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IMPROVING STUDENT LEARNING OUTCOMES THROUGH PROBLEM-BASED LEARNING MODEL IN MATHEMATICS SUBJECT

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Abstract

This research aims to enhance the learning outcomes of 3rd grade students at SD Negeri 112 Palembang by applying the problem-based learning model in mathematics on adding fractions with the same denominators. This research uses Classroom Action Research conducted over three cycles: planning, implementation, observation, and reflection. The subjects of this research are 25 students in the 3rd grade class at SD Negeri 112 Palembang. Data collection is carried out through tests and analysis using quantitative data analysis. By applying the problem-based learning model, the research results demonstrate a significant improvement in the students' learning outcomes regarding the topic of fractions in mathematics. In cycle I, the level of student learning mastery reached 56%; in cycle II, the level of learning mastery increased to 68%; and in cycle III, it reached 84%. In conclusion, applying the problem-based learning model has effectively improved student learning outcomes in mathematics, particularly in fractions material.

Keywords: Mathematics; Problem-Based Learning; Learning Outcomes.

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A. Introduction

The achievements students attain in learning outcomes can reflect their success in the learning process. Learning outcomes, which can be considered the result of the entire undertaken learning process, indicate how much new understanding and knowledge students have acquired in the subject, demonstrating success or failure within a learning process. Anjani (2021) suggests that, following the teaching and learning process, students gain abilities that manifest in their learning outcomes. It is important to remember that students' learning achievements must be connected to the vital role of educators in providing teaching and support throughout this process.

According to Sukirah (2022), educators play a role in designing the learning process, utilizing models that align with the needs of their students in the classroom to achieve the learning objectives to the fullest extent. The use of teaching models by educators in the learning process undoubtedly has a significant impact on the learning outcomes achieved by the students. In line with Hidayati's perspective (2022), educators are responsible for providing students with motivation, guidance, and learning facilities. Based on this, an educator's role in the learning process becomes broader and leads to improving the learning outcomes the students achieve (Taufik, 2022).

Mathematics is one of the essential subjects to be taught to students because it has the potential to develop logical, critical, and creative thinking abilities. This statement is written in the National Education Minister Regulation Number 22 of 2006. It is in line with the perspective of Priatna (2018:2) that the subject of mathematics is recognized as a primary benchmark for measuring students' intelligence levels because the characteristics of mathematics involve logical, axiomatic, deductive, symbolic, hierarchical-systematic knowledge, and also abstract concepts.

Based on observations conducted at SD Negeri 112 Palembang, the researcher observed 3rd grade students and identified a topic within the curriculum where students' understanding is still considered at a lower level. This topic is the addition of fractions. According to Yustitia (2017), students

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follow the provided examples without understanding the concepts and meanings of the given problems. Students need a precise understanding of the concept of solving problems related to adding fractions with the same denominators. Within the context of fraction addition, it found that students are still perplexed in comprehending the concept of fraction addition and tend to add the denominators as well.

Students need to understand the taught concepts regarding the correct methods for solving arithmetic operations involving adding fractions. This situation results in a decreased interest of students in mathematics learning. Furthermore, it affects their ability to solve problems critically. Consequently, students tend to become passive in the learning process, leading to negative impacts on their learning outcomes, which become lower or less than optimal. This argument is presented by Ariyanti (2023). Understanding the concept of fractions is essential for students, as it serves as a prerequisite topic in mathematics for comprehending other subjects such as trigonometry, ratios, et cetera. The term “fraction,” as a mathematical concept, can be interpreted as a symbolic representation of the division between rational numbers. As a form of rational number, fractions are defined as fractional numbers (Priatna, 2018:66).

A gradual approach and understanding are necessary for learning mathematical topics, particularly the topic of adding fractions. However, students desire quick and instant results, leading to a situation where students cannot resist the urge to sit calmly for an extended period to complete tasks with precision and accuracy. Students become passive in participating in learning, especially in mathematics, as they find it challenging. It is because they need to connect the provided examples in the learning process with their everyday lives. Errors are also observed due to the mismatch between the difficulty level of the test questions given to students and the material taught previously, potentially impacting students’ learning outcomes. This finding is consistent with the research conducted by Suganda (2015), which indicates that suboptimal teaching practices can significantly affect students’ ability to achieve low learning outcomes.

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Based on the findings of issues in 3rd grade, there is a need for a teaching model that can captivate the students' interest and actively engage them in the learning process. It aligns with the viewpoint expressed by Maharani (2016) that education should not be confined to learning outcomes. However, it should also inspire students to develop critical thinking skills, actively participate in learning activities on their initiative, and express their opinions during the learning process. The problem-based learning model is employed to make the learning process more engaging, particularly in solving problems relevant to students' real-life experiences.

The researcher considers using the problem-based learning model as an option to enhance the learning outcomes of 3rd grade students in SD Negeri 112 Palembang. This model offers several advantages: (1) It presents challenges for students to develop their abilities while providing satisfaction in the process of acquiring new knowledge; (2) It has a positive effect on increasing motivation and the level of student engagement in learning activities; (3) It plays a role in supporting students in constructing their knowledge to understand relevant real-life issues; (4) It assists students in developing their new knowledge and encourages them to take responsibility for the learning process they have undertaken; (5) It contributes to developing students' critical thinking abilities and enhancing their skills in adapting to the newly acquired knowledge (Hermansyah, 2020).

It aligns with Rusman (2018:196), who stated that the problem-based learning model prioritizes students by integrating problem-solving based on their daily experiences. Furthermore, Riswari (2020) stated that problem-based learning is an innovative teaching approach that allows students to optimize their critical thinking abilities through systematic group work. It enables students to refine, enhance, balance, and continuously test their critical thinking abilities.

Considering the background elaborated earlier, the researcher feels motivated and compelled to conduct research titled "Improving Student Learning Outcomes through Problem-Based Learning Model in Mathematics Subject about Fraction Addition on 3rd Grade Students at SD Negeri 112 Palembang". This

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research is expected to provide solutions to the issue of lower learning outcomes among students in mathematics, particularly in the context of fraction addition.

B. Method

This research is included in the Classroom Action Research (CAR) category, which focuses on observing the effects of actions applied to the research subjects within a specific classroom (Sudaryono, 2019:569). This research implements the problem-based learning model as the tested treatment to compare the differences in learning outcomes obtained by students before and after the treatment is conducted (Bilqis, 2016). Nada (2018) suggests that using the problem-based learning model in the learning process can facilitate students' understanding of the subject currently being studied.

The Classroom Action Research consists of four parts, (1) Planning as the initial stage in determining a program and refining it based on ideas and concepts; (2) Action Implementation as the execution of actions modified to the previously formulated plan; (3) Observation to gather information on the effectiveness of the actions and identify weaknesses from previous actions; (4) Reflection as the analytical activity of the observation results that lead to new planning or programs.

The four stages in action research form a continuous cycle, starting from planning to reflection. This cycle constitutes a series of interconnected activities that can be repeated continuously. Within this cycle, an evaluation involves formulating plans, action implementation, observation, and reflective analysis (Arikunto in Nurmaini, 2014).

This classroom action research was conducted in three cycles. The subjects of this research were 3rd grade students of SD Negeri 112 Palembang, consisting of 10 male students and 15 female students. This research was carried out during the second semester of the 2022/2023 academic year in mathematics, specifically focusing on fractions material. Data collection techniques were based on the learning outcomes data of students in each cycle, analyzed using the test technique method.

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According to Mashudi (2016), this research used instruments to collect data more accurately. This research used a data collection technique in the form of a written test consisting of individual questions that needed to be answered in writing. This test was given at the end of each cycle to evaluate the learning outcomes that had been implemented and the student's achievements.

This research uses quantitative data analysis methods. The collected data will be analyzed using assessments of learning outcomes and assessments of students' learning proficiency. Learning outcomes are assessed using the following formula to evaluate individual students' grades.

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

(Aqib, dkk 2016:41)

Description:

$\bar{x}$ = The average score of all students

$\sum x$ = The total score of all students

$\sum N$ = Number of students

The assessment of learning proficiency is used to measure the overall percentage of students learning outcomes achievement classically. This assessment uses the following formula to determine the student's learning proficiency level.

$$p = \frac{\sum students\ who\ completed\ learning}{\sum students} \times 100$$

(Aqib, dkk 2016:41)

Description:

p = The percentage of overall student learning outcomes completion

$\sum students\ who\ completed\ learning$= The total number of students who have completed

$\sum students$ = Total of students

C. Results and Discussion

This classroom action research (CAR) was conducted in 3 cycles, with each cycle consisting of 2 meetings, and a written test was carried out at the end of

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each cycle during the second meeting. Afterward, the researcher designed a plan and conducted observations on the conducted research.

This CAR was conducted from March 4, 2023, to May 31, 2023, at SD Negeri 112 Palembang, involving 3rd grade students in mathematics, specifically focusing on fraction addition material. This CAR was conducted in 3 cycles, encompassing the first, second, and third cycles.

There has been an improvement in the student's learning outcomes that motivates them to think and work on their initiatives. The research findings show that learning outcomes improved after students took the initiative, bravely participated in class, and expressed their opinions actively. This process has made the learning experience engaging. The following presentation of the increase is data showing students' learning outcomes in the form of a table.

Table 1
Percentage of Student Learning Outcomes in Cycles I, II, III

Mastery Learning	Test Score	Number of students			Classical Mastery (%)		
		Cycle			Cycle		
		I	II	III	I	II	III
Complete	≥70	14	17	21	56%	68%	84%
Incomplete	<70	11	8	4	44%	32%	16%

Here is a graph representing the improvement of students' learning outcomes based on the research results in the bar chart:

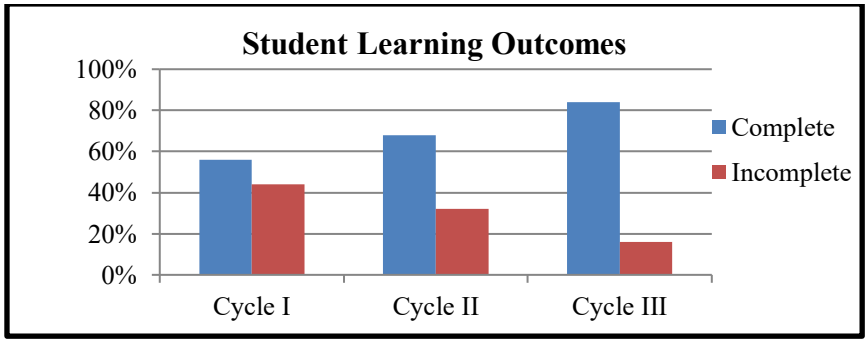

Figure 1. Student Learning Outcomes Diagram

Based on the previous students' learning process observations, it can be seen that in Cycle I, 14 out of 25 students successfully reached learning proficiency. In comparison, 11 students still need to achieve proficiency. Students' lack of learning proficiency is due to a tendency towards passivity in

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the learning process, lack of interest, and challenges in stimulating critical thinking among students. It was also found that some students hesitated to ask questions when they did not understand something. Based on these findings, the research continued to Cycle II because only 56% of the total 25 students achieved learning proficiency. Therefore, the researcher proceeded with Cycle II.

In Cycle II, the researcher used fraction block manipulative to improve students' interest, encouraging them to think critically by requesting students to step forward in the classroom and attempt to add fractions using the fraction blocks. As a result, an improvement in students' learning outcomes was observed. Of 25 students, 17 achieved proficiency, while 8 did not. Therefore, the students' pass rate increased from 56% to 68%. However, in Cycle II, the students had yet to reach the desired learning proficiency, indicating that the research still requires further investigation in Cycle III.

After conducting the previous cycles, the researcher proceeded to Cycle III, utilizing teaching aids, media, and technology in the learning process to stimulate students' critical thinking by presenting images on the slide. As observed during the Cycle III implementation, students showed classical interest and enthusiasm in critical thinking during the learning process. Therefore, a significant improvement in learning outcomes was evident. Of 25 students, 21 achieved above-average scores, while 4 scored below average. As a result, the students' pass rate increased to 84%. Therefore, Cycle III can be categorized as successful as it achieved the predetermined success target of 80%.

Based on the research findings, using the problem-based learning teaching model effectively improves students' learning outcomes. Hotimah suggests that the problem-based learning teaching model is an approach that centers around problem-solving, encouraging students to learn and collaborate within groups to find solutions. This model also balances students' analytical and critical thinking abilities and capacity to use learning resources effectively and optimally. Meanwhile, according to Sulastri (2017), students' learning outcomes are the final evaluation of repeated learning activities.

This research is also aligned with previous research by Pratama (2019) with

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a similar title, "Efforts to Improve Learning Outcomes of 4th Grade Students at SD Negeri 24 Palembang on the Theme of Beauty of Diversity in My Country by Implementing the Problem-Based Learning Model". There was a significant improvement in students' learning outcomes, from 67% in cycle I to 92% in cycle II.

It is further supported by Amelia's research (2020), "Improving Mathematics Learning Outcomes Using the Problem-Based Learning Model in Fourth Grade Elementary School." The results showed an improvement in students' learning outcomes, with 75.5% in cycle I and increasing to 86.8% in cycle II.

Furthermore, this conducted research also correlates with research by Aniza (2021) titled "Problem-Based Learning Model to Improve Learning Outcomes of Third Grade Students." The results showed an improvement in students' learning outcomes. Initially, it reached 52.6% in cycle I, then increased to 68.4% in cycle II, and cycle III reached 84.2%.

Through the utilization and implementation of a teaching approach focused on problem-solving in the learning process, the learning outcomes achieved by the students have shown improvement. In line with the advantages offered by the implementation of the problem-based learning teaching model, these include: (1) Assisting students in sharpening their ability to design solutions to problems, (2) Stimulating students' capacity for creative thinking and innovative action, (3) Providing opportunities for students to manage real-world problems, (4) Teaching students to identify and evaluate the results of their observations, (5) Encouraging students to interpret and carefully assess observation outcomes, (6) Stimulating the independent thinking development of students in discovering accurate solutions to various issues, and (7) Generating education to be more relevant to students' daily lives (Atminingsih, 2019).

D. Conclusion

Based on the research findings, implementing the problem-based learning model improves learning outcomes for 3rd grade students at SD Negeri 112

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Palembang in mathematics, specifically focusing on fraction addition. Using the problem-based learning model has proven effective in improving students' learning achievements in the 2022/2023 academic year. It is evident in each cycle, Cycle I, II, and III, that there is a significant improvement in the outcomes obtained following the indicators.

In line with the research results conducted on a subject of 25 students, in Cycle I, 14 students (56%) completed the tasks well. There was an improvement in Cycle II, with 17 students (68%) showing progress. Furthermore, in Cycle III, the number of students who completed the tasks increased to 21 (84%).

The findings from this research indicate that consistent implementation of the problem-based learning model in Cycle I, II, and III has successfully improved the learning outcomes of 3rd grade students at SD Negeri 112 Palembang in mathematics, particularly in fraction addition. The percentage of students who have completed learning increased significantly from 56% in Cycle I to 68% in Cycle II, reaching 84% in Cycle III. It demonstrates the effectiveness of the applied teaching model in enhancing students' understanding and learning achievements

Other researchers need more attention toward implementing the problem-based learning model in the context of mathematics education. This model can encourage students to be more active, develop critical thinking skills, and connect learning with everyday life. The significant impact of this teaching model is evident in the field of education, making it essential to explore further its potential and benefits in enhancing the quality of mathematics education. The problem-based learning approach is both engaging and influential within the educational context.

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