



Mathematical Problem Solving Ability of Junior High School Students on Straight Line Equations

Dhita Rosalina Putri¹, Nita Hidayati²

University of Singaperbangsa Karawang

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Abstract

The purpose of this study was to describe students' mathematical problem solving abilities in the material of straight line equations. This research was conducted using a qualitative approach with descriptive method to 34 students of class IX-H at one of the junior high schools in Karawang. This study used descriptive tests and debriefing for data collection. The description test used contains 4 questions regarding the ability to solve mathematical problems in the material of straight line equations. After conducting the research, it was concluded that the students' mathematical problem solving abilities, especially in the material of straight line equations, were classified as low, because there were 27 students who had poor problem solving skills. This is because the students are unable to determine the sufficiency of the data in the image, convert existing data into a mathematical model and solve it, explain and interpret the results according to the initial problems and choose and apply strategies to solve problems.

✉Correspondence Address (author1):

University of Singaperbangsa Karawang

E-mail Author 1: 1910631050056@student.unsika.ac.id

Author 2: nita.hidayati@fkip.unsika.ac.id

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INTRODUCTION

Mathematics is known as a science that requires students to have numeracy skills. Even though in solving math problems, not only math skills are needed, but other abilities such as the ability to solve mathematical problems. This ability must be mastered to think by collecting, analyzing, planning, and determining how to solve problems.

Problem solving allows students to develop understanding and explain the process of finding solutions, rather than memorizing and applying a series of procedures (Klerlein, J. and Hervey, S., 2020). According to Copley, 2000 (in Klerlein, J. and Hervey, S., 2020), students learn to solve problems in mathematics mainly through doing, talking, pondering, discussing, observing, investigating, listening, and reasoning. From statement of Copley, 2000, it can be concluded that in solving problems solving problems must go through the following stages: (1) Presenting existing data briefly and clearly; (2) Make a work plan to solve the problem; (3) Solving problems according to the work plan; and (4) Re-checking the correctness of the settlement results.

But many students do not have the ability to solve mathematical problems. In research of Setyaningsih and Firmansyah, 2022, there are only two out of five students who can solve mathematical problems even though it is very low. The results of these tests were reinforced by the interviews conducted; students stated that they did not understand problems regarding problem solving because they were used to conventional teaching.

Ostika, Maidiyah and Ellianti, 2021 also mentioned that in his research there were 50% of the research subjects with less criteria and 18,25% of the subjects were very less creative in solving problem solving problems. This means that more than half of the research subjects had difficulty

solving problem solving questions. When the interview was conducted, students explained that they were still experiencing difficulties in solving problem solving questions.

The two studies confirmed that students' problem-solving abilities were low because they still had difficulty solving problem-solving questions. This can be caused because students are not used to solving problems in the form of problem solving.

Based on the explanation above, the researcher is interested in conducting research on students who have been taught how to solve problems in the form of problem solving. This research was conducted to be able to describe students' mathematical problem-solving abilities in solving mathematical problems with straight line equations as a research instrument, especially for junior high school students in Karawang.

METHOD

This research was conducted using a qualitative approach with descriptive methods to describe students' mathematical problem solving abilities on straight line equations. This research was conducted on 34 students of class IX-H at one of the junior high schools in Karawang as research subjects. This study applies the method of descriptive tests and interviews for data collection. The description test used contains 4 questions where each question contains indicators of problem solving abilities so that students can solve problems in detail.

RESULT AND DISCUSSION

The results of students' problem-solving abilities are grouped into 4 according to the Minimum Completeness Criteria (KKM) value of 75 in the mathematics subject that applies in the 2013 Curriculum

according to the Indonesian Ministry of Education and Culture (KEMENDIK-BUD), 2017. Based on data from the research that has been done, the following are the results of grouping student scores according to their mathematical problem-solving abilities.

Tabel 1. Results of Classification of Student Values

Value Intervals	Predicate	Information	Number of Students
93 – 100	A	Very Good	0
84 – 92	B	Good	4
75 – 83	C	Pretty Good	3
< 75	D	Not Good	27

It can be seen in Table 1 that 27 students have poor mathematical problem solving skills, so it can be concluded that the mathematical problem solving abilities of class IX-H students of one of the junior high schools in Karawang are low.

Number 1 with the indicator determines the adequacy of the data in the figure, as many as 28 people get a score of 4 and 6 people get a score of 3. The following is a discussion of some research samples.

1. Diketahui:
$Y = 150 \text{ cm}$
$X = 50 \text{ cm}$
$M = ? \quad M = \frac{Y}{X} \Rightarrow M = \frac{150}{50} = 3$

Figure 1. Subject with PSA Category Good

At number 1, the subject with good problem-solving skills gets a score of 4 because he writes down the known and asked data, calculates and answers the questions correctly. However, he did not answer questions regarding indicators as shown in Figure 1. During the interview, he thought that he did not need to answer these questions.

1. $M = \frac{Y}{X}$
$M = \frac{150}{50}$
$= 3$

Figure 2. Subject with PSA Category Not Good

For number 1, the subject with poor problem-solving skills gets a score of 3. Because he only counts and answers questions correctly. He did not write down the data that was known and asked and did not answer questions regarding indicators as shown in Figure 2. During the interview, he said that he already understood the problem so he wrote down the data that was known and asked.

Based on the discussion above, it can be said that students still have obstacles in determining the adequacy of the data in the images given. In line with the research conducted by Putra, Harry Dwi., dkk (2018) which has the conclusion that the ability of students is still low in identifying the adequacy of the data on the problem.

Number 2 with the indicator of changing existing data into a mathematical model and solving it, as many as 21 people got a score of 4, 9 people got a score of 3, 3 people got a score of 2 and 1 person got a score of 1. The following is a discussion of some research samples.

a.	$Y = Mx + C$
☐	$Y = 3 \times ?$
☐	$117 = 3 \times ?$
☐	$117 = 3 \times$
☐	$X = \frac{117}{3} = 39$
☐	3

Figure 3. Subject with PSA Category Good

At number 2, the subject with less problem-solving ability gets a score of 4 because he answers questions regarding indicators, calculates and answers questions correctly. However, he did not write down the known and asked data as shown in Figure 3. During the interview, he said that he already understood the problem so he wrote down the known and asked data.

The same thing was done by other subjects. However, there was a subject who made a mistake when calculating, as shown in Figure 4, so he got a score of 2 on question number 2. During the interview, he admitted that he was in a hurry when doing the calculations, so he made a mistake.

2.	$y = mx + c$
	$y = 3x + c$
	$x = ? \quad y = 117$
	$117 = 3x$
	$117 = 39 \times$
	3

Figure 4. Subject with PSA Category Not Good

Based on the discussion above, it can be said that students still have obstacles in converting existing data into mathematical models and then solving problems. In line with research conducted by Daud and Nurman (2017) that before being given action, students have low ability to make mathematical models, namely only 46.43%.

Number 3 with indicators explaining and interpreting the results according to the initial problem, as many as 6 people got a score of 4, 12 people got a score of 3, 2 people got a score of 2 and 14 people got a score of 1. The following is a discussion of some research samples.

3.	$m_2 = m_1$	$y = mx + c$
	$2x - 5y = 8$	$y = \frac{2}{5}x + c$
	$-5 = 8 - 2x$	$x = 7 \quad y = 2$
	$y = \frac{8-2x}{-5}$	$2 = \frac{2}{5} \cdot 7 + c$
	$y = \frac{8-2x}{-5}$	$2 - \frac{14}{5} = c$
		$c = \frac{10-14}{5}$
		$c = \frac{-4}{5} \rightarrow y = \frac{2}{5}x - \frac{4}{5}$

Figure 5. Subject with PSA Category Good

In number 3, the subject with good problem-solving skills received a score of 4 because he did not write down the data

that was known and asked as shown in Figure 5. During the interview, he said that he already understood the problem so he did not write it down. He calculates and answers questions correctly and answers questions regarding indicators by doing proofs as shown in Figure 6.

$2x - 5y = 8$	$y = \frac{2}{5}x - \frac{4}{5}$
$x \quad y \quad 6,5$	$x \quad y \quad 4,5$
$y = -1,2$	$y = -0,4$
$2x - 5 \cdot 1 = 8$	$1 = \frac{2}{5}x - \frac{4}{5}$
$2x - 5 = 8$	$1 + \frac{4}{5} = \frac{2}{5}x$
$2x = 8 + 5$	$\frac{5+4}{5} = \frac{2}{5}x$
$2x = 13$	$\frac{5+4}{5} = \frac{2}{5}x$
$x = \frac{13}{2} = 6,5$	$\frac{5+4}{5} = \frac{2}{5}x$
	$\frac{9}{5} = \frac{2}{5}x$
	$\frac{9}{5} : \frac{2}{5} = \frac{9}{5} \times \frac{5}{2} = \frac{9}{2} = 4,5$

Figure 6. Proof of Subject with PSA Category Good

Other subjects also did the same. However, not a few answered questions such as subjects with poor problem solving skills who did not answer questions regarding indicators, namely explaining and interpreting results according to the initial problems as shown in Figure 7 so that he received a score of 3. During the interview, he said that he did not remember how to place the coordinate points so that you answer correctly based on the question instructions as shown in Figure 8.

3)	$m_2 = m_1$	$y = mx + c$
	$2x - 5y = 8$	$y = 2x + c$
	$-5y = 8 - 2x$	
	$y = \frac{8-2x}{-5}$	$x:7 \quad y:2$
		$2 = \frac{2 \cdot 7 + c}{5}$
	$y = \frac{8-2x}{-5}$	$2 = \frac{14 + c}{5}$
	$m:2$	$c = 2 - \frac{14}{5}$
	$2x - 5y = 8$	$y = \frac{2}{5}x - \frac{4}{5}$
	$c = \frac{10-14}{5}$	$c = -\frac{4}{5}$
	$x:1 \quad y:6,5$	$x:1 \quad y:4,5$
	$y:1,2 \quad x:1$	$y:-0,1 \quad x:1$
		$c:-4 \rightarrow y = \frac{2}{5}x - \frac{4}{5}$

Figure 7. Subject with PSA Category Not Good

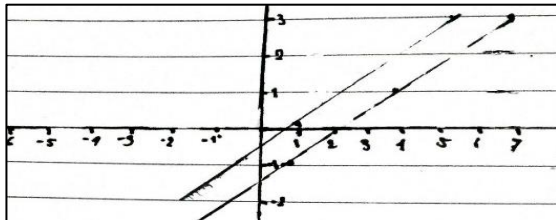


Figure 8. Proof of Subject with PSA Category Not Good

Based on the explanation above, it can be said that students still have obstacles in explaining and interpreting the results according to the initial problems. In line with research conducted by Siregar, Nur Fauziah (2019) that students have difficulty knowing the concept of statements and proving the truth mathematically which causes students to have difficulty doing mathematical proofs.

Number 4 with the indicator of choosing and implementing a strategy to solve the problem, as many as 13 people got a score of 5, 3 people got a score of 4, 3 people got a score of 3, 1 person got a score of 2, 3 people got a score of 1 and 11 people got a score of 0. The following is a discussion of some research samples.

4. $x_1 = 3$	$y_1 = 2$	$2y_1 = 3x_1 - 5$
$x_2 = 2 + 3 = 5$	$y_2 = 5$	$2y_2 = 3x_2 - 5$
$x_3 = 6$	$y_3 = ?$	$2y_3 = 3 \cdot 6 - 5$
$\frac{y_2 - y_1}{y_2 - y_1} = \frac{x_2 - x_1}{x_2 - x_1}$		$2y_3 = 18 - 5$
$\frac{5 - 2}{5 - 2} = \frac{x - 3}{5 - 3}$		$2y_3 = 13$
$\frac{3}{3} = \frac{x - 3}{2}$		$y_3 = \frac{13}{2}$
		$y_3 = 6,5$
$2x(y - 2) = 3(x - 3)$		
$2y - 4 = 3x - 9$		
$2y = 3x - 9 + 4$		
$2y = 3x - 5$		

Figure 9. Subject with PSA Category Good

At number 4, the subject with good problem solving skills gets a score of 5 because he writes down the data that is known and asked, answers questions regarding indicators, calculates and answers questions correctly as shown in Figure 9.

It's different with subjects with poor problem-solving skills who get a score of 3. He writes down the data that is known and asked about and answers questions regarding indicators. However, he calculated and answered the question incorrectly. During the interview, he explained that he was in a hurry when doing the calculations so he made a mistake.

4) $x: \text{waktu}$	$y: \text{ketinggian}$	$\frac{y_2 - y_1}{y_2 - y_1} = \frac{x_2 - x_1}{x_2 - x_1}$
$x_1 = 3$	$y_1 = 2$	$\frac{y_2 - y_1}{y_2 - y_1} = \frac{x_2 - x_1}{x_2 - x_1}$
$x_2 = 3 + 2 = 5$	$y_2 = 5$	$\frac{5 - 2}{5 - 2} = \frac{x - 3}{5 - 3}$
$x_3 = 6$	$y_3 = ?$	$\frac{5 - 2}{3} = \frac{x - 3}{2}$
		$2(5 - 2) = 3(x - 3)$
		$2y - 4 = 3x - 9$
		$2y = 3x - 9 + 4$
		$2y = 3x - 5$

Figure 10. Subject with PSA Category Not Good

Based on the explanation above, it can be said that students still have obstacles in choosing and implementing strategies to solve problems. In line with research conducted by Indriyani, Fitri., dkk (2018) that

students have problems in implementing problem strategies.

CONCLUSION

Based on the results of the research that was conducted on 34 students in class IX-H, one of the junior high schools in Karawang using essay tests and interviews, the students' mathematical problem solving abilities on straight line equations were low, because there were 27 students who had poor problem solving skills. This is because students are not able to determine the adequacy of the data in the image, change the existing data into a mathematical model and solve it, explain and interpret the results according to the initial problems and choose and apply strategies to solve the problem.

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