Literasi Nusantara
vol.6 no. 1, November 2025 – February 2026
https://journal.citradharma.org/index.php/literasinusantara/index

ISSN 2746 8208 (Online)
ISSN 2746 3575 (Print)

The Effect of the Application of the Problem Based Learning Model on Mathematics Learning Outcomes of Mathematics Sentence Material Grade III SDN Ragung 1

Alika Ramadhanti [1*], Conny Dian Sumadi[2]

[1*,2] Universitas Trunodjoyo Madura, Jawa Timur, Indonesia

Corresponding author: *alikaramadhanti4@gmail.com* ,
conny.diansumadi@trunojoyo.ac.id
DOI : *https://doi.org/10.56480/jln.v6i1.1637*

Received: November 14, 2025
Revised: November 23, 2025
Accepted: December 29, 2025

Abstract

This study aims to determine the effect of the application of the Problem Based Learning (PBL) model on students' mathematics learning outcomes in mathematics sentence material in grade III of SDN Ragung 1. The type of research used was a pseudo-experiment with a nonequivalent control group design. The research subjects consisted of two classes, namely the experimental class that was given the PBL model treatment and the control class that used conventional learning. Data collection was carried out through pretest and posttest tests as well as observation of learning implementation. Based on the results of data analysis with the peered sample t-test, it was found that there was a significant difference between student learning outcomes in the experimental and control classes, with a significance value of < 0.05. Thus, it can be concluded that the Problem Based Learning model has an effect on improving students' mathematics learning outcomes in mathematics materials in grade III of SDN Ragung 1.

Keywords– *Problem-Based Learning (PBL), Mathematics Learning Outcomes, Math Sentences*

1. Introduction

Mathematics is fundamentally defined as a branch of science derived through rigorous logical reasoning and systematic thinking, as emphasized by Simangunsong (2021). Within the educational sphere, one of the most vital indicators of success in this discipline is the measurement of learning outcomes. These outcomes represent specific competencies or abilities—spanning cognitive, affective, and psychomotor domains—that students successfully acquire after participating in the instructional process. In the context of elementary education, achieving high learning outcomes in mathematics is essential, as it forms the foundational logic required for more advanced scientific study and everyday problem-solving.

The reality observed in many educational settings, including SDN Ragung 1, reveals that mathematics learning outcomes are frequently suboptimal. Initial observations at the school identified several significant hurdles, particularly regarding the mastery of mathematical sentences. These challenges are often rooted in a combination of internal and external factors; internally, students suffer from a profound lack of interest and motivation, viewing the subject as a daunting or abstract hurdle. Externally, the teaching methods employed by educators often lack variety, relying heavily on traditional, teacher-centered approaches that fail to capture the students' imagination or cater to diverse learning styles, ultimately resulting in stagnant academic performance.

To address these systemic issues, there is an urgent need for a shift toward instructional models that prioritize active student engagement. The Problem Based Learning (PBL) model has been identified as a potent alternative solution to bridge this gap. PBL is a student-centered pedagogical approach that initiates the learning process by confronting students with authentic, real-world problems. By situating mathematical concepts within a practical context, the model transforms the classroom from a place of rote memorization into a laboratory for critical thinking. This encourages students to investigate, analyze, and solve problems independently or collaboratively, ensuring that the knowledge gained is both deeply understood and practically applicable.

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The theoretical promise of PBL is well-supported by previous research, such as the study conducted by Huda & Khotimah (2023), which demonstrated that PBL significantly increases learning outcomes and achieves higher mastery levels compared to conventional teaching methods. By building on these established findings, this research aims to specifically investigate the influence of the PBL model on the mathematical learning outcomes of third-grade students at SDN Ragung 1. Through this investigation, the study seeks to provide empirical evidence that integrating real-world problem-solving into the curriculum can revitalize student enthusiasm and lead to a more profound and lasting understanding of mathematical operations.

2. Method

This research utilizes a quantitative approach with a quasi-experimental design, specifically employing the Nonequivalent Control Group Design. In this framework, the researcher establishes two distinct groups experimental and control without the use of random assignment, which is a practical necessity in educational settings where pre-existing classroom structures must be maintained. The primary objective is to investigate the causal impact of a specific intervention on student learning outcomes by comparing the performance variations between these two groups, ensuring that any observed changes can be systematically analyzed through statistical means.

The study was conducted at SDN Ragung 1, spanning a concentrated period from September 27 to October 4, 2025. The population for this study encompasses all third-grade students at the institution, specifically those enrolled in classes 3A and 3B. For the sampling process, the researcher utilized a total enumeration approach, involving 27 students from class 3A and 26 students from class 3B. By including the entire population of these two classes as the sample, the study aims to achieve a high level of data representativeness, allowing for a comprehensive evaluation of the academic dynamics within this specific grade level.

To ensure a holistic data collection process, the researcher employed a mix of qualitative and quantitative instruments, beginning with semi-structured

interviews and direct observation. The semi-structured interviews were designed to be flexible, allowing the researcher to follow a prepared set of questions while remaining open to deeper, spontaneous inquiries based on the respondents' answers. Simultaneously, the observation phase involved direct immersion in the classroom environment to identify real-time phenomena and pedagogical challenges. These methods provide a rich contextual backdrop, helping the researcher understand the underlying factors that influence the students' learning environment and behavior.

The core assessment of student performance was conducted through written tests and meticulous documentation. The tests, consisting of short-answer questions, served as the primary quantitative tool to measure learning outcomes and academic achievement effectively. To complement these results, the researcher utilized documentation techniques, gathering archival records, written notes, and photographic evidence produced during the research process. This multifaceted data collection strategy combining empirical test scores with descriptive documentation and interview insights ensures a robust and credible analysis of the intervention's effectiveness within the quasi-experimental framework.

3. Result and Discussion

The findings of this research provide a comprehensive look into the academic performance of third-grade students at SDN Ragung 1, specifically comparing the effectiveness of the Problem Based Learning (PBL) model against conventional teaching methods. The primary data source consists of pretest and posttest scores from two distinct groups: Class III-A, serving as the experimental group, and Class III-B, acting as the control group. These quantitative metrics allow for a systematic evaluation of how different pedagogical interventions influence student achievement in mathematics, particularly regarding mathematical sentences involving addition and subtraction operations.A detailed descriptive analysis of the experimental class reveals a profound improvement in student performance following the implementation of the PBL model. Initially,

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the students in Class III-A recorded a modest pretest average of 51.52. However, after engaging in two intensive sessions utilizing the PBL framework, their posttest average surged to 86.52, reflecting a substantial increase of 35 points. The distribution of scores also showcased impressive growth, with the highest student achieving a perfect score of 100 and the lowest score resting at a respectable 75. These figures suggest that the PBL approach successfully elevated the baseline competency of the entire classroom.In contrast, the control group in Class III-B, which was taught using conventional methods, exhibited a more measured growth pattern. Starting with a pretest average of 48.18, these students reached a posttest average of 74.32, marking an improvement of approximately 26.14 points. While the highest score in this group reached 90, the lowest score remained significantly lower at 55. When comparing the two cohorts, it is evident that while both groups experienced academic gains, the experimental group's average increase was nearly 9 points higher than that of the control group, indicating that the PBL model offered a superior learning advantage.Before conducting deep statistical testing, the data underwent rigorous prerequisite examinations to ensure validity, starting with a normality test using the Shapiro-Wilk method. The results indicated that all data sets the pretest and posttest for both the experimental and control groups followed a normal distribution, as their significance values (ranging from 0.062 to 0.203) were all comfortably above the 0.05 threshold. Furthermore, the Levene Statistic for homogeneity yielded significance values of 0.668 for the pretest and 0.113 for the posttest. Since these values exceeded 0.05, it was confirmed that the data variances across both groups were homogeneous, satisfying the requirements for parametric statistical analysis.The hypothesis testing began with a Paired Sample T-Test for the experimental class to measure the internal impact of the intervention. The analysis yielded a significance value (2-tailed) of 0.000, which is significantly lower than the 0.05 alpha level. This result confirms that there is a statistically significant difference between the learning outcomes before and after the application of the PBL model. This internal shift demonstrates that the intervention was not merely a minor change but a transformative educational experience that significantly bolstered the students'

understanding of the subject matter.To further validate the superiority of the PBL model, an Independent Sample T-Test was conducted on the posttest scores of both groups. The results showed a t-value of 4.021 with a significance value (2-tailed) of 0.000. Because the significance value was less than 0.05, the null hypothesis (H_0) was rejected in favor of the alternative hypothesis (H_a). This statistical evidence proves that there is a significant disparity between the learning outcomes of the experimental class using PBL and the control class using conventional methods, cementing the conclusion that the PBL model is more effective in enhancing mathematical competency.The discussion of these results highlights that the success of the PBL model is rooted in its instructional syntax, which begins by presenting students with contextual, real-world problems. By dividing students into groups to solve tasks within Student Worksheets (LKPD), the model fosters an active learning environment. While initial observations showed that students were somewhat hesitant to discuss ideas during the first meeting, the second session saw a dramatic increase in interaction and confidence. This shift aligns with Vygotsky's constructivism theory, which posits that social interaction and collaborative problem-solving are essential for internalizing complex concepts rather than simply memorizing formulas.Conversely, students in the control group appeared more passive, as the conventional model relied heavily on the teacher's explanations. While they did improve, the lack of engagement led to quicker boredom and less enthusiasm when tackling routine practice problems. This research echoes previous studies by Ardianti (2022) and Wandari (2024), which emphasize that PBL effectively increases cognitive learning engagement. The advantages identified in this study include heightened motivation through real-life relevance, the cultivation of teamwork skills, and the sharpening of critical thinking when analyzing mathematical word problems.Despite the clear benefits, the implementation of PBL did face challenges, most notably regarding time management. The phases of group discussion and student presentations naturally consume more time than a standard lecture. However, the researcher mitigated these obstacles by enforcing strict time limits for each stage of the PBL syntax. Ultimately, this study confirms that the

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Problem Based Learning model significantly influences the mathematics learning outcomes of third-grade students at SDN Ragung 1. It stands as a highly recommended alternative strategy for educators seeking to improve the quality and depth of mathematics education in elementary schools.

4. Conclusion

Drawing from the extensive research findings and the comprehensive analysis conducted at SDN Ragung 1, it can be concluded that the implementation of the conventional learning model in the control group yielded sub-optimal results in comparison to modern alternatives. While there was a measurable increase in student performance, the final posttest average of 74.32 indicates a limited mastery of the material, largely attributed to the passive nature of traditional teaching methods. Throughout the observation period, students in this group demonstrated a tendency toward disengagement, acting primarily as passive recipients of information rather than active participants. This lack of interaction hindered their ability to deeply grasp complex mathematical sentences, resulting in a learning experience that, while functional, failed to spark the curiosity or critical thinking necessary for higher academic achievement.

In stark contrast, the application of the Problem Based Learning (PBL) model within the experimental class proved to be a transformative force, significantly enhancing both student engagement and academic outcomes. The students reached an impressive posttest average of 86.52, a clear indicator that the PBL framework effectively bridges the gap between theoretical concepts and practical understanding. By immersing students in collaborative problem-solving and contextual discussions, the model fostered a high level of enthusiasm and empowered them to take ownership of their learning process. This success is further substantiated by the Independent Sample T-Test results, which yielded a significance value of 0.000 well below the 0.05 threshold thereby confirming that the PBL model is statistically and practically more effective than conventional methods. Ultimately, this research affirms that PBL is a superior pedagogical

strategy for improving conceptual mathematical understanding among third-grade elementary students.

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