emphasize memorization of formulas, but also involve students in explorative activities that make them able to connect mathematical concepts with everyday life. Therefore, an active and contextual learning approach is needed so that students can more easily understand the material being taught.

Model Problem-Based Learning (PBL)

Problem Based Learning (PBL) is a student-centered learning model, where the learning process begins with the presentation of a real problem that is relevant to their lives. Fathurrohman (2015) explains that PBL helps students develop critical and creative thinking skills through group work and active discussion. Students are encouraged to find solutions by searching for information, formulating hypotheses, and testing the resolution of the problem at hand.

Relevance of PBL to Learning Outcomes

Some previous studies have shown that the application of PBL in mathematics learning can improve student learning outcomes. For example, Ni Luh Datreni's research (2022) stated that the PBL model was able to significantly improve understanding of mathematical concepts. PBL provides opportunities for students to more actively participate, discuss, and solve problems collaboratively, thus strengthening higher order thinking skills.

Thus, the application of the Problem Based Learning model is considered effective in improving students' mathematics learning outcomes, especially in materials that require in-depth understanding of concepts such as comparing quadrilateral characteristics.

METHODOLOGY

Research Type and Approach

This research is a Classroom Action Research (PTK) conducted collaboratively between the researcher and the fifth-grade teacher of Budi Murni 2 Medan Private Catholic Elementary School. This study aims to improve students' math learning outcomes on the material of comparing quadrilateral characteristics by using the Problem Based Learning (PBL) model.

The approach used is a mixed-methods approach, which combines quantitative and qualitative methods. The quantitative approach was used to measure student learning outcomes through pretests and post-tests. In contrast, the qualitative approach was used to describe the learning process, student activeness, and responses to the application of the PBL model.

Research Subjects and Locations

The subjects in this study were fifth-grade students of SD Swasta Katolik Budi Murni 2 Medan in the even semester of the 2024/2025 school year, totalling 25 people. The research was conducted in the fifth-grade classroom of SD Swasta Katolik Budi Murni 2 Medan, Medan Tuntungan District, Medan City.

Research Procedure

This research procedure refers to the Classroom Action Research model developed by Kemmis & McTaggart, which consists of four stages in each cycle:

1. Planning: Develop PBL-based lesson plans, prepare learning media, group worksheets, evaluation instruments, and observation sheets.
2. Acting: Implementing mathematics learning with the PBL model according to the lesson plan that has been made.
3. Observing: Observing the learning process, student engagement, and recording student activities using the observation sheet.
4. Reflecting: Evaluate the results of the implementation of the action to determine improvements in the next cycle. If the objectives have been achieved, the research can be stopped.

This research was conducted in one cycle, because in the first cycle, there was already a significant increase in student learning outcomes.

Data Collection Technique

1. Learning outcome test (pretest and post-test)
2. Observation of student activity during the learning process
3. Interview with the class teacher regarding responses and constraints during the learning process
4. Documentation in the form of photos and records of learning activities.

Data Analysis Technique

1. Quantitative Data: Analysed by calculating average scores, percentage of completeness, and comparing pretest and post-test results.
2. Qualitative Data: Analysed descriptively by describing the results of observations, interviews, and documentation to determine changes in student behaviour, participation, and motivation.

RESULTS AND DISCUSSION

Overview of Research Implementation

This research was conducted at Budi Murni 2 Medan Catholic Private Elementary School, for fifth-grade students in the even semester of the 2024/2025 school year. The research subjects totalled 25 students, consisting of 13 female students and 12 male students. The material taught was comparing the characteristics of quadrilaterals by the Flow of Mathematics Learning Objectives for grade V.

This research is a Classroom Action Research (PTK) carried out in one cycle, because after the action in the first cycle has shown a significant increase in learning outcomes. The research implementation process followed the PTK stages, which consisted of planning, action, observation, and reflection.

Description of Pre-Cycle Stage

At the pre-cycle stage, researchers conducted an initial test or pretest to determine the initial ability of students to compare quadrilateral characteristics. The pretest results showed that most students still did not understand the basic concepts of quadrilateral flat shapes correctly. Of the 25 students, only 10 students (40%) reached the Minimum Completion Criteria (KKM) of 70. While the other 15 students (60%) were still below the KKM. The highest score obtained was 85, while the lowest score was 45, with an average class score of 63. These results indicate that students' initial ability to understand the material is still low, so a learning model is needed that can increase students' active participation and help them understand the material better.

Implementation of Cycle I

a. Planning

In the planning stage, researchers compiled a Learning Implementation Plan (RPP) by applying the Problem-Based Learning (PBL) model. Researchers prepare learning tools in the form of:

- PBL-based teaching module
- Learner Worksheet (LKPD) in the form of group assignments
- Learning media in the form of animated videos about quadrilateral characteristics
- Student activeness observation instrument
- Post-test evaluation question
- Student response to learning questionnaire

The classroom teacher acts as a collaborator who assists researchers in the implementation of classroom actions and observations.

b. Acting

The implementation of the action was carried out on a date that had been agreed with the class teacher. The learning steps are by the syntax of the PBL model, namely:

1. Problem orientation: The teacher starts the lesson by playing a video about problems in daily life related to flat shapes, such as comparing the shapes of tables and windows.
2. Organizing students in learning: Students are divided into heterogeneous small groups, each with 4-5 members. The teacher distributes LKPD, which contains contextual problems related to the characteristics of quadrilaterals.
3. Guiding group investigations: Each group discusses the problem and looks for solutions by reading books, watching videos, or discussing with the teacher.
4. Presenting the results of the discussion: Each group presents the results of their discussion in front of the class. The presentation is done by alternating group representatives.
5. Evaluating learning outcomes: The teacher and students reflect on the day's learning activities and give individual post-tests to determine each student's understanding.

c. Observing

Observations were conducted by collaborating teachers and researchers to monitor student activities during the learning process. The observation results showed that most of the students:

- 1) Actively discuss in the group
- 2) Dare to express opinions during the presentation
- 3) Enthusiastic about learning because of the fun and interactive learning atmosphere
- 4) Starting to show an attitude of cooperation and responsibility towards group tasks

From the results of the observation sheet, the average active participation of students in learning reached 85%, an increase compared to conventional learning in the pre-cycle, which was only 55%.

d. Reflecting

After the learning process was complete, the researcher and teacher reflected. The reflection results showed that:

1. Learning with the PBL model went smoothly as planned.
2. Students understand the material more easily with a real problem approach.
3. Group discussions encourage students to express their opinions and work together.
4. Some obstacles, such as the division of discussion time that is still less effective, will be noted for improvement at the next meeting.

However, in general, cycle I has shown success, so there is no need for a follow-up cycle.

Evaluation Results (Post-test) Cycle I

After the implementation of the action, researchers conducted a post-test to measure learning outcomes after the application of the PBL model. The results are as follows:

- Highest score: 95
- Lowest score: 70
- Average class score: 82
- Number of students who completed (≥ 70): 22 students (88%)
- Number of students who did not complete: 3 students (12%)

Table 1. Evaluation Results (Posttest) Cycle 1

Aspects	Pretest	Post-test
Average Value	63	82
Completeness (%)	40%	88%
Student Completion	10 students	22 students
Incomplete Students	15 students	3 students

Analysis of Improvement in Learning Outcomes

The improvement of student learning outcomes can be seen from two aspects, namely:

1. Cognitive aspect: The average score increased from 63 to 82, indicating that the application of the PBL model was able to improve students'

understanding of the concept of comparing quadrilateral characteristics. Learning completeness increased from 40% to 88%.

2. Affective and Psychomotor Aspects: From the observation results, students showed changes in learning attitudes, such as being more active in asking questions, daring to express opinions, and cooperating in group discussions. This is by the objectives of problem-based learning, which not only improve cognitive aspects, but also attitudinal aspects and social skills.

Activity Documentation

During the learning process, researchers also conducted documentation in the form of photos and videos of classroom activities. This documentation shows:

- Students discuss in groups
- Students present the results of the discussion in front of the class
- The teacher guides students in a fun atmosphere
- Students' enthusiasm when solving problems with the group

This documentation is proof that the application of PBL is able to create an active, creative, and fun learning atmosphere. Based on the research results, the application of the Problem Based Learning (PBL) model is effective in improving the mathematics learning outcomes of fifth-grade students of Budi Murni 2 Medan Private Catholic Elementary School on the material of comparing quadrilateral characteristics. This improvement is not only seen from the value aspect, but also from students' activeness, creativity, and social skills. The summary of the research results is as follows:

- Average score increased from 63 to 82
- Percentage of learning completeness increased from 40% to 88%
- Student activeness and participation increased from 55% to 85%
- Students understand the material more easily because they learn through solving real problems

With these results, the PBL model deserves to be used as a learning alternative to improve mathematics learning outcomes in elementary schools, especially with flat building materials.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of classroom action research conducted to improve mathematics learning outcomes through the application of the Problem-Based Learning (PBL) model in fifth-grade students of Budi Murni 2 Medan Private Catholic Elementary School, the following conclusions can be drawn:

1. The application of the Problem-Based Learning model is proven to be effective in improving students' mathematics learning outcomes, especially in the material of comparing quadrilateral characteristics. This is indicated by an increase in the average score from 63 (pre-cycle) to 82 (post-cycle), and learning completeness increased from 40% to 88%.
2. Students' active participation and motivation to learn increased significantly. Students were more involved in group discussions, problem solving, and confident in presenting their work. This shows that

PBL encourages students to think critically, communicate, and work together effectively.

3. The learning atmosphere becomes more interactive, fun, and student-centered. In contrast to conventional methods, the PBL model encourages students' active involvement in the learning process and makes learning more meaningful and contextual.
4. The PBL model also improves the development of students' social attitudes and behaviours, such as responsibility, cooperation, and self-confidence. Thus, learning does not only focus on cognitive aspects, but also affective and psychomotor aspects.

Based on the research results and conclusions obtained, the researcher provides the following recommendations:

1. For Teachers: It is recommended that teachers, especially mathematics teachers at the elementary school level, begin to apply the Problem-Based Learning model as an alternative to improve the quality of the learning process and student learning outcomes. Teachers need to prepare real problems that are relevant and appropriate to the level of student development.
2. For Schools: Schools are expected to provide support in the form of training, facilities, and learning media that support the implementation of innovative learning models such as PBL, and encourage collaboration between teachers to share experiences.

FURTHER STUDY

Based on the results of the research that has been conducted, the researcher realizes that this study still has limitations in terms of scope, number of subjects, and duration of implementation. Therefore, for the development of further studies, the researcher provides the following suggestions:

1. Expansion of Subjects and Research Locations: Further research is recommended to be conducted in more than one class or different schools to obtain more general and representative results. This is important to see the consistency of the effectiveness of the Problem Based Learning (PBL) model in various learning contexts.
2. Increase in the number of cycles: This study was conducted in only one cycle. To gain a more comprehensive understanding of the long-term impact of implementing the PBL model, further research could be designed in two or more cycles of action.
3. Integration with Learning Technology: Future research can integrate the PBL model with digital media or interactive learning technologies, such as the use of learning applications or online platforms, to make it more relevant to the times and the learning styles of today's students.
4. Studies in Other Subjects: The PBL model is not only suitable for learning mathematics, but also has the potential to be applied to other subjects, such as science, social studies, or the Indonesian language. Therefore, future researchers can explore the effectiveness of PBL in different subject contexts.

5. Measurement of Non-Cognitive Impact: In addition to cognitive learning outcomes, further research can focus more on measuring affective and psychomotor aspects, such as students' attitudes, motivation, teamwork, and critical thinking skills in more depth.

With these suggestions, it is hoped that further research can enrich the treasure of knowledge in the field of education and make a real contribution to the development of innovative learning models in elementary schools.

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