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Analysis of Mathematical Problem-Solving Abilities of Elementary School Students in Bengkulu City

Febri Kristiani
University of Bengkulu
fkristiani@unib.ac.id
Edi Susanto
University of Bengkulu
edisusanto@unib.ac.id
Corresponding Email: fkristiani@unib.ac.id

Abstract

Mathematical problem-solving ability is a fundamental competency in mathematics education that must be developed from the primary education level. This study aims to describe the mathematical problem-solving abilities of fifth-grade elementary school students in Bengkulu City. The research instruments included a mathematics problem-solving test based on number material and interview guidelines. The results of the study showed that most students were in the fair (29.4%) and low (26.5%) categories in their problem-solving abilities (14.7) in the very low category, while for the very high category (8.8%) and high category (20.6%). The main difficulties faced by students were in the planning phase of the solution and the final verification of answers. The differences in student performance between schools indicate the influence of pedagogical and environmental factors. Teacher interviews revealed that the dominant teaching approach was conventional, lacking emphasis on reasoning and higher-order thinking skills. The findings recommend implementing problem-based learning strategies and providing professional development for teachers to design instruction that promotes critical and creative thinking skills.

Keywords: *Mathematical Problem Solving, Mathematics Learning, Primary Education, Contextual Approach, Student Ability*

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Introduction

The current rapid development of science and technology has led to the widespread recognition of this era as the era of globalization. Globalization impacts various aspects of people's lives and presents new challenges and problems that must be addressed (Nurhaidah & Musa, 2019). To address these challenges, high-quality and highly competitive human resources (HR) are required. One way to improve the quality of HR is through education. Subjects such as mathematics play a crucial role in this effort, Yudha (2019). Mathematics is a mandatory subject at every level of elementary education. According to Argawi & Pujiastuti (2021), mathematics learning is the process of providing students with mathematical learning experiences through a series of planned and systematic activities, enabling them to acquire knowledge of the mathematics they are studying skillfully, intelligently, and effectively understand the lessons taught by their teachers. The goal of learning mathematics is to enable students to solve problems. This includes the ability to understand problems, design mathematical models, solve these models, and interpret the results obtained (Hasbullah & Wiratomo, 2015**).**

According to Riswari, et. al, (2023), the main goal of basic education is to build a foundation of intelligence, knowledge, personality, noble character, and the skills needed to live independently and continue education to the next level. To achieve this goal, basic education is pursued through various subjects taught in the daily learning process. In the context of mathematics learning in elementary schools, serious attention is needed from various parties, including educators, the government, parents, and the community. This is because mathematics learning at the elementary level plays a very important foundation for building basic concepts that will form the basis for learning at the next level. Mathematical problem solving plays a role in developing student abilities, so there is a strong link between mathematical problem-solving abilities and student mathematics learning outcomes. This problem solving is also one of the approaches and goals in mathematics learning in elementary schools (Saja'ah, 2018).

Mathematical problem-solving ability is a key skill that is crucial in mathematics education and in everyday life. Mathematics, often considered a universal language that explains phenomena in the world, requires more than just numerical calculations. According to Permatawati and Karyati (2019), problem-solving ability in mathematics learning is the ability of students to actively use their knowledge, experience, and skills to achieve specific goals in facing various situations and challenges in mathematics learning. According to Permendikbud Number 58 of 2014, mathematics is a universal science that is very useful in human life, underpins the progress of modern technology, and plays a vital role in various disciplines and in the development of human thinking. One of the

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Pages 112-119

essential mathematical skills for students is the ability to solve mathematical problems according to the NCTM standards. According to Polya (1973), there are several steps that can be followed in problem-solving. These steps include: understanding the problem, planning a solution, implementing the plan, and reviewing the results. Students are considered to have good problem-solving skills if they are able to complete all these stages. These problem-solving steps are used as a basis or indicator for assessing and measuring students' problem-solving abilities in mathematics learning.

TIMSS (Trends in International Mathematics and Science Study) is an international study that measures the mathematics and science abilities of elementary and junior high school students, conducted by the International Association for Evaluation of Educational Achievement (IEA) every four years since 1995. This assessment has two reference frameworks, namely the content dimension, which includes Number, Geometry/Measurement, and Data Presentation, and the cognitive dimension consisting of Knowledge, Application, and Reasoning. Based on the 2015 TIMSS report, Indonesia was ranked 44th out of 49 countries, indicating that Indonesia's achievements are still far from international standards, (Hadi & Novaliyosi, 2019). One of the causes is that Indonesian students are not yet accustomed to working on international standard questions such as TIMSS. Wardhani and Rumiati (2011) stated that the low results of TIMSS and PISA are caused by several factors, one of which is the lack of student practice in solving questions like those tested in TIMSS and PISA. Rahayu (2018) added that learning in Indonesia focuses more on low-difficulty questions, while TIMSS questions are medium to high-difficulty and require reasoning to solve. One of the skills assessed in TIMSS is mathematical understanding and problem-solving (Simanjutak, 2016).

Based on the description above, the study entitled "Analysis of Elementary School Students' Mathematical Problem-Solving Abilities in Bengkulu City" is important to investigate. This study was conducted with the aim of determining the mathematical problem-solving abilities of elementary school students in Bengkulu City.

Research Method

This study used a descriptive qualitative approach. The subjects consisted of 34 fifth-grade students, 23 from SDN 04 Bengkulu City and 11 student of SDN 12 Bengkulu City. The instruments used in this study included a mathematics problem-solving ability test with six questions and interviews. The test focused on the topic of numbers, which is taught in fifth-grade elementary schools. The purpose of this test was to assess the quality of students' mathematical problem-solving abilities and analyze the difficulties they encountered in solving problems. Additionally, interviews were conducted with teachers and students to obtain additional data to support the analysis of

International Journal of Innovation and Education Research (IJIER)
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Pages 112-119

students' difficulties.

Table 1. Question Scoring Criteria

No Question	Problem-Solving Ability Indicator	Scoring Criteria
1,2,3,4,5,6	Understanding the Problem Planning a Solution Solving the Problem According to Plan Rechecking	• Writing a complete and correct answer (score 3) • Writing an incomplete answer (score 2) • Writing an incorrect answer (score 1) • Not writing an answer (score 0)

The research data were obtained from problem-solving tests given to students. The data were then processed and described using descriptive analysis techniques based on mathematical problem-solving ability indicators and assessment guidelines. The three indicators used were: understanding the problem, planning a solution, and solving the problem according to plan. The fourth indicator, rechecking answers, was considered fulfilled if indicators 1, 2, and 3 had been met. Therefore, the scoring criteria for assessing students' mathematical problem-solving ability were compiled as listed in Table 1.

$$Student\ Score = \frac{Score\ Obtained}{Score\ Max} \times 100$$

The students' test results were then classified according to the criteria of their problem-solving ability level. The categories of students' mathematical problem-solving ability levels are stated in Table 2.

Table 2. Mathematical Problem-Solving Ability Criteria

Score	Criteria
$85 \leq$ Score	Very High
$70 \leq$ Score ≤ 85	High
$55 \leq$ Score ≤ 70	Fair
$40 \leq$ Score ≤ 55	Low
Score < 40	Fair Low

(Mawwadah & Anisah, 2015)

Result and Discussion Result

1. Description of Problem-Solving Ability Test Results

The data processing results show the distribution of problem-solving ability as follows:

Table 3. Results of Mathematical Problem-Solving Ability Data Processing

Ability Category	Number of Students	Percentage (%)
Very High	3	8.8%
High	7	20.6%

International Journal of Innovation and Education Research (IJIER)
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Pages 112-119

Fair	10	29.4%
Low	9	26.5%
Fair Low	15	14.7%
Total	34	100%

From the data, it appears that the majority of students fall into the sufficient (29.4%) and low (26.5%) categories. Only 8.8% of students demonstrated very high problem-solving skills.

2. Analysis Based on Ability Indicators

1. Understanding the Problem

A total of 22 students (64.7%) were able to write down the known and asked information completely or mostly correctly. However, the remaining 12 students (35.3%) still experienced difficulties understanding the language of the questions, particularly contextual questions. They were unable to identify important information or were unable to differentiate between the data and the questions being asked.

2. Planning a Solution

Only 19 students (55.9%) were able to develop relevant and logical solution steps based on the information in the problem. Most of them used commonly taught strategies such as basic operations, creating tables, or drawing. However, this planning was often not accompanied by a strong rationale. Meanwhile, the other 15 students tended to jump straight into the task without a clear plan.

3. Solving According to Plan

Seventeen students (50%) were able to solve the problem completely according to plan. However, many still made procedural errors, especially in number operations or unit conversions. Some students also made errors in the order of their work.

4. Rechecking

Only around 12 students (35%) checked their answers. Students with high ability tended to be more conscious of verifying their results and finding calculation errors. In contrast, students with low ability generally abandoned the problem immediately after completion without any reflection.

Further analysis revealed that students from SDN 04 performed relatively better than those from SDN 12. At SDN 04, the majority of students were categorized as moderate to high. At SDN 12, the majority of students were categorized as low to moderately low. This could be due to factors such as the learning environment, teacher teaching methods, and frequency of problem-solving exercises.

Interviews with teachers revealed that the learning approach used in class was still predominantly lecture-based, and the questions tended to be direct and procedural. Teachers also stated that students were rarely trained to work on problems that required strategies and in-depth reasoning. Student

interviews revealed that most students reported difficulty understanding the questions due to their unfamiliarity with open-ended or contextual question formats.

Discussion

The findings of this study indicate that students' mathematical problem-solving abilities generally fall within the moderate to low category. Only 8.8% of students categorized as very high, indicating a lack of higher-order thinking skills involving logical reasoning and complex solution strategies.

When analyzed by indicator, the understanding-the-problem stage had the highest achievement percentage (64.7%), while the reviewing-the-revisiting stage had the lowest achievement percentage (35%). The low percentage of the reviewing stage indicates a lack of metacognitive awareness among students, as Polya (1973) stated that successful problem-solving depends not only on planning and solving, but also on the ability to reflect on the results.

Interview results support the quantitative finding that dominant teaching methods, such as lectures and procedural questions, hinder the development of problem-solving skills. Students are accustomed to memorizing solution procedures, thus lacking the skills to design flexible strategies. This aligns with research from the NCTM (2000), which emphasized the importance of open-ended and contextual problem-solving exercises for developing problem-solving skills.

The difference in results between SDN 04 and SDN 12 indicates that the learning environment and intensity of practice play a significant role. Students who are exposed to a greater variety of questions and are accustomed to checking their answers demonstrate better achievement. Therefore, problem-based learning interventions or contextual approaches can be alternative strategies to improve achievement across all indicators.

Conclusions

Based on the research results, it can be concluded that the mathematical problem-solving abilities of fifth-grade students in Bengkulu City are classified as adequate to low. Only a small proportion of students have very high abilities. Students showed difficulties, especially at the stages of planning solutions and reviewing answers. Understanding the problem also remains a major obstacle for some students. Differences in ability levels between schools indicate the influence of internal and external learning factors, including the teacher's approach and student readiness to handle non-routine problems.

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Suggestion

1. For Teachers: It is recommended to implement a problem-based learning approach and provide contextual practice questions, encouraging students to complete the problem-solving stages.
2. For Schools: Professional training is needed for teachers to develop learning design skills that foster students' critical and creative thinking.
3. For Other Researchers: It is hoped that further research involving more schools and using a mixed methods approach can be conducted to further explore the factors influencing students' problem-solving abilities.

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