

ANALYSIS OF MATHEMATICAL PROBLEM SOLVING ABILITY OF XI CLASS VOCATIONAL STUDENTS ON COMPOSITION FUNCTION MATERIAL

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ABSTRACT

This study aims to find out how well vocational students solve mathematical problems based on the composition function material. Mathematical problem solving ability is an ability that must be mastered by students because this ability is the core of mathematics. The location of this research is at SMK TI Garuda Nusantara and the main object of research is class XI students totaling 32 people in one class. The author used a descriptive qualitative approach. Several test questions were used as data collection methods. of 32 students in one class. It can be said that only 9 people were able to complete the test questions and get a good rating on each indicator. The results show that the problem solving ability of students in class XI of SMK TI Garuda Nusantara is classified as sufficient or moderate. This is very clear from the fact that only 28% of students who achieved perfect scores in the good category. 56% were rated medium, and 16% were rated low. The acquisition of the highest indicator value is in problem solving ability, while the lowest indicator is in the indicator of understanding the problem, this is due to the lack of understanding of basic mathematical concepts in students. In order for students' problem-solving skills to improve, researchers suggest that further research should use learning models or media that can help students understand mathematical concepts.

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INTRODUCTION

Education is a factor that influences learners to make people responsible for education. The nature of education is a conscious and deliberate action and responsibility carried out to students by teachers so that there is interaction between me and students to achieve educational goals that are aspired to and take place continuously Arista, (2018).

At this time in every school or college, Indonesia applies the 2013 curriculum to the learning process. In line with that, according to Fussalam, (2018) curriculum development is oriented

to improve and balance by improving and adjusting the mentality, information and abilities of students.

Mathematics is one of the subjects that has an important role in life. Mathematics is a science that has many benefits in various classroom settings so that students apply it in their daily lives. Mathematics makes a general cognitive horizon because it can be used in every discipline. Not only that, learning mathematics is important to be used in everyday life. This opinion is said by Ismaniar, (2015). Mathematics is a compulsory science from elementary school to high school. Mathematics is delivered to students by utilizing concepts or ideas that can make it easier for students to understand. When studying mathematics a number of skills must be mastered, including the ability to solve problems.

Problem solving ability is an important skill when doing problem solving. Especially when studying math. Wardani & Yuniarta, (2017) state that learning mathematics involves practicing using the knowledge and skills needed to solve problems. This is why problem solving is an important part of the subject. When students learn mathematics at school, teachers emphasize the importance of non-typical problem solving. It is part of the curriculum and the goals that students must achieve to learn mathematics. According to Diniyah, (2018) in mathematics, problem solving skills must be possessed by students to solve and complete problem-based problems. Problem solving is an activity that prioritizes the mechanisms, steps, and tactics that learners take when solving problems in mathematics lessons

Mathematical problem solving skills are very important to learn by students. The importance of mathematical problem solving is emphasized in (NCTM 2000: 52) which suggests that problem solving is an integral part of mathematics learning, so that between problem solving and mathematical of mathematics learning, so that between problem solving and learning cannot be separated. The importance of having this ability reflected in the explanation (Hendriana and Soemarmo, 2014) that math problem solving is the most important part of learning. Math problem solving is the most important part of learning mathematics, even the steps involved in problem solving are a core part of mathematics. are a core part of mathematics. According to Effendi (Septiani and Nurhayati, 2019: 169) problem solving skills must be possessed by students to prepare them to be accustomed to managing different problems, both problems in mathematics, problems in different fields of study and problems in everyday life that are increasingly complicated. problems in everyday life that are increasingly complicated.

In line with that, according to Putri, (2018) problem solving can be intended by using lay interpretation. It is problem solving that is the goal. Problem solving becomes a process and problem solving becomes the basic skills of students. The composition function and inverse function are compulsory math materials that have been taught in grade X with basic competencies. Explain the construction and operation of the inverse function and its properties then find the value or result. Composition and inverse function material is very useful in everyday life, and requires accuracy in formulating procedures to formulate strategies and patterns to solve problems. This material was chosen because it has a major role in the discussion of mathematics. In line with Martin & Kadarisma, (2020) and Ramadhani & Hakim, (2021) emphasized that function material is the main role related to mathematics between one and the other and students are felt to be able to solve problems.

The research to be carried out is in line with the research written by Ramadhani & Hakim, (2021), namely examining mathematical problem solving ability. However, there is a comparison in the research to be carried out with previous research. As in the research location, research subject, and implementation time. So that the results obtained are also

different. In this study, the authors used Polya's steps. While in previous studies using Problem Solving.

METHOD

This research uses descriptive qualitative research methods. Descriptive qualitative research method is research that examines the formulation of the problem by exploring and seeing the point of view of the portrait of the social situation as a whole, open, and thoroughly tested. The author uses this method because he wants to describe the situation observed in the field. Namely by examining more specifically and in depth to the object of research. In this study, the authors have taken a sample from one of the illustration rooms, namely students with senior high school level class xi with a total of 32 people.

RESULTS AND DISCUSSION

Results

Problem solving in students' ability to mathematical problems is assessed from the test results. The reference used to evaluate each indicator is modified from Samo, (2017). The following are instructions for scoring each indicator item:

Table 1. Indicator Scoring Instructions

No	Indicator	Categories	Description
1	Understanding the Problem	Good	Able to fully understand the problem and clarify the information found and questions made.
		Medium	Misunderstanding some of the problems.
		Less	Less overall understanding of the problem.
2	Determination of Strategy	Good	suitable planning of the problem presented.
		Medium	Planning that can be used to solve problems but the results tend to be accurate.
		Less	Can't make a plan to solve the problem.
3	Resolving the Problem	Good	All questions can be solved with the correct answer.
		Medium	Only part of the problem can be solved with the right answer.
		Less	All problems cannot be solved
4	Rechecking Results	Good	Checking the process and results that have been completed
		Medium	Checking the process and results that have been completed
		Less	Not checking

Based on the table above, the conclusion of the stages of indicators in mathematical problem solving in students when solving the problems presented is categorized into 3 assessments. Among them; good, moderate, and less. With the aim of making it easier for the author to draw a conclusion on research data processing. The problems given by the author when conducting research, which amounted to 5 problems. Problems are tested on students and produce a percentage of data that refers to the guidelines for assessing indicators of level ability in solving problems, namely as follows:

Table 2. Percentage Value of Each Indicator

No	Indicator	Assessment Category		
		Good	Medium	Less
1	Understanding the Problem	16%	40%	44%
2	Determine Strategy	28%	40%	32%
3	Problem Resolution	56%	32%	12%
4	Rechecking Results	23%	30%	47%

In the table above is the result of the percentage classification of the results of the assessment of each test conducted to students. This is done to test the level of ability of students in problem solving. It can be seen that the level of ability of students on mathematical problem solving indicators in the problem solving stage differs at the highest value, namely 56%. From the results of the percentage data above, the lowest value is found in the indicator of understanding the problem with only 16%. As for some sample pictures of students when solving the test questions given.

Find the function $g(x) = x - 2$ and the function $h(x) = x^2 + 3x - 4$. Find $(h \circ g)(x)$.

$$\begin{aligned}
 g(x) &= x - 2 \\
 h(x) &= x^2 + 3x - 4 \\
 (h \circ g)(x) &= h(g(x)) \\
 &= x^2(x - 2) + 3x - 4 \\
 &= x^2 - 2x^2 + 3x - 4 \\
 &= x^2 - 5x^2 - 4
 \end{aligned}$$

Figure 1. Work of students in the less category

In the first sample, it can be said that students are less able to solve mathematical problems. It is evidenced in the picture above that students appear confused in understanding the problem and determining the solution strategy. This is caused by mistakes in problem solving and the results of the answers to the test questions given.

$$\begin{array}{l}
 f(x) = 3x + 1 \\
 g(x) = 4x - 1 \\
 \text{tentukan !} \\
 a. (f \circ g)(x) \\
 b. (g \circ f)(x)
 \end{array}
 \quad
 \begin{array}{ll}
 \textcircled{a} (f \circ g)(x) & \textcircled{b} (g \circ f)(x) \\
 3(4x - 1) + 1 & 4(3x + 1) - 1 \\
 12x - 3 + 1 & 12x + 4 - 1 \\
 12x - 2 & 12x + 3 \\
 12x - 2 = y & 12x + 3 = y \\
 12x = y + 2 & 12x = y - 3 \\
 x = \frac{y + 2}{12} & x = \frac{y - 3}{12}
 \end{array}$$

Figure 2. Work of Students in the Fair Category

The figure above shows that students are able to complete in solving mathematical problems, understanding the problem, including determining problem solving strategies. But when compared to the next sample, there are only a few shortcomings. Namely the interpretation of results or in checking answers.

Diketahui fungsi f dan g dinyatakan oleh $f(x) = 3x + 1$ dan $g(x) = 4x - 1$ tentukan

a. $(f \circ g)^{-1}$
 b. $(g \circ f)^{-1}$

Jawab:

a. $(f \circ g)(x) = f(4x - 1)$
 $= 3(4x - 1) + 1$
 $= 12x - 3 + 1$
 $= 12x - 2$
 $(f \circ g)^{-1}(x) = \frac{x + 2}{12}$

b. $(g \circ f)(x) = g(3x + 1)$
 $= 4(3x + 1) - 1$
 $= 12x + 4 - 1$
 $= 12x + 3$
 $(g \circ f)^{-1}(x) = \frac{x - 3}{12}$

Figure 3: Good category of students' work

In contrast to the previous results, the figure above shows the level of students' ability to solve mathematical problems is included in the good category. These students are able to understand the overall problem in the test questions given.

Table 3. Percentage of Overall Assessment

NO	Interval	Category	Many students	Persentase
1	80 - 100	Good	9	28%
2	50 - 79	Medium	18	56%
3	25 - 49	Less	5	16%
4	0 - 24	Very Less	0	0%

In the table above, the author can categorize the results of the test of the question instrument that has been given to students. With function material based on reference to the assessment guidelines for indicators of students' abilities in mathematical problem solving from 32 students in one class. It can be said that only 9 people were able to complete the test questions and get a good assessment on each indicator.

Discussions

In this study, the authors used a descriptive qualitative method. In order to make it easier for the author when giving an assessment to students who are the object of research. The indicators chosen as a reference are (1) understanding the problem, (2) determining the strategy, (3) solving the problem, and (4) checking the results. In the first indicator, students are expected to understand the problem or be able to know the problems given. However, students' ability to understand problems is categorized as low. This is due to students' lack of understanding of the basic material so that they are less careful in the process. In line with (Wulandari & Fitrianna, 2017) in his research, emphasizing the low ability of students to

understand a problem is caused by not understanding the test questions, difficulty in understanding concepts, and mathematical ideas.

According to Yuwono, (2018) solving mathematical problems requires students to first master the conception or module capabilities carried out by students in order to familiarize themselves with the material presented. Similarly, the opinion of Indahsari & Fitrianna, (2019) confirms that students in their ability level are categorized as still low. For example, the lack of understanding of concepts that still occurs in students.

In the first sample, students can be said to still lack understanding of the concepts of the basic material. Evidenced by indicators that are not in line with expectations. Learners are less careful in choosing strategies or ways of working on problems to solve problems. In line with Fauzi's opinion, (2018) he argues, the difficulties that can be said to be interconnected with mathematical problem solving skills are mainly in the marker of recognizing problems and using problem-solving strategies. This results in the low ability of students in the indicators and causes high errors in working on the test questions given. In connection with this problem Windari, (2014) said that the lack of accuracy of students in solving problems causes the indicator of checking learning outcomes to be the lowest indicator.

In the second sample, students can be said to be sufficient or moderate because these students are quite capable of understanding the problems given. Thus, the level of ability of students increases in carrying out problem solving strategies and applying them. As revealed by Kurniawan, (2020) the steps taken towards solving problems include identifying elements that are found and made, and elements that are selected as needed. Select and carry out the steps in the planned problem solving procedure. In the category of moderate problem solving ability level, there is an increase in students in the ability to solve the problems given quite well. However, these students seem to miss one thing, namely checking the results that have been done. As explained by Sulistiyorini & Setyaningsih, (2016) when students have difficulty managing time and are slow to check answers. They cannot recheck their answers and do not know how to do it well.

The author's final sample, namely from the object of research that is considered good at understanding problems, determining strategies, solving problems, and reviewing the results of comparisons of the work on problems that have been done on test questions by students, is very good with the work on problems of students whose level of value is not good or moderate. It can be proven from the answers that students show. In the last sample, students can understand the problems presented by formulating mathematical ideas to recheck the results, then get perfect and satisfying scores. As said by Kurniawan (2020) who said that students with advanced problem solving categories are able to solve problems in problems with very good steps. Namely the identification of the suitability of the selected elements

From the indicator-specific evaluation of the test data submitted to students, in conclusion, the level of students' ability to solve mathematical problems at SMK TI Garuda Nusantara is not fully good or only sufficient. The lack of understanding of students in solving test questions on the test questions given is a factor in the low level of ability to solve mathematical problems

CONCLUSION

Based on what has been presented in the content and discussion, it can be concluded that the ability of class XI students of SMK TI Garuda Nusantara in solving math problems on composition & inverse function material is classified as sufficient or moderate. the indicator with the lowest score is in understanding the problem, this is due to a lack of understanding of the concepts of the basic material. In this study, researchers analyzed students' problem

solving skills on mathematical exercise questions related to composition function material. It is hoped that future researchers can analyze students' problem solving skills can be applied and analyzed based on the learning media application model so that students can understand the basic concepts thoroughly in order to increase the value of these indicators and improve students' problem solving skills.

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