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ANALYSIS OF THE PROBLEM SOLVING METHOD ABILITY IN THE SUBJECT OF PLANE GEOMETRY FOR 6TH GRADE ELEMENTARY SCHOOL

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Abstract

This study aims to comprehend the challenges encountered by sixth-grade students while solving word problems related to flat geometric shapes using critical thinking strategies. The critical thinking technique, as formulated by Polya, encompasses four phases: 1) Understanding the problem, 2) Devising a problem-solving strategy, 3) Executing the plan, and 4) Verifying the results. The research is based on data collected from both teachers and sixth-grade students. The study utilizes direct interactions, documentation, and perceptions, with educators conducting interviews. The research results aim to assess the problem-solving proficiency of sixth-grade students using flat geometric shapes. The findings reveal diverse difficulties, including issues in problem identification, discerning causal factors, and applying concerted effort. Engaging with story-based material measurements also poses challenges; for instance, students struggle with question comprehension, calculations, and drawing conclusions. The reasons behind these challenges include students' learning tendencies, subject mastery, and instructional support factors. Communicating the encountered challenges, employing effective communication to construct story problems, regular practice, expanding problem-solving knowledge, adopting responsive and contextual learning approaches, providing personalized guidance, offering motivation and rewards, and utilizing instructional media represent the array of methods instructors should employ.

Keywords: *Critical Thinking Strategies, Flat Shape Materials, Problem Solving Skills*

1. INTRODUCTION

In elementary schools, the mathematics curriculum goes beyond merely improving students' arithmetic skills; it also aims to enhance their problem-solving abilities and numeracy skills in various mathematical contexts (Lidinillah, 2008). Mathematics, especially at the elementary school level, is often feared and disliked by students. This issue can be attributed to several factors, including difficulties in comprehending certain topics discussed in math class (Unaenah, 2017). Therefore, there is a need for analytical research to identify factors contributing to elementary school students' struggles, one of which is the topic of Flat Shape Materials.

Problem-based questions related to everyday life require critical thinking and understanding to master flat shapes, thus enhancing rational thinking skills (Bernard et al., 2018). Fundamentally, the concept of geometric shapes tends to be more accessible to students compared to other topics. Nonetheless, many students lack a comprehensive understanding of flat shapes, resulting in difficulties in solving problem-based questions provided by teachers. This challenge highlights the necessity for students to possess

mathematical conceptual understanding and problem-solving skills (Robiyanto, 2021) to critically think in mathematics at the elementary school level, predominantly implemented through word problems.

The ability to solve problems is crucial for students, as it signifies the extent to which learning objectives are achieved (Unaenah, Ismawati, et al., 2020). Given that individuals frequently face difficulties in life, problem-solving skills are regularly employed. Although problem-solving is a common endeavor, not all problems can be resolved, particularly among students focusing on classroom activities and assessments.

The problem-solving learning model emphasizes activities that foster problem-solving skills to enhance students' logical reasoning and deeper understanding. It serves as an approach to boost critical thinking skills. According to (Hamdani, 2011), the critical thinking strategy is an illustrative introduction approach that empowers students to identify and address problems to achieve educational goals. The benefits of the critical thinking learning model include restricting students' imaginative thinking and actions, formulating rational solutions to problems, and expanding their critical thinking abilities.

In the context of learning mathematics, the problem-solving approach should not be passively accepted; ideally, challenging teaching strategies should be transformed (Unaenah, Maula, et al., 2020). This learning approach can be influenced by significant changes in the Teaching and Learning Activities (KBM) process. Implementing the problem-solving approach is often challenging to identify as a teaching strategy (Unaenah, Ardelia, et al., 2020). Therefore, teacher involvement is essential to ensure the effective application of problem-based learning models in the classroom. "Level Shape" is an example of a critical thinking strategy employed in mathematics education.

Based on the aforementioned overview, the researcher is interested in conducting an in-depth exploration of "Exploring the Capacity of Critical Thinking Strategies in Flat Shape Material for Class VI Elementary School Students." The researcher observed sixth-grade students through interviews, documentation, and direct observations. Consequently, it was discovered that several students encountered difficulties in solving problem-based questions related to flat shape materials in the fourth-grade class.

2. RESEARCH METHODS

The research in this study adopts an engaging examination technique combined with a subjective approach to methodology. The subjective approach is rooted in observing and describing reality or distinct aspects using verbal descriptions and expressions. The participants for this research consist of three sixth-grade students from an elementary school in Tangerang City and a sixth-grade teacher from another selected school within the same city. An expert-reviewed article serves as a response document to test outcomes administered by researchers to alternate participants, focusing on the subject of flat shapes and applying critical thinking methods.

To collect comprehensive data, a mix of methods was utilized, encompassing interviews, assessments, perceptions, and documentation procedures. The assessment strategy involves structured tests used as explanatory tools, while dialogue sessions took place with both sixth-grade students and teachers. The perception technique was employed to evaluate the students' feedback regarding flat shape concepts, and documentation was employed to capture queries and students' written responses. Given the nuanced nature of the study, it was conducted within a specialized environment.

Furthermore, problem-solving assessment sheets were employed to gauge the proficiency of students in effectively addressing challenges. These assessments were conducted in line with detailed guidelines and complemented by perceptions, documentation, and further interactions with the participants. This comprehensive research methodology was chosen to offer an in-depth understanding of the obstacles and factors influencing students' abilities to solve problems related to flat shapes. It aims to provide valuable insights for educational practices and instructional strategies.

3. RESULTS AND DISCUSSION

The results of the analysis regarding students' proficiency levels in solving problems and the difficulties experienced in questions related to anecdotes about flat shapes can be observed. Meanwhile, the dialogue pertains to flat shapes and thinking abilities, employing critical thinking techniques. Based on the posed questions, as presented below, the analysis results regarding the resolution of plane geometry problems are outlined.

1) Question No. 1

"Calculate the number of unused cardboard pieces if Rina possesses cardboard pieces measuring 75x75 cm. Rina requires 26 circles with the same diameter size of 8 cm each."

This question serves as an indicator of students' ability to solve problems involving the area of circles and squares. Students need to ascertain the length of the base side to determine the area exceeding that which is stated in the solution.

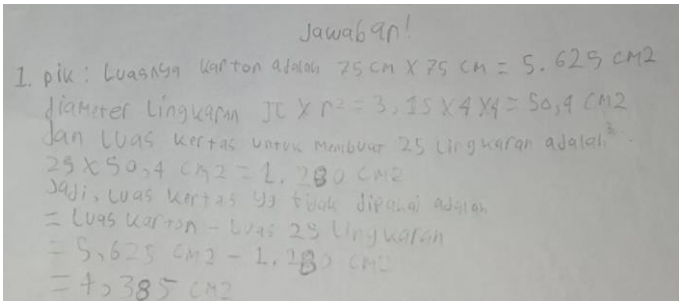

Figure 1. Student F's response to question No. 1

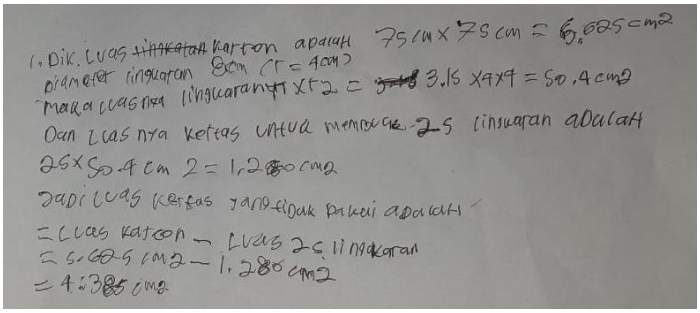

Figure 2. Student A's response to question No. 1

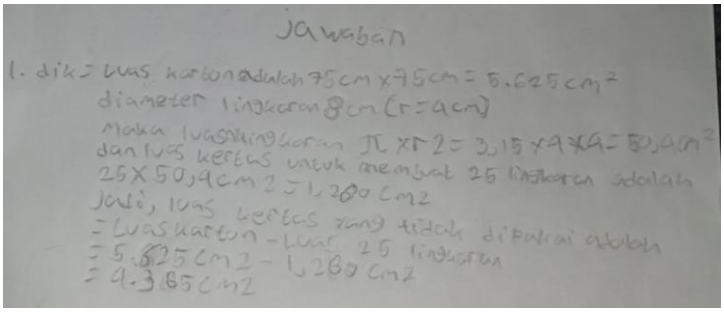

Figure 3. Student R's response to question No. 1

Observing the response of the third student in solving question number 1, data indicates that 2 students provided answers, namely students F and A. However, all students were able to comprehend what was known and answer the question. It can be inferred that there are several students who lack a clear idea of the equation to determine the size of the circle's circumference and do not understand its application. The evidence lies in the incorrect answers provided by some students. Errors occurred due to the incorrect formulation of the circle's formula. This is further supported by several interviews stating that they were unaware that the circle's diameter needed to be determined in this investigation, they did not know how to calculate it, and found it challenging to work on. The following is an illustration of students' answers with mistakes, revealing their lack of awareness regarding the equation to find the circle's diameter and its application, demonstrated by students F and A.

2) Question No. 2

"Calculate the number of areas in Mr. Wawan's garden that are not used to build a fish pond, if a rectangular garden measures 8 x 6 m. Another pond is created in the form of a square with a size of 4m."

For question number 2, it involves inquiry that encompasses students' knowledge in calculating the area of a rectangular pond and the additional area of a square shape. Additionally, it involves identifying the area of the nursery that is not used as a fish pond. In solving this word problem, students must understand how to measure the areas of squares and rectangles.

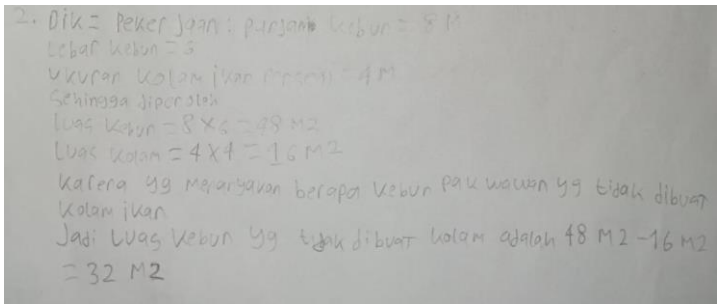

Figure 4. Student F's response to question No. 2

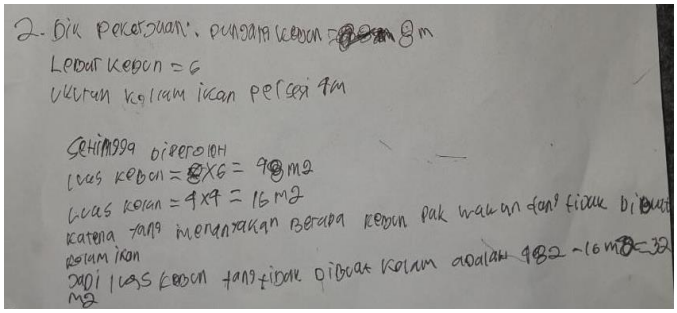

Figure 5. Student A's response to question No. 2

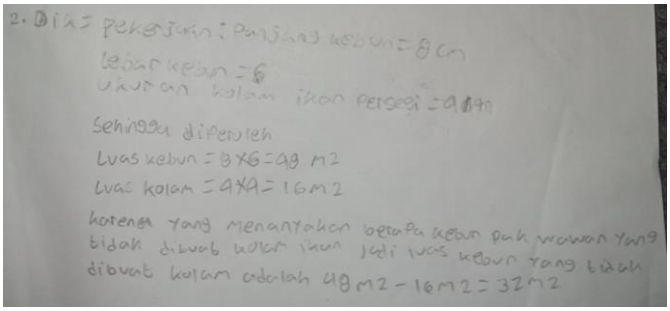

Figure 6. Student R's response to question No. 2

This can be seen from the analysis of the answers given by the three students to question number 2 that they worked on. Their answers are correct and follow the procedures. This demonstrates that the abilities of these three students lie in identifying the related problems, addressing the given questions, outlining the approach to solving the problem, and explaining the calculations applied to solve the question. The approach of first calculating the area of the rectangle before the square is an appropriate method chosen by the students to solve the problem. Subsequently, in determining the area of the garden not used as a pond, the students will calculate the subtraction of the pond's area from the garden's total area. As a result, all three students answered question number 2 accurately.

3) Question No. 3

"Calculate the price of a piece of land, if a plot of land measures 24m in length and 15m in width, and is sold at a price of Rp 150,000 per square meter!"

This question will demonstrate the students' ability to solve a real estate price problem using the formula for the area of a rectangle.

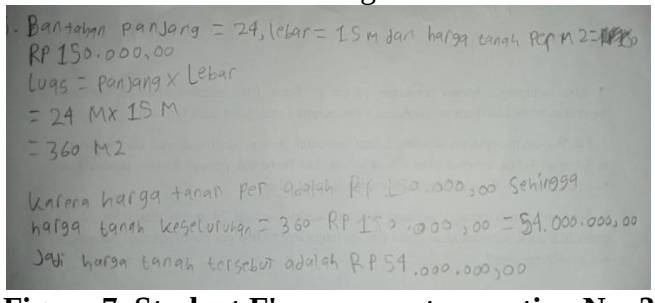

Figure 7. Student F's response to question No. 3

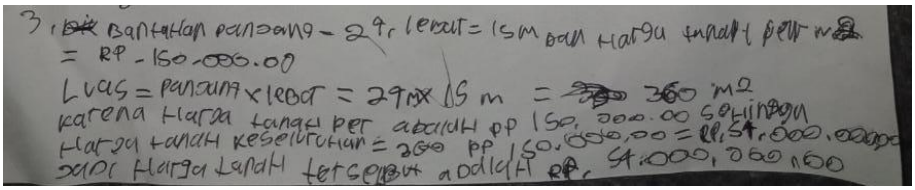

Figure 8. Student A's response to question No. 3

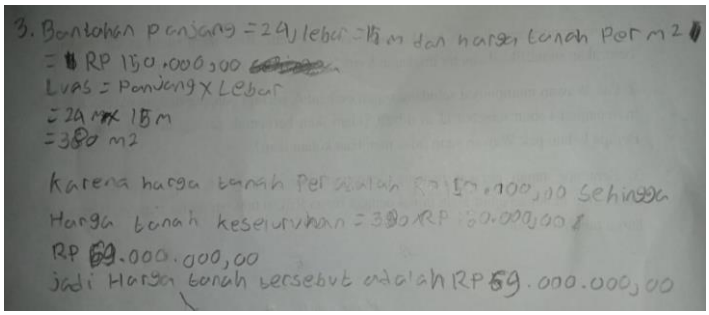

Figure 9. Student R's response to question No. 3

Based on the examination of the responses from the three students above, it becomes evident that two of them, specifically students F and A, have successfully grasped the underlying formula and proficiently applied the relevant equations. This observation highlights their adeptness in tackling problems by utilizing the appropriate mathematical techniques. Notably, the given question serves as a platform to showcase the students' prowess in resolving a land valuation issue through the application of the rectangle's area formula. While some students have accurately harnessed this method, there are others who still struggle to fully comprehend and implement it correctly.

Interestingly, it is important to acknowledge that a portion of the student cohort encounters challenges when endeavoring to execute the formula accurately, indicating a potential gap in their understanding. Furthermore, this analysis underscores that the acquisition of mathematical concepts significantly influences the students' problem-solving capabilities. Notably, questions 1 and 3 stand out as mathematically more intricate in comparison to question 2, within the context of these three specific subjects. The intricate nature of these questions arises from the fact that they require a deeper understanding of the formula and its application, thereby contributing to their perceived complexity.

An intriguing aspect to consider is the variability in students' familiarity with mathematical formulae and their corresponding applications. It is evident that students who lack a firm grasp of these mathematical foundations find themselves grappling with questions of higher complexity. This divergence in proficiency becomes particularly evident in their responses to questions 1 and 3, which involve intricate calculations and conceptual comprehension.

In conclusion, this analysis offers insights into the intricate interplay between students' understanding of mathematical concepts, their application of relevant formulae, and their problem-solving abilities. The disparities observed among the three questions reflect the diverse levels of mastery among the students, emphasizing the need for targeted support and effective teaching strategies to bridge the gap and enhance overall comprehension and problem-solving skills.

4. CONCLUSION

In light of the research findings presented in the analysis of sixth-grade students' difficulties, the research findings reveal significant challenges faced by sixth-grade students in solving geometric shape-related problems. The study encompassed the entire problem-solving process, exposing difficulties at every stage. Students struggled with abstract concepts, struggled to apply formulas, and hesitated to seek teacher guidance. This indicates a need for improved teaching approaches to enhance students' mathematical comprehension and problem-solving skills.

Addressing these challenges requires fostering a deeper understanding of abstract concepts and creating a supportive learning environment. Educators play a vital role in encouraging student engagement, clarifying concepts, and building confidence in tackling geometric shape problems. By promoting open communication and tailored support, educators can empower students to overcome difficulties and develop the critical skills needed for successful problem-solving in mathematics.

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