ANALYSIS OF STUDENTS' MATHEMATICAL LITERACY SKILLS IN SOLVING MATHEMATICAL PROBLEMS

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ABSTRACT

Mathematics is a subject taught at all levels of education. Proficiency in mathematics involves not only calculations but also logical and relevant thinking in everyday life, known as mathematical literacy. However, international surveys have shown that the mathematical literacy skills of students in Indonesia are still low. This research aims to analyze the mathematical literacy abilities of 9th-grade students at SMP Negeri 3 Tikala Satap in solving problems related to three-dimensional geometry.The research method used is a qualitative approach with a descriptive research type. The research subjects consist of two students selected based on test results, one with the highest score and one with the lowest score. Based on the research findings, the student with the highest score in the indicators of mathematical literacy abilities, such as formulating, interpreting, applying, and evaluating, performed well. In contrast, the student with the lowest score had very limited mathematical literacy skills based on the same indicators.In conclusion, the mathematical literacy skills of students in this study are still relatively low because they struggle to apply mathematical concepts to solve problems.

Keywords: Literacy; Mathematical Literacy

1. INTRODUCTION

Literacy is an individual's ability to understand, use, and communicate mathematical information. Mathematical literacy encompasses an understanding of mathematical concepts, the ability to solve mathematical problems, and the skills to apply mathematical knowledge in everyday life.The OECD (Organization for Economic Cooperation and Development) coordinated a survey of 15-year-old students' mathematical literacy skills as part of the PISA (Programme for International Student Assessment) in 2018. The test revealed that students' mathematical literacy skills in Indonesia were significantly below the international average. Indonesia ranked 73rd out of 79 countries (OECD, 2019; Putra & Vebrian, 2019). Similarly, results from TIMSS (Trends in International Mathematics and Science Study) placed Indonesian students at 45th out of 50 countries (Leksmono et al., 2019). Given these facts, students' mathematical literacy skills are still very low and need improvement.Mathematical literacy skills are crucial to cope with the advancing field of education. Students are expected to use their knowledge effectively to become more intelligent and critical individuals in receiving and processing information (Suryapuspitarini et al., 2018). To assess students' mathematical literacy skills, the use of mathematical problems is necessary as a tool to measure the extent of their mathematical literacy abilities. Mathematical problems in mathematics education are used to test students' understanding of mathematical concepts, logical thinking skills, and mathematical literacy abilities (Djidu et al., 2016). Mathematical problems can involve various types of calculations, mathematical modeling, problem-solving, data analysis, and the application of mathematics in everyday life contexts.In evaluating students' mathematical literacy skills, various types of problems can be applied. One of the topics that can be used to assess students' abilities is related to solid geometry. Problems related to this topic can be designed to explore students' understanding of three-dimensional geometry concepts, their ability to formulate, interpret, and interpret visual information, as well as their ability to apply formulas and think critically in various mathematical contexts.

2. METHOD

Descriptive qualitative is the type of research method used in this study. The research subjects consisted of 24 ninth-grade students from SMP Negeri 3 Tikala Satap. The selection of research subjects was based on the test results prepared by the researcher, with two students chosen, one with the highest score and one with the lowest score.Data collection techniques included written tests and interviews. Written tests were used to assess the students' written mathematical literacy abilities, while interviews were conducted to gather in-depth information about the students' mathematical literacy skills. Three test questions related to solid geometry were used in the written test. These questions were designed to meet the criteria for mathematical literacy indicators and were validated by the research advisor and mathematics teachers at the school. The written test was administered to all students to select the research subjects. Interviews were conducted with the two selected subjects, each consisting of one subject with high mathematical literacy skills and one with low skills. After the students completed the test, an analysis of the results was conducted based on the mathematical literacy indicators.Analysing the data in this research involves three stages: data reduction, data presentation, and drawing conclusions or verification. Data reduction is carried out by referring to the results of written tests and interviews, focusing on the indicators of students' mathematical literacy abilities, with the aim of simplifying the selection of relevant data. Data presentation from the written tests and interviews is based on the indicators of students' literacy skills, aiming to facilitate the understanding of the presented data. Finally, conclusions are drawn regarding the students' mathematical literacy skills in solving mathematical problems related to solid geometry.

3. RESULTS AND DISCUSSION

The research findings provide insights into students' mathematical literacy abilities in solving mathematical problems. Based on the test results administered to 24 students with three items, two students, DM and FAP, were selected as subjects for this study, with scores of 68.56 and 37.56, respectively. Data analysis was conducted for both subjects based on their answer sheets and interview results.

a. High-Scoring Student

1. For question number 1, in the "formulating" indicator, Subject 1 was able to write down and explain what they knew and what was asked in the question during the interview. Subject 1 could identify and interpret that the distance from one corner of the box to the adjacent corner was also referred to as the length of a side. Additionally, Subject 1 applied their knowledge to solve the problem. They successfully applied mathematical operations and calculations to obtain the correct answer.
2. In question number 2, Subject 1 was able to formulate what they knew and what was asked in the question, write it down in the answer sheet, and explain it during the interview. Subject 1 was also able to interpret the shape of the aquarium, which was a rectangular prism with dimensions of 85 cm, 60 cm, and 45 cm. Furthermore, Subject 1 could formulate the correct formula to solve the problem and applied mathematical operations effectively to obtain the correct answer.
3. For question number 3, Subject 1 struggled and was unable to solve the problem as a whole. They were only able to formulate and interpret. Subject 1 could formulate what was known from the question, such as the surface area of the gift box being 2,834 cm², and interpret the shape of the gift box if it were a cube. However, Subject 1 couldn't apply and explain during the interview. They couldn't estimate and determine the next steps to find the answer. The student faced difficulty in finding the length of a side when the surface area was known.

Subject 1 was unable to apply their reasoning skills and mathematical concepts to solve the problem.

4. One of the reasons for the student's inability to solve mathematical literacy problems was a lack of understanding of mathematical concepts, particularly in the application and problem-solving stages.

Based on the data above, it can be observed that the high-scoring student was proficient in the first two indicators of mathematical literacy in questions 1 and 2. However, in question 3, the high-scoring student struggled with the "applying" indicator due to the inability to apply mathematical concepts effectively.

b. Low-Scoring Student

1. For question number 1, Student 2 (S2) was proficient in the "formulating" and "interpreting" indicators. S2 could explain what was known and asked in the question, and during the interpretation stage, S2 could interpret that the distance from one corner to the adjacent corner was referred to as the length of a side, as shown in the diagram. However, when it came to the "applying" indicator, S2 was unable to apply the knowledge effectively. This was due to S2's lack of understanding of basic mathematical operations, particularly multiplication.

2. In question number 2, S2 was only proficient in the "formulating" and "interpreting" indicators. S2 wrote down what was known and asked in the question on the answer sheet and confirmed it during the interview. S2 could also determine the appropriate formula to solve the problem during the interpretation phase. However, when it came to the "applying" indicator, S2 faced challenges in applying basic mathematical operations, particularly multiplication.

3. For question number 3, based on the answer sheet and the interview, S2 was only proficient in the "formulating" and "interpreting" indicators and could formulate the correct formula to solve the problem. S2 was unable to solve the problem because they couldn't determine the volume of a cube when the surface area was known. S2 struggled with applying reasoning and mathematical concepts to solve the problem.

Based on the data above, it can be observed that the low-scoring student was significantly lacking in the "applying" indicator. S2 faced difficulties in applying basic mathematical operations, especially multiplication, and couldn't effectively apply mathematical concepts to solve the problems.

To ensure the validity of the data in this study, a triangulation of time was used to assess whether students' responses and interviews were consistent. After conducting a follow-up study two weeks later, it was found that the students' responses in both the initial and follow-up tests remained consistent. Students still faced challenges in the "applying" and "evaluating" indicators for all three questions, primarily due to difficulties in applying basic mathematical operations and concepts.

4. CONCLUSION

The mathematical literacy abilities of students in solving mathematical problems still face several obstacles. Especially in aspects of mathematical literacy skills, such as formulating, interpreting, applying, and evaluating, there is a tendency for insufficient application and evaluation. The results of this study also indicate that further efforts are needed in developing students' mathematical literacy skills, with a specific focus on aspects like interpreting, applying, and evaluating. This will serve as a foundation for the development of more effective curriculum and teaching strategies to enhance students' mathematical literacy in the future. In summary, there is a need to improve mathematics education to help students overcome obstacles in their mathematical literacy skills.

5. REFERENCES

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