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WordWall Application as an Interactive Learning Media in Mastering English Vocabulary at Elementary School

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How Far is the Mathematical Problem-Solving Ability of Vocational School Students?

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Abstract. Learning problem-solving can enable students to be more critical and creative in making decisions to solve problems in their lives. The purpose of this study was to analyze students' mathematical problem-solving skills on the material of a three-variable system of linear equations. The subjects of this study were 3 students of South Garut Vocational School. This research uses the descriptive qualitative method. The instrument used in this study was a description test in the form of a mathematical problem-solving ability test consisting of 3 questions, interviews to determine each student's ability, and field notes. The data analysis technique used in this study consisted of three stages, namely data reduction, data presentation, and conclusion drawing. The results in this study indicate that high-ability students are able to complete all mathematical problem-solving ability test questions well according to the indicators with a score of 97. In contrast, moderately capable students are able to solve all questions but there are still mistakes in each question with a score of 67, and for students, those with low abilities did all the test questions but there were still many mistakes and not all indicators were met with a score of 43.

Keywords: Mathematical Problem-Solving Ability · Three Variable Linear Equation System · Qualitative Descriptive · Vocational School Students

1 Introduction

Many students do not like mathematics because for them mathematics is a difficult subject [1, 2], but students must study mathematics because mathematics is one of the main subjects that must be learned [3]. Mathematics is a basic subject that must be taught in primary and secondary formal education because it is considered an essential lesson [4, 5].

One of the main goals in learning mathematics is that students have problem-solving abilities [6, 7]. With problem-solving in mathematics learning, it is hoped that students will be able to build new knowledge about mathematics, solve problems that arise in mathematics or in the context of everyday life, apply and adapt various strategies that

are suitable for solving problems, and monitor and reflect on the solving process math problems [8]. In human life, you will definitely be faced with a problem that requires skill and ability to solve. Thus, problem-solving needs to be learned in school. Learning problem-solving can enable students to be more critical and creative in making decisions to solve problems in their lives [9–11].

The problem-solving steps according to Polya's steps are understanding the problem, planning a solution, solving the problem according to the plan, and checking again [12]. One example of problem-solving activities that students can do in solving story problems, by solving story problems students are required to change the problem in mathematical form and solve problems based on what is known in the problem [13, 14].

Yuwono, Supanggih, and Ferdiani [15] research problem-solving skills in solving stories based on Polya procedures, and the results, namely out of 6 students of class VIII SMP Terpadu Turen only 5 students reached the stage of understanding the problem, 1 student at the stage of compiling, 4 students who reached the stage of implementing the plan but the student was still having problems with number 3 because the student did not write down on the answer sheet because the student was still having difficulty understanding the question, and 3 students who achieved seeing the results of their work but on question 3 the student number had not yet reached a re-examination because do not write on the answer sheet. This means that the problem ability of the eighth-grade students of SMP Terpadu Turen is still weak. Azzahra and Pujiastuti's research [16], results of this study indicate that the problem-solving ability of students in class X Social Sciences 3 SMAN 5 Serang City is still low. Research by Zakiyah et al. [17], the results of this study can find that students' problem-solving and mathematical reasoning abilities are low, while students' self-efficacy abilities are good.

Meanwhile, Hadi and Radiyatul [6], in this study concluded that the problem-solving method according to Polya can develop students' problem-solving abilities and there are differences in learning outcomes from the problem-solving method according to Polya on students' mathematical problem-solving abilities, the use of problem-solving methods according to Polya Polya can make student learning outcomes better. Research by Chotimah, Sari, and Zanthy [18], the results of the research as a whole show that the achievement of indicators of students' mathematical problem-solving abilities is still low. Research by Zakiyah, Hidayah, and Setiawan [19], shows that the mathematical problem-solving ability of class X students in West Bandung towards SPLTV material is relatively high, with a percentage of 79.868%.

The material for the Three-Variable Linear Equation System (Sistem Persamaan Linier Tiga Variabel - SPLTV) is one of the mathematics subject matters that is often in the form of stories because it is related to daily life [20], such as calculating the price of goods where the number of purchases is only known without knowing the unit price of the goods purchased. Therefore, students must have good problem-solving skills in order to be able to solve these problems.

The difference between the research that we are going to do and previous studies is that the research location will be carried out in Pameungpeuk District, Garut Regency, and the number of samples studied is 3 students. This study aims to determine the problem-solving ability of SMK students on the material of a three-variable system of linear equations.

Table 1. Student Classification Criteria

Classification	Criteria
79–100	High
56–78	Medium
35–56	Low

2   Research Method

This study used the descriptive qualitative method. Descriptive research aims to describe in full and in-depth the social reality that occurs [16]. Qualitative research, namely research that tends to use analysis. In qualitative research, what is more visible is the process and meaning (perspective subject) [21]. The subjects of this study were 3 students of South Garut Vocational School who had studied the material for the Three Variable Linear Equation System. The technique of taking the subject in this study used the purposive sampling technique. The classification criteria used in this study according to [22], are presented in Table 1.

The research on the mathematical problem-solving ability test was carried out in Cikelet District, Garut Regency on December 31, 2021. The instrument used in this study was a description test in the form of a mathematical problem-solving ability test consisting of 3 questions, interviews to determine each student's ability, and field notes. The data analysis technique used in this study consisted of three stages, namely data reduction, data presentation, and conclusion drawing. The following is an assessment sheet for students' mathematical problem-solving abilities according to Akbar et al. [23].

3   Result and Discussions

The researcher gave 3 Mathematical Problem-Solving Ability Test questions to 3 students of South Garut Vocational School. The results of students' problem-solving ability tests on the material of a three-variable linear equation system can be seen in Table 2.

Based on the test results, there are three classifications, namely S1 with a score of 97 including high classification, S2 with a value of 67 including medium classification, and S3 with a value of 43 including low classification. S1 which is included in the high classification is able to work on the ability to test questions of mathematical problems

Table 2. Classification of Mathematical Problem-Solving Ability Test Results

No	Student	Value	Classification
1	S1	97	Height
2	S2	67	Medium
3	S3	43	Low

properly and correctly according to the indicators, although there are slight errors it has no effect on the final results. S2 which is classified as being able to understand the problem, and plan a solution, but there are still mistakes in completing the settlement plan which greatly affects the final result and is still wrong in re-checking. Meanwhile, S3 which is classified as low is not able to solve problems properly and correctly. This can be seen from the discussion of each question of the students' mathematical problem-solving ability test as follows.

Based on Fig. 1, the results of the research on the problem-solving ability test in question number 1, it was revealed that in this study S1 and S2 could understand the problem well, while S3 could understand the problem but there was still something lacking, namely not mentioning what was asked, S1, S2, and S3 could planning the solution well, S1 can carry out the settlement plan well, while S2 carries out the settlement plan but there are still mistakes when eliminating equations 1 and 2 and S3 implementing the problem-solving plan is still wrong, S1 can re-check the results of the answers that are done well, while S2 and S3 are not correct in re-checking.

The results of interviews with high-ability students are as follows.

R: "What is known in the question?"
S1: "What is known in the question is that Sela bought 2 meatballs plus 1 chicken noodle and 1 orange juice for a total of Rp. 39,000. Then Resi bought 1 meatball plus 3 chicken noodles and 1 orange ice for a total of IDR 49,000. Then, Rima bought 1 meatball plus 1 chicken noodle and 1 orange juice for a total of IDR 28,000."
R: "What is asked in the question?"
S1: "What is being asked in the question is how much Rinjani has to pay if she buys 5 meatballs plus 2 chicken noodles and 3 orange juice."
R: "How do you model the problem?"
S1: "I assume that meatball is x, chicken noodle is y, and orange ice is z. Then, the first is $2x + y + z = 39,000$, the second $x + 3y + z = 49,000$, and the third $x + y + z = 28,000$. Of the three knowns, it is used as an equation of three variables."
R: "What are the steps taken in solving SPLTV contextual questions?"
S1: "First I eliminate equations 1 and 2 so as to produce the equation $x – 2y = -10000$, then eliminate 1 and 3 so as to produce the value $x = 11,000$, after that substitute the value of x into equation 4 so as to produce the value of $y = 10,500$, then substitute values of x and y to equation 3 and results in the value of $z = 6,500$. To find out what the total price that Rinjani has to pay is by substituting the values of x, y, and z into the equation $5x + 2y + 3z$."
R: "Did you double-check the steps and answers?"
S1: "Yes, I checked again."
R: "What is the conclusion from what you have done?"
S1: "According to the results of what I did, the total that Rinjani had to pay was Rp. 95,500."

Based on the results of the interview with S1 on question number 1, S1 can answer question number 1 correctly and S1 says that there is no difficulty in answering question number 1 given.

Based on what the researcher observed at the time of the study, S1 after being distributed the written test sheet immediately read the question, then worked on question
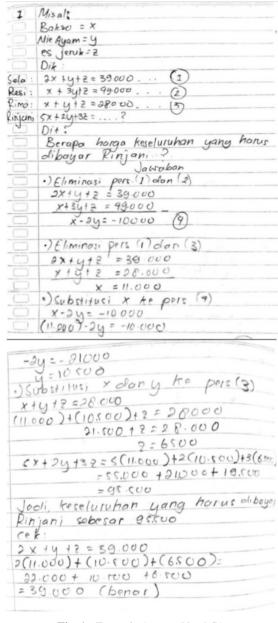
Fig. 1. Example Answer No. 1 S1.

number 1, and when working on question number 1 S1 focused on working on the questions and answering the problems given carefully from starting to understand the problem, planning problem solving, carrying out the settlement plan to re-checking the answer number 1 that has been done.

Furthermore, the results of interviews with students with moderate abilities.

R: "What is known in the question?"
S2: "What I read, what I know is that Sela bought 2 meatballs, 1 chicken noodle, and 1 orange juice for Rp. 39,000. Then Resi bought 1 meatball, 3 chicken noodles, and 1 orange ice at a price of IDR 49,000. Then, Rima bought 1 meatball, 1 chicken noodle, and 1 orange juice for Rp. 28,000."
R: "What is asked in the question?"
S2: "The value of $5x + 2y + 3z$."
R: "How do you model the problem?"
S2: "First, let me assume that meatballs $= x$, chicken noodles $= y$, and orange juice $= z$. Then make equations for 3 variables including $2x + y + z = 39000$, $x + 3y + z = 49000$, and $x + y + z = 28000$.
R: "What are the steps taken in solving SPLTV contextual questions?"
S2: "I use the method of elimination and substitution, first I eliminate equations 1 and 2 and produce the equation $x - y = 5000$ but I'm not sure about the answer. After that, I eliminated equations 2 and 3 and got the value of $y = 10,500$. Then, substitute equations 1 and 3 to get $x = 11,000$ and substitute x and y values into equation 2 to get $z = 6,500$."
R: "Did you double-check the steps and answers?"
S2: "Yes, I checked again and there are still doubts about the results because there are a few things that are not understood."
R: "What is the conclusion from what you have done?"
S2: So, the result of $5x + 2y + 3z = 95,500$."

Based on the results of the interview with S2 on question number 1, S2 can answer question number 1 correctly, but in doing the elimination of equations 1 and 2 and in re-checking S2 is still unsure about the results he did.

Based on what the researcher observed at the time of the study, after being distributed the written test sheet he reads the questions repeatedly, after reading them over and over and then working on question number 1, and when working on question number 1 S2 shows a face of the doubt after eliminating equations 1 and 2 as well as in re-checking, and S2 answered the problems given carelessly when eliminating equations 1 and 2 as well as at the time of re-checking.

Then, the results of interviews with low-ability students.

R: "What is known in the question?"
S3: "Sela bought 2 portions of meatballs $+$ 1 pack of chicken noodles $+$ 1 orange juice. Rishi bought 1 portion of meatballs $+$ 3 packs of chicken noodles $+$ 1 glass of orange juice. Rima bought 1 portion of meatballs $+$ 1 pack of chicken noodles $+$ 1 glass of orange ice."
R: "What is asked in the question?"
S3: "The total price that Rinjani has to pay, but I did not write down what was asked during the written test."
R: "How do you model the problem?"
S3: "I am modelling on 3 equations, namely $2x + y + z = 39,000$, $x + 3y + z = 49,000$, and $x + y + z = 28,000$."
R: "What are the steps taken in solving SPLTV contextual questions?"

S3: "By eliminating equations 1 and 2 and producing a value of y, which is 44, then eliminating equations 1 and 3 and producing x, which is 11,000. After that, I didn't continue solving the problem because I didn't know how to solve it anymore."
R: "Did you double-check the steps and answers?"
S3: "Yes, I checked it but I think my answer is wrong."
R: "What is the conclusion from what you have done?"
S3: "So, if Rinjani buys the whole thing, then he has to pay a price of IDR 37,000."

Based on the results of the interview with S3 on question number 1, S3 cannot answer question number 1 correctly because S3 does not know how to solve it, S3 is only able to understand the problem and plan problem-solving.

Based on what the researcher observed at the time of the study, after being distributed the written test sheet he read the questions many times and felt insecure in doing it so there were a lot of left and right lyrics when he worked on question number 1, S3 wrote down what he knew but still didn't know. right without writing down what was asked, and S3 wrote the completion plan but S3 was wrong in completing the problem-solving plan and re-checking the answers that were done.

Based on Fig. 2, the results of the research on the problem-solving ability test in question number 2, it was revealed that in this study S1 and S3 could understand the problem well, while S2 was not right in writing what was known, S1 and S2 could plan a solution well, while S3 planned a solution but not correct, S1 can carry out the completion plan well, while S2 completes the problem planning but is still wrong and S3 completes the completion plan but it is not right, S1 can re-check the results of the

Fig. 2. Example Answer No. 2 S2.

answers that are done well, while S2 is not right at the time of checking back and S3 is not rechecked.

The results of interviews with high-ability students are as follows.

R: "What is known in the question?"
S1: "According to what I read, Saskia bought 2 books plus 1 pencil and 1 eraser for a total of Rp. 4,700. Raihan bought 1 book plus 2 pencils and 1 eraser for a total of IDR 4,300. Then, Yasmin bought 3 books plus 2 pencils and 1 eraser for a total of IDR 7,100."
R: "What is asked in the question?"
S1: "How much is the price for 1 notebook, 1 pencil, and 1 eraser."
R: "How do you model the problem?"
S1: "I assume the book is x, the pencil is y, and the eraser is z. Then, the first is $2x + y + z = 4,700$, the second $x + 2y + z = 4,300$, and the third is $3x + 2y + z = 7,100$. Of the three knowns, it is used as an equation of three variables.
R: "What are the steps taken in solving SPLTV contextual questions?"
S1: "First eliminate equations 1 and 2 so as to produce the equation $x - y = 400$, then eliminate 2 and 3 so as to produce the value $x = 1,400$, after that substitute the value of x into equation 4 so as to produce the value of $y = 1,000$, then substitute the value of x and y to equation 3 and yields a value of $z = 900$."
R: "Did you double-check the steps and answers?"
S1: "Yes, I checked again."
R: "What is the conclusion from what you have done?"
S1: "So, according to the results I worked on, the price of 1 book was Rp. 1,400, the price of 2 pencils was Rp. 1000 and the price of 2 erasers were Rp. 900."

Based on the results of the interview with S1 on question number 2, S1 can answer question number 1 correctly and S1 says that there is no difficulty in answering the question number 1 given.

Based on what the researcher observed at the time of the study, S1 immediately read question number 2 and worked on it, when working on question number 2 S1 focused on working on the questions and answering the problems given carefully from understanding the problem, planning problem solving, implementing a settlement plan to re-checking answer number 2 that has been done.

Furthermore, the results of interviews with students with moderate abilities.

R: "What is known in the question?"
S2: "In the question, it is known that Saskia paid Rp. 4,700, Raihan paid Rp. 4,300 and Yasmin paid Rp. 7,100."
R: "What is asked in the question?"
S2: "The price of each item."
R: "How do you model the problem?"
S2: "First, let me assume that notebook = x, pencil = y and eraser = z. Then make equations for 3 variables including $2x + y + z = 4,700$, $x + 2y + z = 4,300$, and $3x + 2y + z = 7,100$."
R: "What are the steps taken in solving SPLTV contextual questions?"

*S2: "At first I was confused in working on the problem, but I tried my best and I elimi-
nated equations 1 and 2 and produced equation 4, namely x - y = 400, then eliminated
equations 2 and 1 and produced the value of x, which is 1600, after that, I substituted
the value of x into equation 4 so that the value of y = 1200 and substituted the value of
x, y into equation 2 and got the value of z = 300."*
R: "Did you double-check the steps and answers?"
S2: "Yes."
R: "What is the conclusion from what you have done?"
*S2: "So, the price of 1 book = 1600, 1 pencil = 1200 and 1 eraser 300. But at the time
of the written test, I did not conclude what I was doing."*

Based on the results of the interview with S2 on question number 2, S2 can answer
question number 2, but in working on solving the problem S2 feels confused but is still
trying to do it and S2 does not simulate the results that are done.

Based on what the researchers observed during the research, S2 immediately read
question number 2 over and over again and then worked on it, when working on question
number 2 S2 showed a confused face but S2 kept trying to do it and S2 answered the
problems given carelessly from starting to carry out the completion plan until re-checking
the answer number 2 that has been done.

Then, the results of interviews with low-ability students.

R: "What is known in the question?"
*S3: "Saskia bought 2 notebooks + 1 pencils + 1 eraser for Rp. 4,700. Raihan bought 1
notebook + 2 pencils + 1 eraser for Rp. 4,300. Yasmin bought 3 notebooks + 2 pencils
+ 1 eraser for IDR 7,100."*
R: "What is asked in the question?"
S3: "How much is the price for 1 notebook, 1 pencil, and 1 eraser."
R: "How do you model the problem?"
*S3: "I am modeling 3 equations, namely 2x + y + z = 4,700, x + 2y + z = 4,300, and
3x + y + z = 7,100."*
R: "What are the steps taken in solving SPLTV contextual questions?"
*S3: "The first step is to eliminate equations 1 and 2 so that we get the results of the
equation 3x + 3y + z = 9,000, then eliminate equations 1 and 3 by getting the result of
the x value, which is 2,400. After that, 4,700 minus 200, which is 4,500."*
R: "Did you double-check the steps and answers?"
S3: "I did not check."
R: "What is the conclusion from what you have done?"
S3: "So, the price of 1 notebook + 1 pencil + 1 eraser is paid at Rp. 4,500."

Based on the results of the interview with S3 on question number 2, S3 can answer
question number 2 but S3 is not confident in answering it, S3 is able to understand the
problem, plan problem solving, solve problems, and re-check the results that have been
done but are still wrong.

Based on what the researchers observed at the time of the study, S3 immediately
read question number 2 many times and then worked on it, when working on question
number 2 S3 felt difficult so S3 was nervous and S3 answered the problems given by
starting from carrying out the completion plan to re-checking the answers. number 2
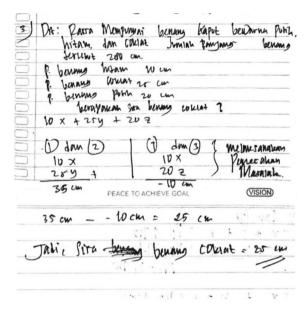which has been done.

Fig. 3. Example Answer No. 3 S3.

Based on Fig. 3, the results of the research on the problem-solving ability test in question number 3, it was revealed that in this study S1 and S2 could understand the problem well, while S3 stated what was known and asked but was not correct, S1 could plan a solution, but in writing the elimination of equation 1 to -2 incorrectly should substitute equation 2 to 1 while S2 is able to plan problem solving correctly and S3 does not plan a solution, S1 can carry out the settlement plan well, while S2 and S3 solve the problem but are still wrong, S1 can re-check the results of the answers that are done well, while S2 and S3 did not check again.

The results of interviews with high-ability students are as follows.

R: "What is known in the question?"
S1: "The length of the three kaput threads is 280 cm. The length of the black thread is 10 cm less than the brown thread, meaning the length of the brown thread is reduced by 10 cm. The length of the brown thread is 25 cm more than the white thread, that means the white thread is added by 25 cm."
R: "What is asked in the question?"
S1: "What is the remaining length of the brown thread if it is 20 cm long."
R: "How do you model the problem?"
S1: "I assume the white thread is x, the black thread is y, and the brown thread is z. Then, the first known x + y + z = 280, the second y = z - 10, and the third z = + 25. From the three known equations, three variables are used."
R: "What are the steps taken in solving SPLTV contextual questions?"
S1: "Eliminates equations 1 to 2 so as to produce the equation x + 2z = 290, then substitute y and z into equation 1 so as to produce equation 2x + z = 265. After that, eliminate the 4th equation to get the value of z = 105 Then, substitute z into equation 2 to get the value y = 95. Substitute y and z into equation 1 and get x = 80."

R: "Did you double-check the steps and answers?"
S1: "Yes, I checked again."
R: "What is the conclusion from what you have done?"
S1: "So, the remaining brown thread if you use 20 is the length of the brown thread 105
- 20 = 85 cm."

Based on the results of interviews with S1 on question number 3, S1 can answer question number 3, S1 is able to understand the problem, plan problem solving, solve problems, and re-check the results that have been done.

Based on what the researchers observed at the time of the study, S1 immediately read the questions, then worked on question number 3, and when working on question number 3 S1 focused on working on the questions and answering the problems given but not being careful in writing eliminations 1 and 2 should substitute equation 2 into -1 but has no effect on the calculation, S1 understands the problem, plans problem-solving, implements a settlement plan to re-check the answer number 1 that has been done.

Furthermore, the results of interviews with students with moderate abilities.

R: "What is known in the question?"
S2: "The total length of white, black, and brown threads is 280 cm. The length of the black thread is 10 cm less than the brown thread. The brown thread is 25 cm longer than the white thread."
R: "What is asked in the question?"
S2: "How long will the brown thread remain if it is 20 cm long."
R: "How do you model the problem?"
S2: "I assume x as white thread, y as black thread, and z as brown thread."
R: "What are the steps taken in solving SPLTV contextual questions?"
S2: "I substituted equations 2 and 3 into equation 1 and got a z-value, which is 157.5,
but I'm not sure how to solve the problem I'm working on."
R: "Did you double-check the steps and answers?"
S2: "I did not re-check the steps or answers."
R: "What is the conclusion from what you have done?"
S2: "So, if you have used 20 cm of brown thread, then what is left is 137.5."

Based on the results of the interview with S2 on question number 3, S2 can answer question number 3, but in working on the completion of S2 is not sure about the answer that is done.

Based on what the researchers observed at the time of the study, S2 immediately read question number 3 over and over again and then worked on it, when working on question number 3 S2 showed a confused face but S2 kept trying to do it and S2 answered the problems given carelessly from starting to carry out the settlement plan until re-checking the answer number 2 that has been done.

Then, the results of interviews with low-ability students.

R: "What is known in the question?"
S3: "Raisa has white, black, and brown kaput threads, the number of threads is 280 cm.
The length of the black thread is 10 cm, the brown is 25, and the white is 20 cm."
R: "What is asked in the question?"
S3: "How much is the remaining brown thread."

R: *"How do you model the problem?"*
S3: *"I don't know and find it difficult to model question number 3."*
R: *"What are the steps taken in solving SPLTV contextual questions?"*
S3: *"I can't solve problem number 3, but I try to do it by adding up the lengths of black and brown threads and it produces 35 cm, then the length of the black thread is 10 minus 20 the length of the white thread and the result is – 10. After that, 35 cm – 10cm = 25cm."*
R: *"Did you double-check the steps and answers?"*
S3: *"I didn't check again."*
R: *"What is the conclusion from what you have done?"*
S3: *"So, the remaining brown thread is 25 cm."*

Based on the results of the interview with S3 on question number 3, S3 can answer question number 3 but by not being sure of the answer it gives, S3 is not able to understand the problem, plan problem solving, solve problems, and re-check the results that have been done but are still wrong.

Based on what the researcher observed at the time of the study, S3 immediately read question number 3 many times and then did it from scratch, when working on question number 3, S3 found it difficult so S3 was nervous and S3 answered the problems given by origin from starting to carry out the completion plan until the end. recheck answer number 2 that has been done.

In line with several previous studies students with high abilities in their schools have high mathematical problem-solving abilities [24, 25], when compared to other students. This shows that there is a positive relationship between students' abilities in school and their mathematical problem-solving abilities, namely: the lower the ability of students in their schools, the lower their mathematical problem-solving abilities [26].

4 Conclusion

The conclusion of this study is that high-ability students were able to complete all mathematical problem-solving ability test questions well according to the indicators with a score of 97. In contrast, moderately capable students were able to solve all questions. However, there were still mistakes in each question with a score of 67, and students those with low ability did all the test questions but there were still many mistakes and not all indicators were met with a score of 43. The benefit of this research is to be used as reference material for further research. The suggestions to be conveyed are: (1) To improve students' mathematical problem-solving skills, teacher readiness is needed in guiding students and compiling LKS as discussion material to make it easier for students to learn the material being taught; (2) For students, it is recommended to increase the number of practice questions and be more active in learning, so that they can improve their mathematical problem-solving abilities.

References

1. R. Capuno, R. Necesario, J. O. Etcuban, R. Espina, G. Padillo, R. Manguilimotan. Attitudes, Study Habits, and Academic Performance of Junior High School Students in Mathematics. International Electronic Journal of Mathematics Education, vol. 14, no 3, 2019, pp. 547–61.
2. F. J. Ibrokhimovich. Application Of Some Teaching Methods in Mathematics Lessons in Elementary Grades. Journal of Pedagogical Inventions and Practices, vol. 5, 2022, pp. 15–7.
3. Y. Chevallard, M. Bosch. Didactic transposition in mathematics education. Encyclopedia of mathematics education, 2020, pp. 214–8.
4. R. P. Permatasari, E. A. Afriansyah. Kendala orang tua dalam mendampingi siswa ditinjau dari hasil belajar matematika secara online. PowerMathEdu: Jurnal Inovasi Pembelajaran Matematika, vol. 1, no. 1, 2022, pp. 27–36.
5. I. N. A. Khadijah, R. Maya, & W. Setiawan. Analisis kemampuan komunikasi matematis siswa smp pada materi statistika. JPMI: Jurnal Pembelajaran Matematika Inovatif, vol. 1, no. 6, 2018, pp. 1095–104.
6. S. Hadi, Radiyatul. Metode Pemecahan Masalah Menurut Polya Untuk Mengembangkan Kemampuan Siswa Dalam Pemecahan Masalah Matematis Di Sekolah Menengah Pertama. EDU-MAT: Jurnal Pendidikan Matematika, vol. 2, no. 1, 2014, pp. 53–61.
7. N. Akben. Effects of the problem-posing approach on students' problem-solving skills and metacognitive awareness in science education. Research in Science Education, vol. 50, no. 3, 2020, pp. 1143–65.
8. P. Lestari, R. Rosdiana. Kemampuan Pemecahan Masalah Matematika Siswa Melalui Model Pembelajaran Learning Cycle 7E dan Problem Based Learning. Mosharafa: Jurnal Pendidikan Matematika, vol. 7, no. 3, 2018, pp. 425–32.
9. K. Ulger. The effect of problem-based learning on the creative thinking and critical thinking disposition of students in visual arts education. Interdisciplinary Journal of Problem-Based Learning, vol. 12, no. 1, 2018.
10. E. A. Afriansyah, T. Herman, Turmudi, J. A. Dahlan. Critical thinking skills in mathematics. In Journal of Physics: Conference Series, vol. 1778, no. 1, 2021, p. 012013.
11. R. F. Sari, E. A. Afriansyah. Kemampuan Berpikir Kreatif Matematis dan Belief Siswa pada Materi Persamaan dan Pertidaksamaan Linear. Plusminus: Jurnal Pendidikan Matematika, vol. 2, no. 2, 2022, pp. 275–88.
12. R. Astutiani, Isnarto, I. Hidayah. Kemampuan Pemecahan Masalah Matematika dalam Menyelesaikan Soal Cerita Berdasarkan Langkah Polya. Seminar Nasional Pascasarjana, 2019.
13. L. Verschaffel, S. Schukajlow, J. Star, W. Van Dooren. Word problems in mathematics education: A survey. ZDM, vol. 52, no. 1, 2020, pp. 1–6.
14. J. G. Greeno. Some examples of cognitive task analysis with instructional implications. In Aptitude, learning, and instruction, 2021, pp. 1–22. Routledge.
15. T. Yuwono, M. Supanggih, R. D. Ferdiani. Analisis Kemampuan Pemecahan Masalah Matematika dalam Menyelesaikan Soal Cerita Berdasarkan Prosedur Polya. Jurnal Tadris Matematika, vol. 1, no. 2, 2018, pp. 137–44. DOI: https://doi.org/10.21274/jtm.2018.1.2.137-144
16. R. H. Azzahra, H. Pujiastuti. Analisis Kemampuan Pemecahan Masalah Siswa Pada Materi Sistem Persamaan Linear Tiga Variabel. Transformasi: Jurnal Pendidikan Matematika Dan Matematika, vol. 4, no. 1, 2020, pp. 153–62.
17. S. Zakiyah, S. H. Imania, G. Rahayu, W. Hidayat. Analisis Kemampuan Pemecahan Masalah dan Penalaran Matematika Serta Self-Efficacy Siswa SMA. Jurnal Pembelajaran Matematika Inovatif, vol. 1, no. 4, 2018, pp. 647–56.

18. S. Chotimah, I. P. Sari, L. S. Zanthy. Analisis Kemampuan Pemecahan Masalah Matematika Siswa SMP pada Materi Kubus dan Balok. Jurnal Ilmiah P2M STKIP Siliwangi, vol. 6, no. 2, 2019, 1–4.
19. S. Zakiyah, W. Hidayat, & W. Setiawan. Analisis Kemampuan Pemecahan Masalah dan Respon Peralihan Matematik dari SMP ke SMA pada Materi SPLTV. Mosharafa: Jurnal Pendidikan Matematika, vol. 8, no. 2, 2019, pp. 227–38.
20. L. Rani, S. Maarif. Development E-Module Three Variables Linear Equations System Based On Mathematic Communication. Journal of Medives: Journal of Mathematics Education IKIP Veteran Semarang, vol. 5, no. 2, 2021, pp. 377–89.
21. S. Mariam, E. E. Rohaeti, R. Sariningsih. Analisis Kemampuan Pemecahan Masalah Matematis Siswa Madrasah Aliyah pada Materi Pola Bilangan. Journal On Education, vol. 01, no. 02, 2018, pp. 156–62.
22. H. Zulfitri, N. Aisyah, Indaryanti. Analisis Kemampuan Pemecahan Masalah Matematika Setelah Pembelajaran dengan Pendekatan MEAs pada Materi Sistem Persamaan Linier Tiga Variabel. Jurnal Gantang, vol. 4, no. 1, 2019, pp. 7–13.
23. P. Akbar, A. Hamid, M. Bernard, A. I. Sugandi. Analisis Kemampuan Pemecahan Masalah dan Disposisi Matematik Siswa Kelas XI SMA Putra Juang dalam Materi Peluang. Journal Cendekia: Jurnal Pendidikan Matematika, vol. 2, no. 1, 2018, pp. 144–153.
24. S. Z. Sholihah, E. A. Afriansyah. Analisis kesulitan siswa dalam proses pemecahan masalah geometri berdasarkan tahapan berpikir Van Hiele. Mosharafa: Jurnal Pendidikan Matematika, vol. 6, no. 2, 2017, pp. 287–98.
25. D. Zhou, X. Du, K. T. Hau, H. Luo, P. Feng, J. Liu. Teacher-student relationship and mathematical problem-solving ability: mediating roles of self-efficacy and mathematical anxiety. Educational Psychology, vol. 40, no. 4, 2020, pp. 473–89.
26. M. Öztürk, Y. Akkan, A. Kaplan. Reading comprehension, Mathematics self-efficacy perception, and Mathematics attitude as correlates of students' non-routine Mathematics problem-solving skills in Turkey. International Journal of Mathematical Education in Science and Technology, vol. 51, no. 7, 2020, pp. 1042–58.

How Far is the Mathematical Problem-Solving Ability of Vocational School Students?

by Nizar Alam Hamdani

How Far is the Mathematical Problem-Solving Ability of Vocational School Students?

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Abstract. Learning problem-solving can enable students to be more critical and creative in making decisions to solve problems in their lives. The purpose of this study was to analyze students' mathematical problem-solving skills on the material of a three-variable system of linear equations. The subjects of this study were 3 students of South Garut Vocational School. This research uses the descriptive qualitative method. The instrument used in this study was a description test in the form of a mathematical problem-solving ability test consisting of 3 questions, interviews to determine each student's ability, and field notes. The data analysis technique used in this study consisted of three stages, namely data reduction, data presentation, and conclusion drawing. The results in this study indicate that high-ability students are able to complete all mathematical problem-solving ability test questions well according to the indicators with a score of 97. In contrast, moderately capable students are able to solve all questions but there are still mistakes in each question with a score of 67, and for students, those with low abilities did all the test questions but there were still many mistakes and not all indicators were met with a score of 43.

Keywords: Mathematical Problem-Solving Ability · Three Variable Linear Equation System · Qualitative Descriptive · Vocational School Students

1 Introduction

Many students do not like mathematics because for them mathematics is a difficult subject [1, 2], but students must study mathematics because mathematics is one of the main subjects that must be learned [3]. Mathematics is a basic subject that must be taught in primary and secondary formal education because it is considered an essential lesson [4, 5].

One of the main goals in learning mathematics is that students have problem-solving abilities [6, 7]. With problem-solving in mathematics learning, it is hoped that students will be able to build new knowledge about mathematics, solve problems that arise in mathematics or in the context of everyday life, apply and adapt various strategies that

are suitable for solving problems, and monitor and reflect on the solving process math problems [8]. In human life, you will definitely be faced with a problem that requires skill and ability to solve. Thus, problem-solving needs to be learned in school. Learning problem-solving can enable students to be more critical and creative in making decisions to solve problems in their lives [9–11].

The problem-solving steps according to Polya's steps are understanding the problem, planning a solution, solving the problem according to the plan, and checking again [12]. One example of problem-solving activities that students can do in solving story problems, by solving story problems students are required to change the problem in mathematical form and solve problems based on what is known in the problem [13, 14].

Yuwono, Supanggih, and Ferdiani [15] research problem-solving skills in solving stories based on Polya procedures, and the results, namely out of 6 students of class VIII SMP Terpadu Turen only 5 students reached the stage of understanding the problem, 1 student at the stage of compiling, 4 students who reached the stage of implementing the plan but the student was still having problems with number 3 because the student did not write down on the answer sheet because the student was still having difficulty understanding the question, and 3 students who achieved seeing the results of their work but on question 3 the student number had not yet reached a re-examination because do not write on the answer sheet. This means that the problem ability of the eighth-grade students of SMP Terpadu Turen is still weak. Azzahra and Pujiastuti's research [16], results of this study indicate that the problem-solving ability of students in class X Social Sciences 3 SMAN 5 Serang City is still low. Research by Zakiyah et al. [17], the results of this study can find that students' problem-solving and mathematical reasoning abilities are low, while students' self-efficacy abilities are good.

Meanwhile, Hadi and Radiyatul [6], in this study concluded that the problem-solving method according to Polya can develop students' problem-solving abilities and there are differences in learning outcomes from the problem-solving method according to Polya on students' mathematical problem-solving abilities, the use of problem-solving methods according to Polya Polya can make student learning outcomes better. Research by Chotimah, Sari, and Zanthy [18], the results of the research as a whole show that the achievement of indicators of students' mathematical problem-solving abilities is still low. Research by Zakiyah, Hidayah, and Setiawan [19], shows that the mathematical problem-solving ability of class X students in West Bandung towards SPLTV material is relatively high, with a percentage of 79.868%.

The material for the Three-Variable Linear Equation System (Sistem Persamaan Linier Tiga Variabel - SPLTV) is one of the mathematics subject matters that is often in the form of stories because it is related to daily life [20], such as calculating the price of goods where the number of purchases is only known without knowing the unit price of the goods purchased. Therefore, students must have good problem-solving skills in order to be able to solve these problems.

The difference between the research that we are going to do and previous studies is that the research location will be carried out in Pameungpeuk District, Garut Regency, and the number of samples studied is 3 students. This study aims to determine the problem-solving ability of SMK students on the material of a three-variable system of linear equations.

Table 1. Student Classification Criteria

Classification	Criteria
79–100	High
56–78	Medium
35–56	Low

2 Research Method

This study used the descriptive qualitative method. Descriptive research aims to describe in full and in-depth the social reality that occurs [16]. Qualitative research, namely research that tends to use analysis. In qualitative research, what is more visible is the process and meaning (perspective subject) [21]. The subjects of this study were 3 students of South Garut Vocational School who had studied the material for the Three Variable Linear Equation System. The technique of taking the subject in this study used the purposive sampling technique. The classification criteria used in this study according to [22], are presented in Table 1.

The research on the mathematical problem-solving ability test was carried out in Cikelet District, Garut Regency on December 31, 2021. The instrument used in this study was a description test in the form of a mathematical problem-solving ability test consisting of 3 questions, interviews to determine each student's ability, and field notes. The data analysis technique used in this study consisted of three stages, namely data reduction, data presentation, and conclusion drawing. The following is an assessment sheet for students' mathematical problem-solving abilities according to Akbar et al. [23].

3 Result and Discussions

The researcher gave 3 Mathematical Problem-Solving Ability Test questions to 3 students of South Garut Vocational School. The results of students' problem-solving ability tests on the material of a three-variable linear equation system can be seen in Table 2.

Based on the test results, there are three classifications, namely S1 with a score of 97 including high classification, S2 with a value of 67 including medium classification, and S3 with a value of 43 including low classification. S1 which is included in the high classification is able to work on the ability to test questions of mathematical problems

Table 2. Classification of Mathematical Problem-Solving Ability Test Results

No	Student	Value	Classification
1	S1	97	Height
2	S2	67	Medium
3	S3	43	Low

properly and correctly according to the indicators, although there are slight errors it has no effect on the final results. S2 which is classified as being able to understand the problem, and plan a solution, but there are still mistakes in completing the settlement plan which greatly affects the final result and is still wrong in re-checking. Meanwhile, S3 which is classified as low is not able to solve problems properly and correctly. This can be seen from the discussion of each question of the students' mathematical problem-solving ability test as follows.

Based on Fig. 1, the results of the research on the problem-solving ability test in question number 1, it was revealed that in this study S1 and S2 could understand the problem well, while S3 could understand the problem but there was still something lacking, namely not mentioning what was asked, S1, S2, and S3 could planning the solution well, S1 can carry out the settlement plan well, while S2 carries out the settlement plan but there are still mistakes when eliminating equations 1 and 2 and S3 implementing the problem-solving plan is still wrong, S1 can re-check the results of the answers that are done well, while S2 and S3 are not correct in re-checking.

The results of interviews with high-ability students are as follows.

R: "What is known in the question?"
S1: "What is known in the question is that Sela bought 2 meatballs plus 1 chicken noodle and 1 orange juice for a total of Rp. 39,000. Then Resi bought 1 meatball plus 3 chicken noodles and 1 orange ice for a total of IDR 49,000. Then, Rima bought 1 meatball plus 1 chicken noodle and 1 orange juice for a total of IDR 28,000."
R: "What is asked in the question?"
S1: "What is being asked in the question is how much Rinjani has to pay if she buys 5 meatballs plus 2 chicken noodles and 3 orange juice."
R: "How do you model the problem?"
S1: "I assume that meatball is x, chicken noodle is y, and orange ice is z. Then, the first is $2x + y + z = 39,000$, the second $x + 3y + z = 49,000$, and the third $x + y + z = 28,000$. Of the three knowns, it is used as an equation of three variables.
R: "What are the steps taken in solving SPLTV contextual questions?"
S1: "First I eliminate equations 1 and 2 so as to produce the equation $x - 2y = -10000$, then eliminate 1 and 3 so as to produce the value $x = 11,000$, after that substitute the value of x into equation 4 so as to produce the value of $y = 10,500$, then substitute values of x and y to equation 3 and results in the value of $z = 6,500$. To find out what the total price that Rinjani has to pay is by substituting the values of x, y, and z into the equation $5x + 2y + 3z$."
R: "Did you double-check the steps and answers?"
S1: "Yes, I checked again."
R: "What is the conclusion from what you have done?"
S1: "According to the results of what I did, the total that Rinjani had to pay was Rp. 95,500."

Based on the results of the interview with S1 on question number 1, S1 can answer question number 1 correctly and S1 says that there is no difficulty in answering question number 1 given.

Based on what the researcher observed at the time of the study, S1 after being distributed the written test sheet immediately read the question, then worked on question
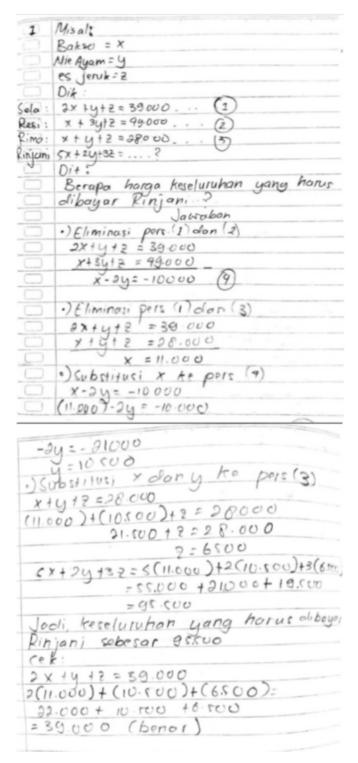
1 | Misal:
Bakso = x
Mie Ayam = y
es Jeruk = z
Dik :
Sela : 2x + y + z = 39000 ... (1)
Resi : x + 3y + z = 99000 ... (2)
Rima: x + y + z = 28000 ... (3)
Rinjani 5x + 2y + 3z = ... ?
Dit :
Berapa harga keseluruhan yang harus dibayar Rinjani...?

Jawaban
•) Eliminasi pers. (1) dan (2)
2x + y + z = 39.000
x + 3y + z = 99000 −
x - 2y = -10000 (4)

•) Eliminasi pers (1) dan (3)
2x + y + z = 39.000
x + y + z = 28.000
x = 11.000

•) Substitusi x ke pers (4)
x - 2y = -10 000
(11.000) - 2y = -10.000

-2y = -21000
y = 10500

•) Substitusi x dan y ke pers (3)
x + y + z = 28.000
(11.000) + (10500) + z = 28000
21.500 + z = 28.000
z = 6500

5x + 2y + 3z = 5(11.000) + 2(10.500) + 3(6500)
= 55.000 + 21000 + 19.500
= 95.500

Jadi, keseluruhan yang harus dibayar
Rinjani sebesar 95500

Cek :
2x + y + z = 39.000
2(11.000) + (10.500) + (6500) =
22.000 + 10.500 + 6.500
= 39.000 (benar)

Fig. 1. Example Answer No. 1 S1.

number 1, and when working on question number 1 S1 focused on working on the questions and answering the problems given carefully from starting to understand the problem, planning problem solving, carrying out the settlement plan to re-checking the answer number 1 that has been done.

Furthermore, the results of interviews with students with moderate abilities.

R: *"What is known in the question?"*
S2: *"What I read, what I know is that Sela bought 2 meatballs, 1 chicken noodle, and 1 orange juice for Rp. 39,000. Then Resi bought 1 meatball, 3 chicken noodles, and 1 orange ice at a price of IDR 49,000. Then, Rima bought 1 meatball, 1 chicken noodle, and 1 orange juice for Rp. 28,000."*
R: *"What is asked in the question?"*
S2: *"The value of $5x + 2y + 3z$."*
R: *"How do you model the problem?"*
S2: *"First, let me assume that meatballs $= x$, chicken noodles $= y$, and orange juice $= z$. Then make equations for 3 variables including $2x + y + z = 39000$, $x + 3y + z = 49000$, and $x + y + z = 28000$.*
R: *"What are the steps taken in solving SPLTV contextual questions?"*
S2: *"I use the method of elimination and substitution, first I eliminate equations 1 and 2 and produce the equation $x - y = 5000$ but I'm not sure about the answer. After that, I eliminated equations 2 and 3 and got the value of $y = 10,500$. Then, substitute equations 1 and 3 to get $x = 11,000$ and substitute x and y values into equation 2 to get $z = 6,500$."*
R: *"Did you double-check the steps and answers?"*
S2: *"Yes, I checked again and there are still doubts about the results because there are a few things that are not understood."*
R: *"What is the conclusion from what you have done?"*
S2: *So, the result of $5x + 2y + 3z = 95,500$."*

Based on the results of the interview with S2 on question number 1, S2 can answer question number 1 correctly, but in doing the elimination of equations 1 and 2 and in re-checking S2 is still unsure about the results he did.

Based on what the researcher observed at the time of the study, after being distributed the written test sheet he reads the questions repeatedly, after reading them over and over and then working on question number 1, and when working on question number 1 S2 shows a face of the doubt after eliminating equations 1 and 2 as well as in re-checking, and S2 answered the problems given carelessly when eliminating equations 1 and 2 as well as at the time of re-checking.

Then, the results of interviews with low-ability students.

R: *"What is known in the question?"*
S3: *"Sela bought 2 portions of meatballs + 1 pack of chicken noodles + 1 orange juice. Rishi bought 1 portion of meatballs + 3 packs of chicken noodles + 1 glass of orange juice. Rima bought 1 portion of meatballs + 1 pack of chicken noodles + 1 glass of orange ice."*
R: *"What is asked in the question?"*
S3: *"The total price that Rinjani has to pay, but I did not write down what was asked during the written test."*
R: *"How do you model the problem?"*
S3: *"I am modelling on 3 equations, namely $2x + y + z = 39,000$, $x + 3y + z = 49,000$, and $x + y + z = 28,000$."*
R: *"What are the steps taken in solving SPLTV contextual questions?"*

S3: "By eliminating equations 1 and 2 and producing a value of y, which is 44, then eliminating equations 1 and 3 and producing x, which is 11,000. After that, I didn't continue solving the problem because I didn't know how to solve it anymore."
R: "Did you double-check the steps and answers?"
S3: "Yes, I checked it but I think my answer is wrong."
R: "What is the conclusion from what you have done?"
S3: "So, if Rinjani buys the whole thing, then he has to pay a price of IDR 37,000."

Based on the results of the interview with S3 on question number 1, S3 cannot answer question number 1 correctly because S3 does not know how to solve it, S3 is only able to understand the problem and plan problem-solving.

Based on what the researcher observed at the time of the study, after being distributed the written test sheet he read the questions many times and felt insecure in doing it so there were a lot of left and right lyrics when he worked on question number 1, S3 wrote down what he knew but still didn't know. right without writing down what was asked, and S3 wrote the completion plan but S3 was wrong in completing the problem-solving plan and re-checking the answers that were done.

Based on Fig. 2, the results of the research on the problem-solving ability test in question number 2, it was revealed that in this study S1 and S3 could understand the problem well, while S2 was not right in writing what was known, S1 and S2 could plan a solution well, while S3 planned a solution but not correct, S1 can carry out the completion plan well, while S2 completes the problem planning but is still wrong and S3 completes the completion plan but it is not right, S1 can re-check the results of the

Fig. 2. Example Answer No. 2 S2.

answers that are done well, while S2 is not right at the time of checking back and S3 is not rechecked.

The results of interviews with high-ability students are as follows.

R: *"What is known in the question?"*
S1: *"According to what I read, Saskia bought 2 books plus 1 pencil and 1 eraser for a total of Rp. 4,700. Raihan bought 1 book plus 2 pencils and 1 eraser for a total of IDR 4,300. Then, Yasmin bought 3 books plus 2 pencils and 1 eraser for a total of IDR 7,100."*
R: *"What is asked in the question?"*
S1: *"How much is the price for 1 notebook, 1 pencil, and 1 eraser."*
R: *"How do you model the problem?"*
S1: *"I assume the book is x, the pencil is y, and the eraser is z. Then, the first is $2x + y + z = 4,700$, the second $x + 2y + z = 4,300$, and the third is $3x + 2y + z = 7,100$. Of the three knowns, it is used as an equation of three variables.*
R: *"What are the steps taken in solving SPLTV contextual questions?"*
S1: *"First eliminate equations 1 and 2 so as to produce the equation $x - y = 400$, then eliminate 2 and 3 so as to produce the value $x = 1,400$, after that substitute the value of x into equation 4 so as to produce the value of $y = 1,000$, then substitute the value of x and y to equation 3 and yields a value of $z = 900$."*
R: *"Did you double-check the steps and answers?"*
S1: *"Yes, I checked again."*
R: *"What is the conclusion from what you have done?"*
S1: *"So, according to the results I worked on, the price of 1 book was Rp. 1,400, the price of 2 pencils was Rp. 1000 and the price of 2 erasers were Rp. 900."*

Based on the results of the interview with S1 on question number 2, S1 can answer question number 1 correctly and S1 says that there is no difficulty in answering the question number 1 given.

Based on what the researcher observed at the time of the study, S1 immediately read question number 2 and worked on it, when working on question number 2 S1 focused on working on the questions and answering the problems given carefully from understanding the problem, planning problem solving, implementing a settlement plan to re-checking answer number 2 that has been done.

Furthermore, the results of interviews with students with moderate abilities.

R: *"What is known in the question?"*
S2: *"In the question, it is known that Saskia paid Rp. 4,700, Raihan paid Rp. 4,300 and Yasmin paid Rp. 7,100."*
R: *"What is asked in the question?"*
S2: *"The price of each item."*
R: *"How do you model the problem?"*
S2: *"First, let me assume that notebook = x, pencil = y and eraser = z. Then make equations for 3 variables including $2x + y + z = 4,700$, $x + 2y + z = 4,300$, and $3x + 2y + z = 7,100$."*
R: *"What are the steps taken in solving SPLTV contextual questions?"*

S2: "At first I was confused in working on the problem, but I tried my best and I eliminated equations 1 and 2 and produced equation 4, namely x - y = 400, then eliminated equations 2 and 1 and produced the value of x, which is 1600, after that, I substituted the value of x into equation 4 so that the value of y = 1200 and substituted the value of x, y into equation 2 and got the value of z = 300."
R: "Did you double-check the steps and answers?"
S2: "Yes."
R: "What is the conclusion from what you have done?"
S2: "So, the price of 1 book = 1600, 1 pencil = 1200 and 1 eraser 300. But at the time of the written test, I did not conclude what I was doing."

Based on the results of the interview with S2 on question number 2, S2 can answer question number 2, but in working on solving the problem S2 feels confused but is still trying to do it and S2 does not simulate the results that are done.

Based on what the researchers observed during the research, S2 immediately read question number 2 over and over again and then worked on it, when working on question number 2 S2 showed a confused face but S2 kept trying to do it and S2 answered the problems given carelessly from starting to carry out the completion plan until re-checking the answer number 2 that has been done.

Then, the results of interviews with low-ability students.

R: "What is known in the question?"
S3: "Saskia bought 2 notebooks + 1 pencils + 1 eraser for Rp. 4,700. Raihan bought 1 notebook + 2 pencils + 1 eraser for Rp. 4,300. Yasmin bought 3 notebooks + 2 pencils + 1 eraser for IDR 7,100."
R: "What is asked in the question?"
S3: "How much is the price for 1 notebook, 1 pencil, and 1 eraser."
R: "How do you model the problem?"
S3: "I am modeling 3 equations, namely 2x + y + z = 4,700, x + 2y + z = 4,300, and 3x + y + z = 7,100."
R: "What are the steps taken in solving SPLTV contextual questions?"
S3: "The first step is to eliminate equations 1 and 2 so that we get the results of the equation 3x + 3y + z = 9,000, then eliminate equations 1 and 3 by getting the result of the x value, which is 2,400. After that, 4,700 minus 200, which is 4,500."
R: "Did you double-check the steps and answers?"
S3: "I did not check."
R: "What is the conclusion from what you have done?"
S3: "So, the price of 1 notebook + 1 pencil + 1 eraser is paid at Rp. 4,500."

Based on the results of the interview with S3 on question number 2, S3 can answer question number 2 but S3 is not confident in answering it, S3 is able to understand the problem, plan problem solving, solve problems, and re-check the results that have been done but are still wrong.

Based on what the researchers observed at the time of the study, S3 immediately read question number 2 many times and then worked on it, when working on question number 2 S3 felt difficult so S3 was nervous and S3 answered the problems given by starting from carrying out the completion plan to re-checking the answers. number 2 which has been done.

Fig. 3. Example Answer No. 3 S3.

Based on Fig. 3, the results of the research on the problem-solving ability test in question number 3, it was revealed that in this study S1 and S2 could understand the problem well, while S3 stated what was known and asked but was not correct, S1 could plan a solution, but in writing the elimination of equation 1 to -2 incorrectly should substitute equation 2 to 1 while S2 is able to plan problem solving correctly and S3 does not plan a solution, S1 can carry out the settlement plan well, while S2 and S3 solve the problem but are still wrong, S1 can re-check the results of the answers that are done well, while S2 and S3 did not check again.

The results of interviews with high-ability students are as follows.

R: "What is known in the question?"
S1: "The length of the three kaput threads is 280 cm. The length of the black thread is 10 cm less than the brown thread, meaning the length of the brown thread is reduced by 10 cm. The length of the brown thread is 25 cm more than the white thread, that means the white thread is added by 25 cm."
R: "What is asked in the question?"
S1: "What is the remaining length of the brown thread if it is 20 cm long."
R: "How do you model the problem?"
S1: "I assume the white thread is x, the black thread is y, and the brown thread is z. Then, the first known $x + y + z = 280$, the second $y = z - 10$, and the third $z = + 25$. From the three known equations, three variables are used."
R: "What are the steps taken in solving SPLTV contextual questions?"
S1: "Eliminates equations 1 to 2 so as to produce the equation $x + 2z = 290$, then substitute y and z into equation 1 so as to produce equation $2x + z = 265$. After that, eliminate the 4th equation to get the value of $z = 105$ Then, substitute z into equation 2 to get the value $y = 95$. Substitute y and z into equation 1 and get $x = 80$."

R: *"Did you double-check the steps and answers?"*
S1: *"Yes, I checked again."*
R: *"What is the conclusion from what you have done?"*
S1: *"So, the remaining brown thread if you use 20 is the length of the brown thread 105 - 20 = 85 cm."*

Based on the results of interviews with S1 on question number 3, S1 can answer question number 3, S1 is able to understand the problem, plan problem solving, solve problems, and re-check the results that have been done.

Based on what the researchers observed at the time of the study, S1 immediately read the questions, then worked on question number 3, and when working on question number 3 S1 focused on working on the questions and answering the problems given but not being careful in writing eliminations 1 and 2 should substitute equation 2 into -1 but has no effect on the calculation, S1 understands the problem, plans problem-solving, implements a settlement plan to re-check the answer number 1 that has been done.

Furthermore, the results of interviews with students with moderate abilities.

R: *"What is known in the question?"*
S2: *"The total length of white, black, and brown threads is 280 cm. The length of the black thread is 10 cm less than the brown thread. The brown thread is 25 cm longer than the white thread."*
R: *"What is asked in the question?"*
S2: *"How long will the brown thread remain if it is 20 cm long."*
R: *"How do you model the problem?"*
S2: *"I assume x as white thread, y as black thread, and z as brown thread."*
R: *"What are the steps taken in solving SPLTV contextual questions?"*
S2: *"I substituted equations 2 and 3 into equation 1 and got a z-value, which is 157.5, but I'm not sure how to solve the problem I'm working on."*
R: *"Did you double-check the steps and answers?"*
S2: *"I did not re-check the steps or answers."*
R: *"What is the conclusion from what you have done?"*
S2: *"So, if you have used 20 cm of brown thread, then what is left is 137.5."*

Based on the results of the interview with S2 on question number 3, S2 can answer question number 3, but in working on the completion of S2 is not sure about the answer that is done.

Based on what the researchers observed at the time of the study, S2 immediately read question number 3 over and over again and then worked on it, when working on question number 3 S2 showed a confused face but S2 kept trying to do it and S2 answered the problems given carelessly from starting to carry out the settlement plan until re-checking the answer number 2 that has been done.

Then, the results of interviews with low-ability students.

R: *"What is known in the question?"*
S3: *"Raisa has white, black, and brown kaput threads, the number of threads is 280 cm. The length of the black thread is 10 cm, the brown is 25, and the white is 20 cm."*
R: *"What is asked in the question?"*
S3: *"How much is the remaining brown thread."*

R: "How do you model the problem?"
S3: "I don't know and find it difficult to model question number 3."
R: "What are the steps taken in solving SPLTV contextual questions?"
S3: "I can't solve problem number 3, but I try to do it by adding up the lengths of black and brown threads and it produces 35 cm, then the length of the black thread is 10 minus 20 the length of the white thread and the result is – 10. After that, 35 cm – 10cm = 25cm."
R: "Did you double-check the steps and answers?"
S3: "I didn't check again."
R: "What is the conclusion from what you have done?"
S3: "So, the remaining brown thread is 25 cm."

Based on the results of the interview with S3 on question number 3, S3 can answer question number 3 but by not being sure of the answer it gives, S3 is not able to understand the problem, plan problem solving, solve problems, and re-check the results that have been done but are still wrong.

Based on what the researcher observed at the time of the study, S3 immediately read question number 3 many times and then did it from scratch, when working on question number 3, S3 found it difficult so S3 was nervous and S3 answered the problems given by origin from starting to carry out the completion plan until the end. recheck answer number 2 that has been done.

In line with several previous studies students with high abilities in their schools have high mathematical problem-solving abilities [24, 25], when compared to other students. This shows that there is a positive relationship between students' abilities in school and their mathematical problem-solving abilities, namely: the lower the ability of students in their schools, the lower their mathematical problem-solving abilities [26].

4   Conclusion

The conclusion of this study is that high-ability students were able to complete all mathematical problem-solving ability test questions well according to the indicators with a score of 97. In contrast, moderately capable students were able to solve all questions. However, there were still mistakes in each question with a score of 67, and students those with low ability did all the test questions but there were still many mistakes and not all indicators were met with a score of 43. The benefit of this research is to be used as reference material for further research. The suggestions to be conveyed are: (1) To improve students' mathematical problem-solving skills, teacher readiness is needed in guiding students and compiling LKS as discussion material to make it easier for students to learn the material being taught; (2) For students, it is recommended to increase the number of practice questions and be more active in learning, so that they can improve their mathematical problem-solving abilities.

References

1. R. Capuno, R. Necesario, J. O. Etcuban, R. Espina, G. Padillo, R. Manguilimotan. Attitudes, Study Habits, and Academic Performance of Junior High School Students in Mathematics. International Electronic Journal of Mathematics Education, vol. 14, no 3, 2019, pp. 547–61.

2. F. J. Ibrokhimovich. Application Of Some Teaching Methods in Mathematics Lessons in Elementary Grades. Journal of Pedagogical Inventions and Practices, vol. 5, 2022, pp. 15–7.

3. Y. Chevallard, M. Bosch. Didactic transposition in mathematics education. Encyclopedia of mathematics education, 2020, pp. 214–8.

4. R. P. Permatasari, E. A. Afriansyah. Kendala orang tua dalam mendampingi siswa ditinjau dari hasil belajar matematika secara online. PowerMathEdu: Jurnal Inovasi Pembelajaran Matematika, vol. 1, no. 1, 2022, pp. 27–36.

5. I. N. A. Khadijah, R. Maya, & W. Setiawan. Analisis kemampuan komunikasi matematis siswa smp pada materi statistika. JPMI: Jurnal Pembelajaran Matematika Inovatif, vol. 1, no. 6, 2018, pp. 1095–104.

6. S. Hadi, Radiyatul. Metode Pemecahan Masalah Menurut Polya Untuk Mengembangkan Kemampuan Siswa Dalam Pemecahan Masalah Matematis Di Sekolah Menengah Pertama. EDU-MAT: Jurnal Pendidikan Matematika, vol. 2, no. 1, 2014, pp. 53–61.

7. N. Akben. Effects of the problem-posing approach on students' problem-solving skills and metacognitive awareness in science education. Research in Science Education, vol. 50, no. 3, 2020, pp. 1143–65.

8. P. Lestari, R. Rosdiana. Kemampuan Pemecahan Masalah Matematika Siswa Melalui Model Pembelajaran Learning Cycle 7E dan Problem Based Learning. Mosharafa: Jurnal Pendidikan Matematika, vol. 7, no. 3, 2018, pp. 425–32.

9. K. Ulger. The effect of problem-based learning on the creative thinking and critical thinking disposition of students in visual arts education. Interdisciplinary Journal of Problem-Based Learning, vol. 12, no. 1, 2018.

10. E. A. Afriansyah, T. Herman, Turmudi, J. A. Dahlan. Critical thinking skills in mathematics. In Journal of Physics: Conference Series, vol. 1778, no. 1, 2021, p. 012013.

11. R. F. Sari, E. A. Afriansyah. Kemampuan Berpikir Kreatif Matematis dan Belief Siswa pada Materi Persamaan dan Pertidaksamaan Linear. Plusminus: Jurnal Pendidikan Matematika, vol. 2, no. 2, 2022, pp. 275–88.

12. R. Astutiani, Isnarto, I. Hidayah. Kemampuan Pemecahan Masalah Matematika dalam Menyelesaikan Soal Cerita Berdasarkan Langkah Polya. Seminar Nasional Pascasarjana, 2019.

13. L. Verschaffel, S. Schukajlow, J. Star, W. Van Dooren. Word problems in mathematics education: A survey. ZDM, vol. 52, no. 1, 2020, pp. 1–6.

14. J. G. Greeno. Some examples of cognitive task analysis with instructional implications. In Aptitude, learning, and instruction, 2021, pp. 1–22. Routledge.

15. T. Yuwono, M. Supanggih, R. D. Ferdiani. Analisis Kemampuan Pemecahan Masalah Matematika dalam Menyelesaikan Soal Cerita Berdasarkan Prosedur Polya. Jurnal Tadris Matematika, vol. 1, no. 2, 2018, pp. 137–44. DOI: https://doi.org/10.21274/jtm.2018.1.2.137-144

16. R. H. Azzahra, H. Pujiastuti. Analisis Kemampuan Pemecahan Masalah Siswa Pada Materi Sistem Persamaan Linear Tiga Variabel. Transformasi: Jurnal Pendidikan Matematika Dan Matematika, vol. 4, no. 1, 2020, pp. 153–62.

17. S. Zakiyah, S. H. Imania, G. Rahayu, W. Hidayat. Analisis Kemampuan Pemecahan Masalah dan Penalaran Matematika Serta Self-Efficacy Siswa SMA. Jurnal Pembelajaran Matematika Inovatif, vol. 1, no. 4, 2018, pp. 647–56.

18. S. Chotimah, I. P. Sari, L. S. Zanthy. Analisis Kemampuan Pemecahan Masalah Matematika Siswa SMP pada Materi Kubus dan Balok. Jurnal Ilmiah P2M STKIP Siliwangi, vol. 6, no. 2, 2019, 1–4.

19. S. Zakiyah, W. Hidayat, & W. Setiawan. Analisis Kemampuan Pemecahan Masalah dan Respon Peralihan Matematik dari SMP ke SMA pada Materi SPLTV. Mosharafa: Jurnal Pendidikan Matematika, vol. 8, no. 2, 2019, pp. 227–38.

20. L. Rani, S. Maarif. Development E-Module Three Variables Linear Equations System Based On Mathematic Communication. Journal of Medives: Journal of Mathematics Education IKIP Veteran Semarang, vol. 5, no. 2, 2021, pp. 377–89.

21. S. Mariam, E. E. Rohaeti, R. Sariningsih. Analisis Kemampuan Pemecahan Masalah Matematis Siswa Madrasah Aliyah pada Materi Pola Bilangan. Journal On Education, vol. 01, no. 02, 2018, pp. 156–62.

22. H. Zulfitri, N. Aisyah, Indaryanti. Analisis Kemampuan Pemecahan Masalah Matematika Setelah Pembelajaran dengan Pendekatan MEAs pada Materi Sistem Persamaan Linier Tiga Variabel. Jurnal Gantang, vol. 4, no. 1, 2019, pp. 7–13.

23. P. Akbar, A. Hamid, M. Bernard, A. I. Sugandi. Analisis Kemampuan Pemecahan Masalah dan Disposisi Matematik Siswa Kelas XI SMA Putra Juang dalam Materi Peluang. Journal Cendekia: Jurnal Pendidikan Matematika, vol. 2, no. 1, 2018, pp. 144–153.

24. S. Z. Sholihah, E. A. Afriansyah. Analisis kesulitan siswa dalam proses pemecahan masalah geometri berdasarkan tahapan berpikir Van Hiele. Mosharafa: Jurnal Pendidikan Matematika, vol. 6, no. 2, 2017, pp. 287–98.

25. D. Zhou, X. Du, K. T. Hau, H. Luo, P. Feng, J. Liu. Teacher-student relationship and mathematical problem-solving ability: mediating roles of self-efficacy and mathematical anxiety. Educational Psychology, vol. 40, no. 4, 2020, pp. 473–89.

26. M. Öztürk, Y. Akkan, A. Kaplan. Reading comprehension, Mathematics self-efficacy perception, and Mathematics attitude as correlates of students' non-routine Mathematics problem-solving skills in Turkey. International Journal of Mathematical Education in Science and Technology, vol. 51, no. 7, 2020, pp. 1042–58.

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Publication

50 Patresya Nova Mainake, Christina M. Laamena, Magy Gaspersz. "Penggunaan Model Problem Based Learning (PBL) untuk Meningkatkan Hasil Belajar Siswa", Edumatica : Jurnal Pendidikan Matematika, 2021

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