



Analysis of Students' Problem Solving Skills on the Material of Two-Variable Linear Equation System

Ratih Indriati; Kana Hidayati

Mathematics Education Department, Yogyakarta State University, Indonesia

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Abstract

This research aims to describe students' problem solving skills. This type of research is descriptive research with a qualitative approach. The subjects in this study were VIII grade students totaling 33 students. The process of taking subjects through purposive sampling technique. The data collection techniques used were tests, interviews, and documentation. Data analysis techniques using Miles and Huberman, namely data reduction, data display, and verification. Data validation with triangulation. The result of this study is the problem solving ability of students in grade VIII of one of the State Junior High Schools in Yogyakarta on the material of the system of linear equations of two variables is included in the low category. This can be seen from the number of students who have problem solving skills in the low category of more than 50%. Students who have problem solving skills in high qualifications are only 27%. Students who have moderate problem solving ability amounted to 9%. The remaining 64% have low problem solving skills.

Keywords: *Descriptive Research; Qualitative Approach; Problem Solving; System of Linear Equations in Two Variables; Junior High School*

Introduction

Mathematics is one of the most important subjects. One of the objectives of mathematics is to equip learners to solve problems that include the ability to understand problems, design mathematical models, solve models or interpret the solutions obtained (mathematical problem solving). Therefore, math is very important for learners to solve everyday problems (BSKAP, 2022).

The National Council of Teachers of Mathematics (NCTM) states that problem solving is an integrated part of mathematics learning, so it should not be a separate part of mathematics learning. The purpose of learning mathematics is to improve problem solving skills, reasoning and proof skills, communication skills, ability to make connections and representation skills (NCTM, 2000). Thus, problem solving ability is one of the indispensable abilities in learning mathematics and needs to be owned by students.

Problem solving is one of the most important learning skills that can be acquired in school and in life (Jonassen, 2011). One of the most fundamental goals of educational institutions is for individuals to

acquire problem-solving skills and prepare them for life (Güleç, 2020). Problem solving is an important skill that includes cognitive, metacognitive and motivational aspects (Mayer, 2001).

Problem solving skills in mathematics learning are very important for students to have. Problem solving skills are very important for students because it can equip them with the competencies needed for a knowledge-based economy (Kaur *et al.*, 2009). Just being proficient in mathematical procedures is not enough, students must also be able to apply their mathematical knowledge in unfamiliar situations and transfer their knowledge from one context to another. Problem solving ability is a competency that needs to be given to students in preparing a superior generation that is ready to compete in facing the challenges of the 21st century (Kurniawati *et al.*, 2019).

Problem solving has been a part of mathematics education in several countries around the world for decades (Törner *et al.*, 2007). Since 1992, mathematical problem solving has been a major goal of the school mathematics curriculum in Singapore (Kaur *et al.*, 2009). The National Council of Teachers of Mathematics in the United States in 1980 initiated that problem solving should be the main focus of mathematics schools (NCTM, 2000). In addition, international survey research institutions such as the Program for International Student Assessment (PISA) in 2015 also conducted a survey to see students' mathematical problem solving skills.

However, difficulties in solving math problems still occur in schools (Demitra & Sulisworo, 2018). Reality also shows that the mathematical problem solving skills of students in Indonesia are currently low (Gee *et al.*, 2017). Based on the results of the Trends International Mathematics Science Study (TIMSS) in 2015, it is known that Indonesia is ranked 45 out of 50 countries with 2% at a high level, and 0% at an advanced level. According to the results of the 2022 Programme for International Student Assessment (PISA) survey, Indonesia is ranked 70 out of 81 countries with an Indonesian mathematics score of 366. The score is below the average international score of 472. This shows that students' problem solving skills are still low.

A problem is a situation where someone wants to do something but does not know what to do immediately (Altun, 2013). The Singapore mathematics curriculum defines problems to cover a wide range of situations, including non-routine, open-ended, and real-world problems (Kaur *et al.*, 2009). Problems in the OECD problem-solving approach are conceptualized as pre-existing conditions that require analysis. For example, the Programme for the International Assessment of Adult Competencies (PIAAC) conceptual framework places problems as the starting point of analysis that triggers and conditions problem solving (Bacchi, 2020).

Problem solving refers to the type of thinking required when the achievement of a goal does not occur automatically and students must use one or more higher-order thinking processes to achieve it (Nitko & Brookhart, 2014). This is in line with the view of Kroll & Miller in Kaur (2009) who mentioned that mathematical problem solving occurs when the task provides some blockage. A mathematical problem is defined as a task that a person or group of people wants or needs to find. However, what makes them a problem is that they do not have an easily accessible procedure that guarantees or fully determines the solution.

Problem solving as an attempt to find a way out of a difficulty in order to achieve a goal that is not immediately achievable (Polya, 1973). So, math problem solving is the process that students go through to answer questions or problems. Problem solving arises if there are obstacles that separate the current state from the goal state. In math, problems are usually in the form of problems. However, not all problems are problems for students. So that problem solving can be measured by a description test. A problem for one learner is not necessarily a problem for another learner.

According to NCTM (1989), the indicators of problem solving skills in learning mathematics are: (1) formulate problems; (2) use various strategies to solve problems; (3) solve problems; (4) check and interpret results; (5) generalize solutions. As for this research, the problem solving stages used are the

problem solving stages according to Polya which consist of understanding the problem, developing a plan, implementing the plan, and checking back.

Mathematics subjects in phase D are organized within the scope of five content elements, one of which is the algebra element. The algebraic field of study discusses non-formal algebra in the form of picture symbols to formal algebra in the form of letter symbols representing certain numbers in the subelements of equations and inequalities, number relations and patterns, and ratios and proportions (BSKAP, 2022). One of the learning outcomes in the algebra element in phase D is that students can solve a system of linear equations of two variables through several ways for problem solving.

According to Achir *et al.* (2017) the system of linear equations of two variables is one of the mathematics materials that presents problems according to the existing situation (contextual problem), namely simple problems related to everyday life. This is also supported by Wijaya *et al.* (2020) that this subject matter is closely related to problem solving in everyday life in the form of story problems. So that students need problem solving skills.

The position of the two-variable linear equation system material listed in the independent curriculum is as initial knowledge to learn subsequent material such as linear programs and the three-variable linear equation system. As stated by Sari & Lestari (2020), two-variable linear equation system material is a continuation of one variable linear equation material and is a prerequisite for learning three-variable linear equation system material. But in the reality, there are still many students who have difficulty solving two-variable linear equation system problems. Still according to Sari & Lestari (2020), the difficulties experienced by students in solving two-variable linear equation system problems are difficulties in writing description form questions into mathematical symbols because students do not master the two-variable linear equation system concept, difficulties in operating two-variable linear equation system because students forget the material they have learned before and lack of accuracy in working on problems.

In understanding math lessons, students often experience learning difficulties, causing low learning outcomes. Based on the results of research by Maryani & Setiawan (2021), it is concluded that students still have difficulty solving two-variable linear equation system problems, it can be seen from the test results obtained that they are still not optimal. This is because students still have difficulty understanding the concept of two-variable linear equation system, converting story problems into mathematical form, using methods in determining the set of two-variable linear equation system solutions, and difficulty in understanding supporting material.

The results of the researcher's interview with one of the public junior high school teachers in Yogyakarta, obtained information that the junior high school had never analyzed students' mathematical problem solving skills. So, the author is interested in knowing exactly how the problem solving ability of students in the State Junior High School. The purpose of this research is to describe students' problem solving ability on the material of system of linear equations of two variables.

Methods

This research is descriptive research with a qualitative approach. The qualitative approach is used to obtain in-depth and meaningful data analysis. With the intention of describing the phenomenon, where researchers reveal students' problem solving skills on two-variable linear equation system material.

The subjects in this study were 33 students of class VIII of one of the public junior high schools in Yogyakarta in the academic year 2023/2024 consisting of 17 male students and 16 female students. The object of this research is mathematical problem solving ability. Sampling was done by purposive sampling. The number of samples in this study consisted of three students who were categorized into three levels based on the division of students' problem solving ability levels.

The data collection techniques used included tests, interviews, and documentation. Tests were given to track problem solving ability. Interviews were used to explore deeper information to complement the information obtained from the problem solving ability test. This research was conducted in November 2023. The data analysis technique used was the analysis technique developed by Miles and Huberman, namely data reduction, data display, and verification.

The instruments used in this research are problem solving ability test, interview guidelines, qualitative analysis, and document collection. The results of the problem solving ability test and interview data are used as the basis for analysis with the stages of data reduction, and conclusion drawing. The interview guideline will be used to interview selected students after students do the problem solving ability test. Documentation in this study is only in the form of document analysis guidelines, namely test analysis results and also data collection in the form of student data.

The stages of problem solving used in this study are the stages of problem solving according to [14] which consists of understanding the problem, devising a plan, carrying out the plan, and looking back. The following assessment guidelines were used.

Table 1. Problem Solving Skill Test Assessment Guidelines

Aspect	Indicator	score
Understand the problem	Correctly writes the information needed and what is asked in the problem	3
	Write down the important information needed and/or what is asked in the problem but incomplete	2
	Write down important information needed but incomplete/inaccurate	1
	Did not write the information needed or asked	0
Devise a plan	Develops appropriate strategies in all steps of the solution	3
	Develops the right strategy in 2 steps of completion	2
	Develops the right strategy in 1 step of the solution	1
	All strategies used are wrong	0
Carry out the plan	Performs correct calculations in all steps of the solution so as to produce the right answer	3
	There are errors in calculations, but at least half are correct	2
	Less than 50% of the calculations are correct	1
	https://www.deepl.com/id/translator	0
Look back	Students can interpret the solution obtained in the context of the existing problem correctly and completely	3
	Students can interpret the solution obtained in the context of the problem correctly, but incompletely.	2
	Students interpret the solution obtained in the context of the existing problem, but incorrectly	1
	Students do not interpret the solution obtained in the context of the existing problem	0

The results of the student problem solving ability test were analyzed based on the scoring guidelines that had been made. Furthermore, the average percentage of each stage of problem solving was calculated.

Percentage score of stages per item

$$= \frac{\text{overall score obtained on each item}}{\text{number of students} \times \text{maximum score for each item}} \times 100\%$$

$$\text{Average percentage of each stage} = \frac{\text{the sum of the percentage of stage scores for each item}}{\text{number of items}}$$

Furthermore, the average percentage of each stage of problem solving will be qualified into four categories, namely, high, medium, low, and very low based on the assessment guidelines made by Morris *et al.* (1986) in Table 2.

Table 2. Qualification of Results Average Percentage of Each Stage

Percentage	Criteria
$t > 75\%$	High
$50\% < t \leq 75\%$	Middle
$25\% < t \leq 50\%$	Low
$t \leq 25\%$	Pass/Fail

Description: $t = \text{average percentage of each stage}$

In addition, the maximum score of students is also calculated to determine the level of problem solving ability of each student in solving problem solving ability test questions on the material of the system of linear equations of two variables. In calculating the maximum score, it will be qualified into three categories, namely high, medium, and low based on the criteria for achieving school learning objectives as follows.

Table 3. Qualification of Students' Problem Solving Skill

No.	Student Problem Solving Skill Test Results	Qualification
1	86 – 100	High
2	76 – 85	Middle
3	0 – 75	Low

Results

This study aims to determine the description of the problem solving ability of 8th grade students of one of the State Junior High Schools in Yogyakarta on the material of the system of linear equations of two variables. Students are given a problem solving ability test which is then analyzed to find out how far the problem solving ability is and also analyzed how many students are able to solve problem solving ability problems according to the stages of problem solving ability. The problem solving ability test questions were made as many as 3 questions in the form of descriptions.

In the problem solving ability test, the score of each stage of problem solving is calculated against the maximum score of each stage to find out how far students' problem solving skills are. The stages in question are understanding the problem, developing a plan, implementing the plan, and re-examining. This analysis will provide a more detailed view of students' strengths and weaknesses in dealing with math problems. Through this table, we can detail the contribution of each indicator to the overall achievement, guiding us to strategize towards students' individual needs. The following is a table of problem solving ability test scores at each stage of problem solving. From the data obtained, the percentage score for each stage of problem solving is presented in Table 4.

Table 4. Percentage Score of Problem Solving Stages

Stages of Problem Solving	Total Score	Max Score	Percentage	Qualification
Understand the problem	178	297	60%	Middle
Devise a plan	202	330	61%	Middle
Carry out the plan	153	297	52%	Middle
Look back	123	264	47%	Low

The results above show that the average student has a moderate ability to understand the problem, develop a plan, and implement the plan. It can be seen that the percentage of the three stages lies in the interval 50% - 75%. While the percentage of the re-examination stage is 47% which is included in the low category.

After that, the score of each student was calculated and then qualified to each level, namely high, medium, and low. The following qualification results of student scores on the problem solving ability test are shown in Table 5.

Table 5. Results of Data Analysis of Students' Problem Solving Skill

No.	Name	Score	Result/Value	Qualification
1	AW	23	64	Low
2	ASP	12	33	Low
3	ARAR	20	56	Low
4	AHS	33	92	High
5	APP	36	100	High
6	APS	34	94	High
7	AAA	0	0	Low
8	ANN	20	56	Low
9	ADJ	31	86	High
10	AMN	0	0	Low
11	AEM	28	78	Middle
12	DNK	22	61	Low
13	DKD	36	100	High
14	FHW	0	0	Low
15	FE	28	78	Middle
16	KAHA	34	94	High
17	LNK	0	0	Low
18	MJAS	8	22	Low
19	MHRP	5	14	Low
20	MJD	20	56	Low
21	MRBA	12	33	Low
22	MRW	32	89	High
23	RAC	28	78	Middle
24	RPC	18	50	Low
25	RKM	16	44	Low
26	RMA	24	67	Low
27	RIS	10	28	Low
28	RAS	12	33	Low
29	SPA	6	17	Low
30	SAZ	32	89	High
31	TYA	24	67	Low
32	ZTA	33	92	High
33	ZPM	19	53	Low

From the results of the problem solving ability test on the material of the system of linear equations of two variables, it can be concluded that 27% of students have problem solving skills in high qualifications. Students who have moderate problem solving ability are 9%. The remaining 64% have low problem solving skills. From the above results, it can be concluded that the problem solving ability of students in grade VIII of one of the State Junior High Schools in Yogyakarta is in the low category, because more than 50% of students whose scores are still low.

From the results of the assessment carried out, the qualifications of students' problem solving skills are obtained as shown in Figure 1 below.

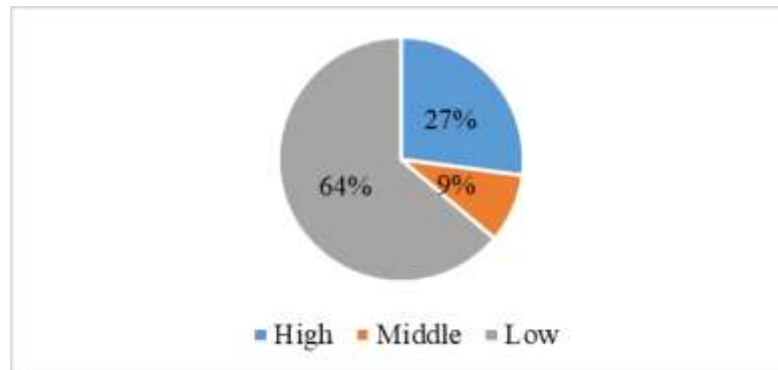
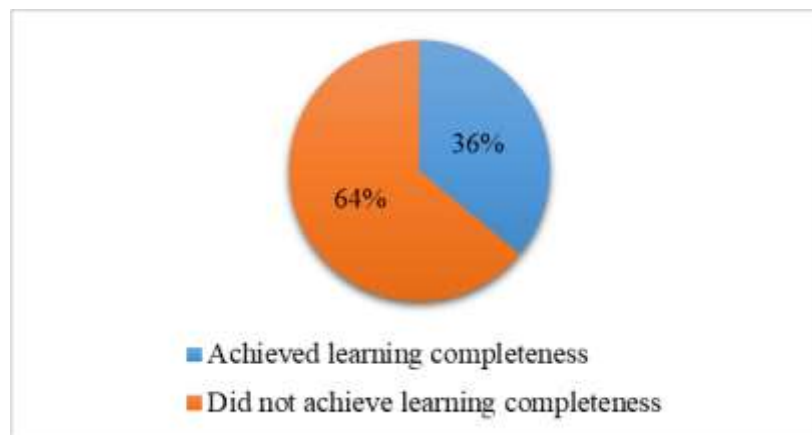


Figure 1. Category Diagram of Students' Problem Solving Skill and its Percentage

Based on the results of the problem solving ability test conducted, the student completeness diagram is obtained as shown in Figure 1 below. The number of students who achieved completeness was 12 students and the number of students who did not achieve learning completeness was 21 students.



The next analysis carried out is to analyze per item. This analysis will provide a more detailed view of students' strengths and weaknesses in dealing with mathematical challenges.

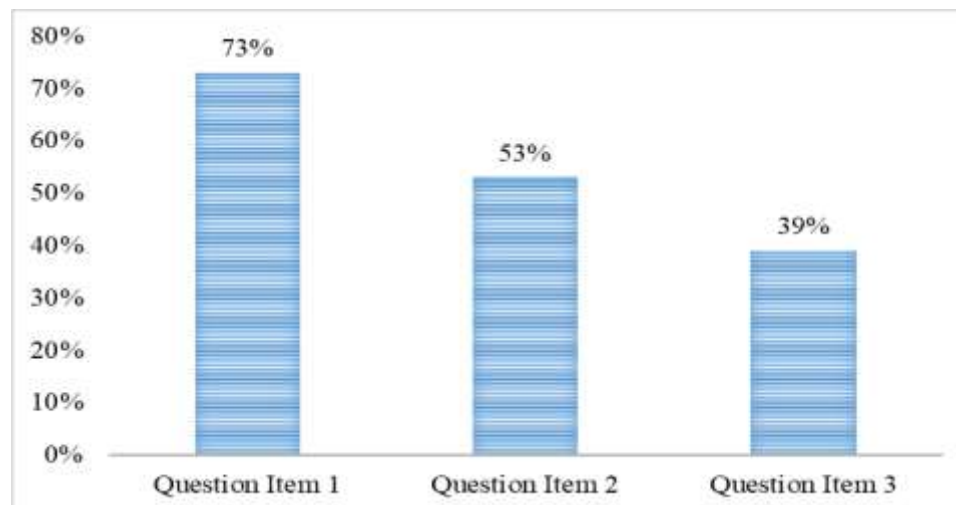


Figure 3. Outcome Diagram per Question Item

The findings in this study were obtained from the mathematical problem solving test and student interviews as follows:

a. High Problem Solving Skill

1. Diket : 110 kendaraan } terdiri dari Sepeda motor dan mobil
280 Roda

Tarif parkir } motor = 3000
mobil = 5000

Ditanya = apakah pendapatan yang diperoleh tukang parkir Rp 400.000 ?
Misal x : Banyak motor y : Banyak mobil

Persamaan 1 : $x + y = 110$
Persamaan 2 : $2x + 4y = 280$

Eliminasi x

$$\begin{array}{r} x + y = 110 \quad | \times 2 | 2x + 2y = 220 \\ 2x + 4y = 280 \quad | \times 1 | 2x + 4y = 280 \\ \hline -2y = -60 \\ y = -60 \\ \quad -2 \\ y = 30 \end{array}$$

Eliminasi y

$$\begin{array}{r} x + y = 110 \quad | \times 4 | 4x + 4y = 440 \\ 2x + 4y = 280 \quad | \times 1 | 2x + 4y = 280 \\ \hline 2x = 160 \\ x = 160 \\ \quad 2 \\ x = 80 \end{array}$$

Harga tarif motor = 80×3000
= 240.000

Harga tarif mobil = 30×5000
= 150.000

Jumlah harga tarif motor dan mobil = $240.000 + 150.000$
= 390.000

Jadi Pendapatan yang diperoleh tukang parkir adalah 390.000, Bukan 400.000

Figure 4. Answer to Problem Number 1 Subject DKD

Subject DKD is included in the category of students who have high problem solving skills. In solving problem number 1, DKD has excellent problem solving skills. The subject can write down important information used in problem solving. DKD can develop the right strategy, namely using the elimination method. The subject can perform correct calculations in all steps of the solution, as well as correctly interpret the solution obtained in the context of the existing problem.

Diket = 5 tahun yang lalu selisih umur ayah dan anaknya adalah 30 tahun, 15 tahun akan datang, usi ayah 2 kali usi anaknya.

Ditanya: Carilah masing-masing usi ayah dan anaknya saat ini?

Jawab: Misal x = umur Anak saat ini
 Misal y = umur Ayah saat ini
 umur ayah 5 tahun yang lalu = $y - 5$
 umur anak 5 tahun yang lalu = $x - 5$

Persamaan 1 $x - 5 = y - 5 - 30$
 $x - y = -5 - 30 + 5$
 $x - y = -30$

umur ayah 15 tahun yang akan datang = $y + 15$
 umur anak 15 tahun yang akan datang = $x + 15$

Persamaan 2 = $2(x + 15) = y + 15$
 $2x + 30 = y + 15$
 $2x - y = 15 - 30$
 $2x - y = -15$

Eliminasi x

$x - y = -30$	$\times 2$	$2x - 2y = -60$	$+$	Eliminasi $y = x - y = -30$ $2x - y = -15$ <hr/> $-x = -15$ $x = 15$
$2x - y = -15$	$\times 1$	$2x - y = -15$	$-$	
		$-y = -45$		
		$y = 45$		

Jadi umur anak adalah 15 tahun sedangkan umur ayah adalah 45.

Figure 5. Answer to Problem Number 2 Subject DKD

In solving problem number 2, subject DKD also have excellent problem solving skills. The subject can write down important information used in problem solving. DKD can develop the right strategy, namely using the elimination method. The subject can perform correct calculations in all steps of the solution, and interpret the solution obtained in the context of the problem correctly.

Diket: Hasil penjualan hari pertama Rp. 140.000 { 5 bungkus keripik beteln
 6 bungkus keripik pisang
 Hasil penjualan hari kedua Rp. 160.000 { 4 bungkus keripik beteln
 8 bungkus keripik pisang

Pitanya: Berapa penghasilan Sipa pada hari ketiga?

Jawaban: Misal x = harga 1 bungkus keripik beteln
 y = harga 1 bungkus keripik pisang

Persamaan 1 = $5x + 6y = 140.000$
 Persamaan 2 = $4x + 8y = 160.000$

Eliminasi x

$5x + 6y = 140.000$	$\times 1$	$5x + 6y = 140.000$	$+$	Eliminasi y $5x + 6y = 140.000$ $4x + 8y = 160.000$ <hr/> $x + 2y = 10.000$ $2x + 4y = 20.000$ $-2x - 4y = -20.000$ <hr/> $0 = 0$
$4x + 8y = 160.000$	$\times 2$	$8x + 16y = 320.000$	$-$	
		$-3x - 10y = -180.000$		
		$3x + 10y = 180.000$		

Eliminasi y

$5x + 6y = 140.000$	$\times 4$	$20x + 24y = 560.000$	$+$	Eliminasi x $5x + 6y = 140.000$ $4x + 8y = 160.000$ <hr/> $x + 2y = 10.000$ $2x + 4y = 20.000$ $-2x - 4y = -20.000$ <hr/> $0 = 0$
$4x + 8y = 160.000$	$\times 3$	$12x + 24y = 480.000$	$-$	
		$8x = 80.000$		
		$x = 10.000$		

Penjualan Sipa Hari ketiga = $6x + 5y$
 $= 6(10.000) + 5(15.000)$
 $= 60.000 + 75.000$
 $= 135.000$

Jadi hasil penjualan Sipa pada hari ketiga adalah Rp. 135.000

Figure 6. Answer to Problem Number 3 Subject DKD

In solving problem number 3, subject DKD have very good problem solving skills. The subject can write down important information used in problem solving. DKD can develop the right strategy, namely using the elimination method. The subject can perform correct calculations in all steps of the solution, and interpret the solution obtained in the context of the problem correctly.

b. Moderate Problem Solving Skill

1. Diketahui: 110 kendaraan } terdiri dari motor dan
280 roda } mobil
Tarif Parkiran } Motor: 3.000
Mobil: 5.000

Ditanya: Apakah pendapatan yang diperoleh tukang parkir
Rp 400.000?

Jawab: Misal x = Banyak motor
 y = Banyak mobil

$x + y = 110$ (Persamaan yang menunjukkan banyak kendaraan)
 $2x + 4y = 280$ (Persamaan yang menunjukkan banyak roda)

$x + y = 110$ Persamaan pertama

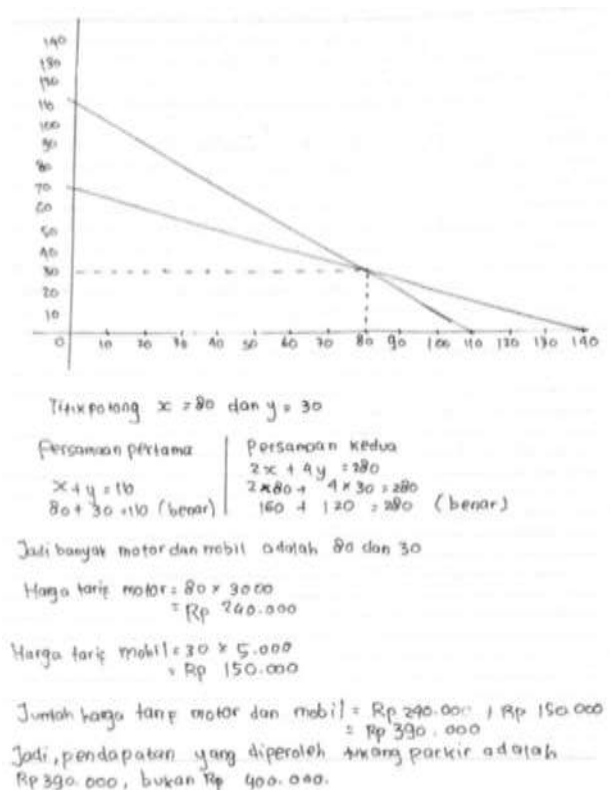
x	0	110
y	110	0
(x, y)	0, 110	110, 0

$2x + 4y = 280$ Persamaan kedua

x	0	140
y	70	0
(x, y)	0, 70	140, 0

Figure 7. Answer to Problem Number 1 Subject RAC

Subject RAC is included in the category of students who have moderate problem solving ability. In solving problem number 1, RAC subjects can write down important information used in problem solving. RAC can develop the right strategy, namely by using the graph method. Subject RAC can perform correct calculations in all steps of the solution and can interpret the solution obtained in the context of the problem given.



2. Diket = 5 tahun lalu, selisih usia ayah dan anaknya = 30 thn
 15 tahun akan datang, usia ayah 2x usia anaknya
 Ditanya = Carilah masing-masing usia ayah dan anaknya
 Saat ini!

Misal a = usia ayah saat ini
 b = usia anak saat ini

Persamaan 1 = $a - 5 = b + 5 + 30$
 Persamaan 2 = $a + 15 = 2 \cdot (b + 15)$

Dari persamaan 1 kita dapat mengekspresikan a
 dalam bentuk b

$$a - 5 = b + 5 + 30$$

$$a = b + 30 + 5 + 5$$

$$a = b + 40$$

Substitusikan a ke dalam persamaan kedua

$$b + 40 + 15 = 2 \cdot (b + 15)$$

$$b + 55 = 2b + 30$$

$$b - 2b = 30 - 55$$

$$-1b = -25$$

$$b = 25$$

Jadi $b = 25$ = usia anak saat ini

Jika kita substitusikan $b = 25$ ke dalam persamaan

$$a = b + 40$$

$$a = 25 + 40$$

$$a = 65 = \text{usia ayah saat ini}$$

Jadi usia ayah saat ini adalah 65 thn dan usia anak
 saat ini adalah 25 thn.

Figure 8. Answer to Problem Number 2 Subject RAC

In problem number 2, subject RAC can write the information needed and what is asked in the problem. However, there is one strategy that is not correct, causing incorrect calculation results and conclusions. Based on the results of the interview, the subject admitted that there was a mistake in making an equation related to the difference in the ages of the father and son 5 years ago.

Subject RKM is included in the category of students who have low problem solving skills. In solving problem number 2, subject RKM did not write down important information used in problem solving and what was asked in the problem. The subject immediately made mathematical modeling and solved the problem using the graph method. However, the graph made is less precise so it does not get the right intersection point. Subject RKM has not been able to solve the problem and make a conclusion from the problem.

$$\begin{array}{l}
 \text{Umur Ayah} = x \\
 \text{Umur anak} = x - 30 \\
 x = 2(x - 30) \\
 x = 2x - 60 \\
 x = 2x - 60 \\
 -x = 60 \\
 x = 60
 \end{array}
 \qquad
 \begin{array}{l}
 \text{Umur ayah} = 60 \text{ tahun} \\
 \text{Umur anak} = x - 30 \\
 = 60 - 30 \\
 = 30 \text{ tahun}
 \end{array}$$

Figure 11. Answer to Problem Number 2 Subject RKM

In solving problem number 2, subject RKM did not write down the information needed for problem solving and what was asked in the problem. The information written by subject RKM was not clear. So that RKM cannot develop the right strategy and get the wrong solution. Based on the results of the interview, Subject RKM was confused about how to solve the problem.

$$\begin{array}{l}
 x = \text{K. Ketela} \\
 y = \text{K. Pisang} \\
 \text{Persamaan} = 5x + 6y = 140.000 \text{ (H1)} \\
 4x + 8y = 160.000 \text{ (H2)} \\
 \text{Eliminasi:} \\
 \begin{array}{r|l}
 5x + 6y = 140.000 & 4x \\
 4x + 8y = 160.000 & 5x \\
 \hline
 & 20x + 24y = 560.000 \\
 & 20x + 32y = 800.000 \\
 & -8y = -240.000 \\
 & y = 240 : 8 \\
 & y = 30
 \end{array} \\
 \text{Substitusi} \\
 5x + 6y = 140.000 \\
 5x + 6(30) = 140.000 \\
 5x + 180 = 140.000 \\
 5x = 140.000 - 180 \\
 5x = -40 \cdot x = 8 \\
 \text{Hari ke 3} = \\
 6x + 5y \\
 = 6(8) + 5(30) \\
 = 48 + 150 \\
 = 198.000
 \end{array}$$

Figure 12. Answer to Problem Number 3 Subject RKM

Subject RKM did not write down important information and what was asked completely. However, Subject RKM solved the problem using elimination and substitution methods, but there were calculation and writing errors in solving the problem. The subject should have written the number hundreds of thousands, but only hundreds. As a result, the solution obtained was also incorrect. The subject also did not write the conclusion of the given problem.

Discussion

From the research results of the problem solving ability test on the material of the system of linear equations of two variables in class VIII of one of the Yogyakarta State Junior High School totaling 33 students, it can be seen that 27% of students have problem solving skills in high qualifications. Students who have moderate problem solving ability amounted to 9%. The remaining 64% have low problem solving skills. From the above results, it can be concluded that the problem solving ability of students in grade VIII of one of the State Junior High Schools in Yogyakarta is in the low category, because more than 50% of the students whose scores are still low.

In addition, based on the results of descriptions and interviews of selected students, the factors that influence the level of students' problem solving skills are as follows.

- a. Students are less careful in understanding the problem in the given problem so that it results in the next stages of making plans, implementing plans, and checking back less precisely.
- b. Students lack understanding of the methods used to solve problems related to the system of linear equations of two variables.
- c. Students are less careful in performing calculations so that the solution obtained is not correct.
- d. Students do not have any ideas in solving the problem so students only write down what is known and what is asked.

The following will discuss student errors based on problem solving abilities.

- a. Ability to Understand Problems

The ability to understand problems is very important, because it has an impact on the next problem-solving stage. This is in line with the research of Kushendri & Zanthi (2019) students do not understand the problem well, so that when implementing the strategy and carrying out calculations, students have not been able to elaborate on it, as well as re-checking, students do not do it well.

- b. Ability to Devise a Plan

Students in compiling a problem-solving plan usually compare previously worked-on questions that are almost similar to the problem being worked on. According to Simatupang *et al.* (2020), the stage of making a solution plan is the stage where you look for possibilities that can occur and then compile a solution procedure. Ersoy & Guner (2015) stated that the use of appropriate problem strategies is very important in the success of problem solving.

- c. Ability to Carry Out a Plan

The success of students in implementing the problem-solving plan depends on the problem-solving plan. The success of students in implementing the problem-solving plan is determined by the success in performing calculations. Mistakes that are often encountered in the stage of implementing the plan are errors in calculations. According to Fitriatien & Mutianingsih (2020), sometimes students know how to answer the questions asked, but are careless in the calculations. Because solving mathematical problems requires precision in calculations Afriansyah *et al.* (2021), if the concept of solving the problem is correct but the calculation process is careless, the final answer will definitely be wrong.

- d. Ability to Look Back

The ability to re-check is characterized by being able to write conclusions based on information understood from what is asked from the questions and solutions that have been obtained during problem solving. Therefore, the success of re-checking is very much determined by the success of the previous stages such as understanding the problem, making plans, and implementing the plan. This is in line with Windari (2014) which explains that the ability to solve problems at the planning and conclusion-drawing stages is the lowest indicator.

Conclusion

The problem solving ability of students in grade VIII of one of the public junior high schools in Yogyakarta on the material of the system of linear equations of two variables is in the low category. This can be seen from the number of students who have problem solving skills in the low category of more than 50%. Students who have high problem solving ability are only 27%. Students who have moderate problem solving ability are 9%. Students who have low problem solving ability are 64%.

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