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THE EFFECT OF THE PROBLEM-BASED LEARNING (PBL) MODEL ON THE CRITICAL THINKING SKILLS OF FOURTH GRADE STUDENTS AT SDN 2 BOYEMARE

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ABSTRACTS

The critical thinking skills of fourth grade students at SDN 2 Boyemare in Mathematics remain low. Students struggle to understand and solve contextual problems because instruction is still teacher-centered. This study aims to determine the effect of the Problem-Based Learning (PBL) model on the critical thinking skills of Grade IV students at SDN 2 Boyemare during the 2025/2026 academic year, specifically regarding the topics of equivalent fractions and converting fractions to percentages. This study employs a quantitative approach using a pre-experimental design—specifically, the One-Group Pretest-Posttest Design. The data source comprises the entire Grade IV cohort of 17 students, selected via total sampling. Data were collected using an essay test consisting of eight items based on Ennis's critical thinking indicators. Data analysis involved descriptive statistics, the N-Gain test, normality tests (Kolmogorov-Smirnov and Shapiro-Wilk), the paired-sample t-test, and the analysis of observational data using the SPSS program. The research results show that the average pretest score of 39.15 increased to 69.67 in the posttest, representing an increase of 30.52 points. The N-Gain test yielded an average score of 0.50 (moderate category), with 94.12% of students falling into the moderate category and 5.88% into the high category; no students fell into the low category. The paired sample t-test resulted in a calculated t-value of -15.712 with a significance value of < 0.001—well below the 0.05 significance level—leading to the rejection of H_0 and the acceptance of H_1. This indicates that the Problem-Based Learning (PBL) model has a significant effect on the critical thinking skills of fourth-grade students at SDN 2 Boyemare during the 2025/2026 academic year.

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INTRODUCTION

Education is a human endeavor to develop one's personality in accordance with societal values or to assist students in developing and enhancing knowledge, skills, values,

attitudes, and behavioral patterns useful in life (Nasution & Putri, 2023). Education is a systematic process for transmitting knowledge, skills, values, and norms to the next generation. Education is a learning process aimed at maximizing the potential of students. Through education, students are expected to possess the ability to think logically, systematically, creatively, and critically when understanding and solving life's problems (Law of the Republic of Indonesia Number 20 of 2003). Critical thinking ability is a crucial competency that needs to be cultivated from an early age, particularly at the elementary school level.

Critical thinking ability itself is a skill used to process information logically and rationally. Critical thinking skills involve the ability to analyze and evaluate information, understand arguments, and draw conclusions based on available evidence (Salsa Novianti Ariadila et al., 2023). Critical thinking skills are the ability to analyze information, evaluate arguments, and draw conclusions logically and systematically. According to (Facione, 2020) critical thinking includes the skills of interpretation, analysis, evaluation, inference, as well as the ability to provide rational explanations. This ability is very important in learning mathematics because mathematics does not only focus on calculations, but also on understanding concepts and solving problems.

In learning mathematics in elementary schools, critical thinking skills are very necessary because mathematics not only requires students to carry out calculations, but also understand concepts and solve problems logically. (Principles to Actions: Ensuring Mathematical Success for All, 2014) emphasizes that mathematics learning must encourage students to reason, solve problems, and communicate ideas systematically. Therefore, mathematics learning should be able to train students to think critically from an early age. However, based on the results of initial observations in class IV, students' critical thinking abilities are still relatively low. This can be seen from students who have difficulty understanding questions in the form of problems, especially regarding equivalent fractions and changing fractions to percent. Students tend to just follow the example solutions given by the teacher without understanding the concept in depth. When given questions with different forms, students often experience confusion and are less able to provide reasons for the answers given.

Students' low critical thinking abilities can be caused by a learning process that is still teacher-centered. The lecture-dominant learning model makes students less actively involved in the learning process. Learning that does not give students the opportunity to explore and solve problems independently can hinder the development of higher order thinking abilities. To overcome this problem, a learning model is needed that is able to actively involve students and requires them to think deeply. One relevant learning model is Problem Based Learning (PBL). According to (Arends, 2021), Problem Based Learning is a learning model that uses real problems as a starting point for learning and encourages students to carry out investigations and discussions to find solutions. Through the application of the Problem Based Learning (PBL) model, students are expected to be able to identify problems, analyze information, express opinions logically, and draw conclusions based on the results of discussions. Research conducted by (Siregar & Habibi, 2026) shows that the application of the PBL model can improve students' critical thinking skills in learning mathematics.

The material on equivalent fractions and changing fractions to percent was chosen in this study because this material requires a strong conceptual understanding and analytical skills in solving problems in the form of contextual problems. According to (Sirait et al., 2024), fraction material is quite complex material for elementary school students because it requires understanding the relationships between concepts and mathematical reasoning abilities. Based on the background of the problem that has been described, the problem formulation in this research is "Is there an influence of the Problem Based Learning model on the critical thinking abilities of fourth grade students at SDN 2 Boyemare for the 2025/2026 academic year?"

RESEARCH METHODS

The research design used was pre-experimental design (One Group Pretest–Posttest). In this design, research is carried out on only one group which acts as the experimental group. Before the treatment was carried out, the group was first given a pretest to determine students' initial abilities in thinking critically in mathematics subjects. Next, the group was given treatment in the form of applying the Problem Based Learning (PBL) learning model in the learning process. After the treatment is given, students are then given a posttest to determine changes in critical thinking abilities after implementing the learning model. By comparing the results of the pretest and posttest, it can be seen whether or not there is an influence of the application of the Problem Based Learning (PBL) model on the critical thinking abilities of fourth grade elementary school students. The sample for this study consisted of all 17 fourth-grade students at SDN 2 Boyemare. The data collection techniques employed were: 1) tests, 2) observation, and 3) documentation. Analysis techniques included descriptive statistics, the N-Gain test, prerequisite tests, hypothesis testing, and analysis of observational data, all of which were processed using the SPSS program.

RESEARCH RESULTS AND DISCUSSION

The results indicate that the implementation of the Problem-Based Learning (PBL) model had a significant impact on the critical thinking skills of fourth-grade students at SDN 2 Boyemare in Mathematics, specifically regarding the topics of equivalent fractions and converting fractions to percentages. This is evidenced by the increase in the students' average score from 39.15 on the pretest to 69.67 on the posttest, representing a gain of 30.52 points. The highest score achieved by a student rose from 50.00 to 81.25, while the lowest score increased from 31.25 to 62.50. The improvement observed across all 17 students indicates that the implemented learning model fostered the development of critical thinking skills comprehensively, benefiting not only students with higher initial proficiency. The students' low initial average score of 39.15 suggests that, prior to the implementation of PBL, the learning process had not optimally stimulated their ability to analyze, evaluate, and draw logical conclusions regarding the mathematical problems presented. This aligns with the findings of Wicaksanti (2023) in her study at SD Kanisius Totogan, where—prior to the implementation of the PBL model—the critical thinking skills of fourth-grade students were classified as very low, with an average score of 57.4 and a learning mastery rate of only 14.8%. However, following the implementation of the PBL model across two cycles, the

students' average score rose to 82.9, and the mastery rate reached 66.7%, demonstrating the model's effectiveness in enhancing the critical thinking skills of fourth-grade elementary students.

The magnitude of the improvement in students' critical thinking skills is corroborated by N-Gain test results, which yielded an average score of 0.50, placing it in the "medium" category. No students fell into the "low" N-Gain category; in fact, one student achieved the "high" category with an N-Gain score of 0.73. These results indicate that the Problem-Based Learning (PBL) model effectively fosters a significant improvement in students' critical thinking skills. Through the systematic application of PBL stages—ranging from the orientation toward contextual problems involving equivalent fractions and percentages, the organization of students into study groups, and the guidance of individual and group inquiries, to the development and presentation of discussion results and the collaborative analysis and evaluation of the problem-solving process with the teacher—students were gradually trained to independently identify problems, analyze relevant information, articulate logical arguments, and draw structured, well-founded conclusions. This process directly stimulated the five critical thinking indicators measured in the study, ensuring that the changes in student ability were not merely procedural—limited to calculation—but also encompassed deeper dimensions of conceptual understanding and mathematical reasoning. This aligns with the findings of Aini et al. (2020), which demonstrate that implementing the PBL model with fourth-grade students at MI Al-Falah significantly enhances their critical thinking skills; specifically, active student engagement in the problem-solving process—facilitated by the stages of PBL—trains students to think more analytically and systematically when addressing learning-related problems.

These research findings are further statistically reinforced by the results of a paired-sample t-test, which yielded a calculated t-value of -15.712 and a significance value of < 0.001—well below the established significance level of 0.05. These results provide strong statistical evidence that the difference in students' critical thinking skills between the pre- and post-implementation phases of the Problem-Based Learning (PBL) model was not due to chance, but rather a tangible and measurable outcome of the instructional intervention. The mean difference of -30.516, with a standard deviation of 8.008, indicates that the improvement was not only substantial on average but also relatively consistent across the student body. With a 95% confidence interval falling entirely within the negative range of -34.633 to -26.399—and excluding zero—it can be confirmed that the PBL model consistently produces a significant and scientifically valid improvement in critical thinking skills. This aligns with findings by Dewi (2025), which state that Problem-Based Learning uses problems as a starting point for gathering and integrating new knowledge; this fosters critical thinking skills in learners because PBL entails deep cognitive processing rather than mere reasoning. Consequently, the hypothesis (H_1) stating that the implementation of the Problem-Based Learning model has a significant effect on the critical thinking skills of fourth-grade students at SDN 2 Boyemare (2025/2026 academic year) is statistically accepted, demonstrating that the PBL model is an effective instructional alternative for developing students' critical thinking skills regarding equivalent fractions and fraction-to-percentage conversions at the elementary school level.

CONCLUSION

It can be concluded that the implementation of the Problem-Based Learning (PBL) model significantly influenced the critical thinking skills of fourth-grade students at SDN 2 Boyemare in Mathematics—specifically regarding the topics of equivalent fractions and converting fractions to percentages—during the 2025/2026 academic year. This is empirically evidenced by the increase in the students' average critical thinking score from 39.15 in the pretest to 69.67 in the posttest, representing a gain of 30.52 points. The magnitude of this improvement was confirmed by the N-Gain test results, which yielded an average score of 0.50 (categorized as "medium"); notably, all 17 students demonstrated improvement, with none falling into the "low" category. Statistically, the paired-sample t-test produced a calculated t-value of -15.712 with a significance level of < 0.001—well below the 0.05 threshold—leading to the rejection of H_0 and the acceptance of H_1. Thus, the research objective—to determine the impact of the Problem-Based Learning model on the critical thinking skills of fourth-grade students at SDN 2 Boyemare—has been addressed both empirically and statistically, yielding results that are consistent and scientifically sound.

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