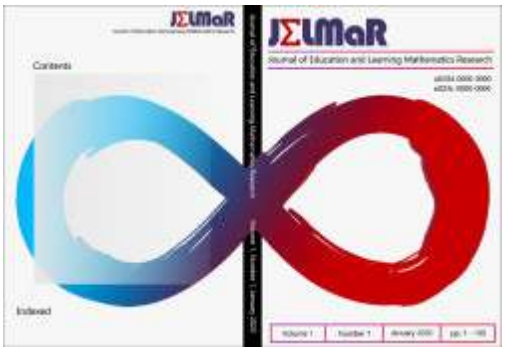

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Transforming Mathematical Problem Solving Through AI Tools: An Investigation of Photomath Integration in Problem-Based Learning

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***Abstract**: This study aims to determine the ability of problem solving through Problem Based Learning (PBL) on the material of the Three Variable Linear Equation System (SPLTV) assisted by Photomath. This research is qualitative descriptive research. The subjects of this research were students of class X SMA Srijaya Negara Palembang. Data collection was carried out using test, interview, and observation methods. Analysis of test data was carried out by describing the subject's ability in problem solving, and for data analysis, interviews and observations were carried out by data reduction. interviews and observations were done by data reduction, data presentation and conclusion drawing. The results showed that the subject's problem-solving ability was the subject's problem-solving ability is quite good by applying Problem Based Learning on SPLTV material assisted by Photomath can develop students' problem-solving skills. This can be seen from the students can understand the problem in the problem, make a mathematical model, solve the problem using Photomath, compile the answer conclusion from the steps that have been done and recheck the answer using Photomath.*
Keyword: problem solving skills, PBL, SPLTV, photomath

INTRODUCTION

Mathematical problem-solving skills are processes and strategies used by students (Ukobizaba et al., 2021), to find solutions or solutions to a problem to obtain the result or answer to the problem (Fatqurhohman, 2021), by applying their skills and knowledge (Faradiba & Alifiani, 2020). Problem-solving skills are very important for every student to have because they are the general purpose of teaching mathematics, including methods, procedures and strategies that are the core and main processes in the mathematics curriculum, and are the basic skills in learning mathematics and problem-solving skills help students think analytically in making decisions in daily life and help improve thinking skills critical in facing the new situation (Rahman, 2019).

However, in fact, problem-solving skills are still low because during the learning process students are inactive so that students find it difficult to understand the problems presented (Sakir & Kim, 2020), the results of the study (Nuraeni et al., 2020) show that 50.00% of students have problem-solving skills with a low category, students write what they know but do not write what is asked, Students can make a settlement plan and implement the settlement plan in accordance with procedures and can simplify the problem, but there are still students who make mistakes in calculating, and students do not check the answers again. In the SPLTV material, students also have low problem-solving skills because students are confused when modeling, eliminating repetitive ones and do not know the types of problems that have a solution and do not have a solution.

The cause of students' low mathematical problem-solving skills is due to the choice of inappropriate learning approaches or models, where teachers tend to use monotonous approaches or models with a teacher-centered learning focus (Tsegaw et al., 2021). The low ability of students in solving mathematical problems is not only caused by a lack of understanding of problems, but also due to the low interest in learning during the learning process (Lumbantoruan, 2022).

One of the learning models that can be used to develop problem-solving skills is Problem Based Learning. Problem Based Learning is a learning model that involves students in solving problems in context (Wulandari, 2024), a learning model that uses real problems encountered in the environment as a basis to gain knowledge and concepts through critical thinking and problem-solving skills (Berlian et al., 2023), the PBL learning model directs students to work independently using various learning resources.

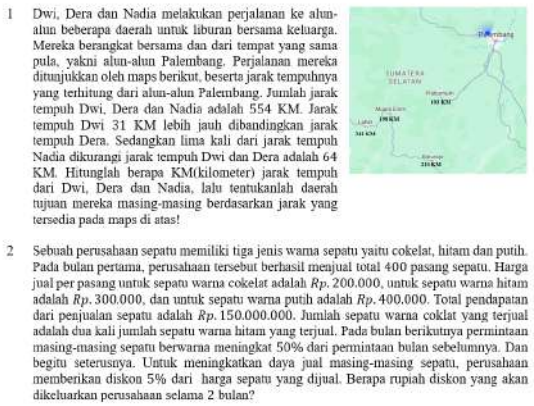
Along with technological advances that have brought about major changes in daily life. One of the changes is the use of Artificial Intelligence (AI). AI is a software or computer program that has a mechanism to learn, and use that knowledge to make decisions like humans do (Sajja, 2021). One of the AIs that can be used in math lessons, especially in SPLTV materials, is Photomath. Photomath provides various methods of solving SPLTV problems ranging from elimination, substitution, Cramer and Gauss-Jordan. With the completion of these various methods, students will have a deeper understanding of concepts such as variable substitution, elimination, and matrix manipulation used to solve SPLTV problems.

Previously, research on problem solving had been carried out (Saputra et al., 2023), but in previous research, two-variable linear equation system material was used, and did not use AI, so researchers were very interested in conducting research using three-variable linear equation system material with the help of Photomath. This research is titled "Problem Solving Ability Through Problem Based Learning on Photomath-Assisted SPLTV Material". Therefore, the purpose of this study is to determine the ability to solve problems through Problem Based Learning (PBL) in the material of the Three-Variable Linear Equation System assisted by Photomath. After conducting problem-based learning assisted by Photomath, students are expected to be able to understand the problem, prepare a solution plan, carry out the solution and check the answers.

METHOD

This research is a descriptive type of research with qualitative and quantitative approaches. This study aims to describe the ability of students to solve problems through Photomath in SPLTV questions using the PBL learning model. The research subjects consisted of 33 people with varying abilities, namely high, medium and low. This research was carried out in the 2024/2025 school year at Srijaya State High School, Palembang.

Data collection techniques are observation, tests and interviews. This observation uses an observation sheet instrument, the test will take place after the learning process, then the interview from the test results the researcher will find out the problem-solving ability when solving SPLTV questions. The test questions given are in the form of 2 questions related to the indicator of problem-solving ability of the three-variable linear equation system. The following are the test questions used in the research, namely:



1 Dwi, Dera dan Nadia melakukan perjalanan ke alun-alun beberapa daerah untuk liburan bersama keluarga. Mereka berangkat bersama dan dari tempat yang sama pula, yakni alun-alun Palembang. Perjalanan mereka ditunjukkan oleh maps berikut, beserta jarak tempuhnya yang terhitung dari alun-alun Palembang. Jumlah jarak tempuh Dwi, Dera dan Nadia adalah 554 KM. Jarak tempuh Dwi 31 KM lebih jauh dibandingkan jarak tempuh Dera. Sedangkan lima kali dari jarak tempuh Nadia dikurangi jarak tempuh Dwi dan Dera adalah 64 KM. Hitunglah berapa KM(kilometer) jarak tempuh dari Dwi, Dera dan Nadia, lalu tentukanlah daerah tujuan mereka masing-masing berdasarkan jarak yang tersedia pada maps di atas!

2 Sebuah perusahaan sepatu memiliki tiga jenis warna sepatu yaitu cokelat, hitam dan putih. Pada bulan pertama, perusahaan tersebut berhasil menjual total 400 pasang sepatu. Harga jual per pasang untuk sepatu warna cokelat adalah *Rp*. 200.000, untuk sepatu warna hitam adalah *Rp*. 300.000, dan untuk sepatu warna putih adalah *Rp*. 400.000. Total pendapatan dari penjualan sepatu adalah *Rp*. 150.000.000. Jumlah sepatu warna coklat yang terjual adalah dua kali jumlah sepatu warna hitam yang terjual. Pada bulan berikutnya permintaan masing-masing sepatu berwarna meningkat 50% dari permintaan bulan sebelumnya. Dan begitu seterusnya. Untuk meningkatkan daya jual masing-masing sepatu, perusahaan memberikan diskon 5% dari harga sepatu yang dijual. Berapa rupiah diskon yang akan dikeluarkan perusahaan selama 2 bulan?

Figure 1. Test Questions

The quantitative data was obtained from the results of the written test as a reference to categorize students' problem-solving abilities in the material of the three-variable linear equation system. The following are the categories of problem-solving skills.

Table 1. Categories Problem-Solving Skills

Value	Category
$81 \leq x < 100$	Excellent
$61 \leq x < 80$	Good
$41 \leq x < 60$	Enough
$21 \leq x < 40$	Less
$0 \leq x < 20$	Very Less

(Purwaningsih & Ardani, 2020)

Quantitative data is used as a reference to select subjects from each category. The researcher makes the categorization by setting the criteria first. This study selects subjects that meet 3 criteria, namely written test results based on categories, students' willingness and teacher recommendations. Then for qualitative data obtained from observations and interviews based on indicators of problem-solving skills, from the data the researcher will describe the results.

RESULT AND DISCUSSION

The research was conducted in three meetings, consisting of two meetings for problem-based learning with the help of AI Photomath, and the last meeting for test activities. The learning stage consists of five stages of problem-based learning, namely student orientation to problems, organizing students to learn, guiding individual/group experiences, developing works and analyzing and evaluating the problem-solving process. The learning activities in each learning are illustrated in each of the following stages.

1. Orientation of students to problems

Student orientation activities to problems are carried out with the aim that students are able to identify problems in contextual problems in the form of known and asked, present problems in the form of mathematical models on contextual problems, identify whether the problem has a solution, solve problems using the chosen method, present conclusions from the problem, re-evaluate the answers that have been obtained. The following are the problems at the LKPD meeting 1.

Figure 2. Problems in LKPD Meeting 1

2. Organizing learners to learn

After providing examples of problems and opportunities to ask students, the researcher then asked students to form groups according to the division that had been determined. After that, the researcher distributed the LKPD meeting 1 to each group to be worked on together through group discussions.

Figure 3. Group Discussion and Usage *Photomath* In LKPD 1

Students work on LKPD meeting 1 by discussing with the group. During the LKPD work, students use Photomath to solve problems and the researcher provides guidance or guidance to students if they do not understand what is meant by the problem.

3. Mentoring individual/group experiences

The researcher gave time to all groups to work on the LKPD. Furthermore, the researcher guides students to identify problems in the questions. In the first step, students are guided to discuss in identifying problems in the problem. At this stage, students must write down what they know and ask in the question. At this stage, students are trained to understand the problem. The following are the results of the answers from the students.

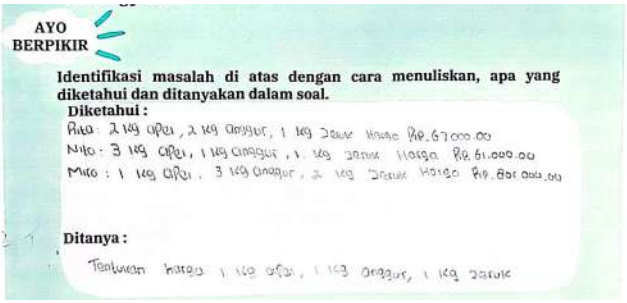


Figure 4. Answer to Question No.1 on the Problem Understanding Indicator

In picture 4, students write what is known by making from each fruit that Rita, Nita and Mira bought. Next, students make what they are asked. It can be seen from the results of the students' answers that the entire group has been able to identify problem 1.

In the next step, students are directed to make reasoning and mathematical models from problems. At this stage, it is in line with the indicators of preparing a completion plan. At this stage, students discuss in groups to make mathematical models so that they form equations. The following are the students' answers.

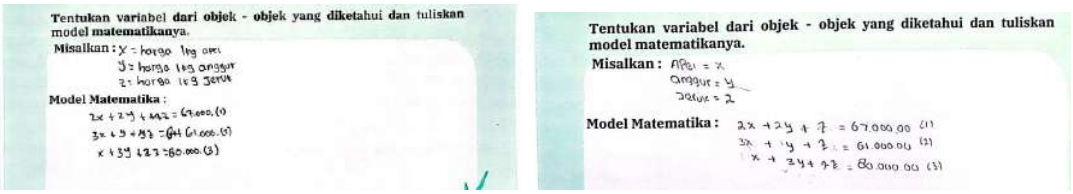


Figure 5. Answer to Question No.1 on the Indicator of Developing a Completion Plan

In figure 5 (a) the learners have made the right judgement, that is, *x* is the price of 1 kg of apples, *y* is the price of 1 kg of grapes and *z* is the price of 1 kg of oranges. However, in figure 5 (b) there are still learners who are less precise when making a memorization. The memorization made is in the form of x in the form of apples, y in the form of grapes and z in the form of oranges, learners do not add the word price of 1 kg. Nevertheless,

learners have been able to make modelling from problem one, namely $2x + 2y + z = 67.000, 3x + y + z = 61.000$ and $x + 3y + 2z = 80.000$. However, there are still learners who write the number 1 as a coefficient, it can be seen in Figure 5 (a) learners make with $2x + 2y + 1z = 67.000$.

Furthermore, the researcher directed students to use the Photomath application to find out if the problem had a solution, did not have a solution or had many solutions. The students were very enthusiastic when the researcher explained how to use Photomath. There was one student who asked if the Photomath application could solve the story problem without having to model it, so the researcher replied that the story problem could not be solved directly using Photomath, you had to make modeling first. After the researcher answered the question, the students proved by trying to do it by taking pictures of the questions in the LKPD, and it was proven that it could not be solved.

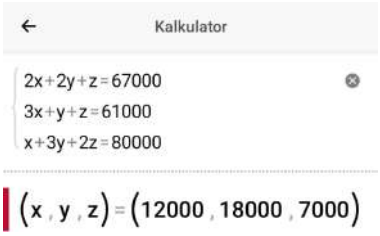
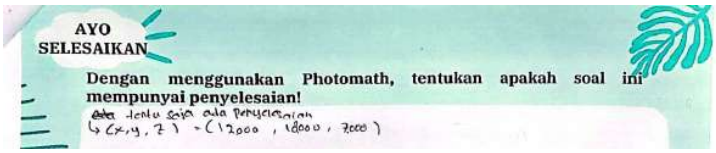


Figure 6. Result *Photomath* On Problem 1

In the picture above is the result of problem 1, namely $(x, y, z) = (12000, 18000, 7000)$ meaning x is 12000, y is 18000 and z is 7000). Here are the answers from students.



Picture 7. Answer to Question No.1 on Use *Photomath*

At this stage learners have been able to understand that this problem has a solution. In this section the answers from learners vary, namely in the first group writing has a solution, the second group writing yes this problem has a solution and the third group writing of course there is a solution $(x, y, z) = (1200, 1800, 7000)$. In the third group wrote the results in the Photomath application.

In order not to make them dependent, the researcher teaches students a coefficient comparison, so that they know why the problem has a solution, many solutions or no solutions. To prove that the problem does have a solution, students must prove it by using a coefficient comparison.

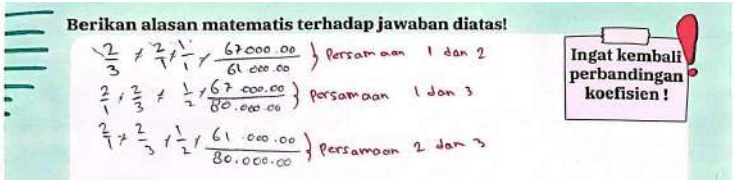


Figure Picture 8. Answer to Question No.1 on Coefficient Comparison

In the figure above, students make a comparison of coefficients starting from equations 1 and 2, then 1 and 3, then 2 and 3. The result of the coefficient comparison is that the sign is not the same as so that this problem has an exact solution. (≠)All groups were able to make a comparison of the coefficients of problem 1.

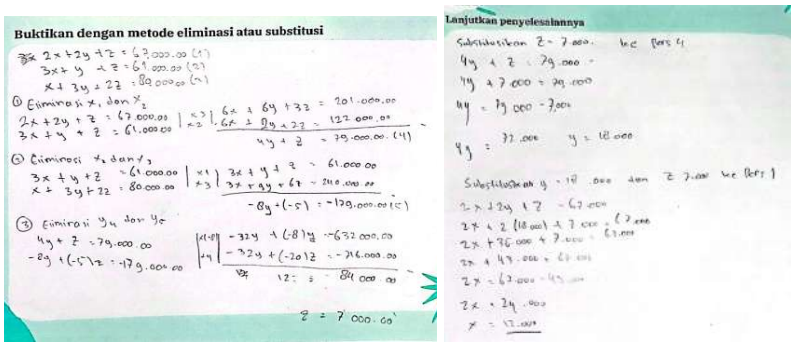


Figure 9. Answer to Question No.1 on the Indicator of Implementing Completion

The researcher asked students to observe the completion steps in the Photomath application starting from choosing the method to be used. At this stage it is in line with the indicator of implementing the solution. In the picture above the learners solve the problem using the combined method. In problem 1 the first step learners take is to eliminate x from equations 1 and 2 to get equation 4, then eliminate x from equations 2 and 3 to get equation 5, then eliminate y from equations 4 and 5 to get the value of z, after getting the value of z learners substitute it into equation 4 to get the value of y, and the last step learners substitute the values of y and z into equation 1 to get the value of x. However, there is one group that does not solve the problem. However, there was one group that did not solve problem 1.

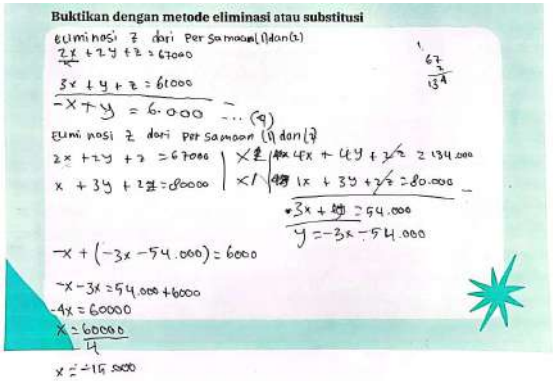


Figure 10. The answer to question No.1 on the indicator of implementing the settlement is not right

In the picture above the learners solve the problem using the combined method. In problem 1, the first step learners take is to eliminate z from equations 1 and 2 to get equation 4, namely $-x + y = 6.000$, then eliminate z from equations 1 and 3 to get $3x + y = 54.000$. Furthermore, participants subtracted $3x$ in both segments so that it became $y = 3x - 54.000$, but the learner made a mistake he made -54.000 should be $y = 3x + 54.000$. Then substitute the value of y into equation 4 to get the value of $x = 15.000$. Because at the beginning there was a mistake so that it got inappropriate results. Learners do not continue solving because the results obtained do not match those in Photomath.

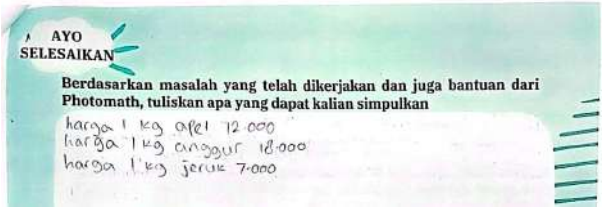


Figure 11. Answer to Question No.1 Making a Conclusion

Furthermore, students are directed to make conclusions. At this stage it is in line with the indicator of rechecking the answer. In problem 1, students make conclusions by writing down the price of 1 kg of fruit then students enter the price, namely the price of 1 kg of apples 12.000, the price of 1 kg of grapes 18.000 and the price of 1 kg of oranges 7.000. But there are also learners who misunderstand when making conclusions, it can be seen from the picture below.

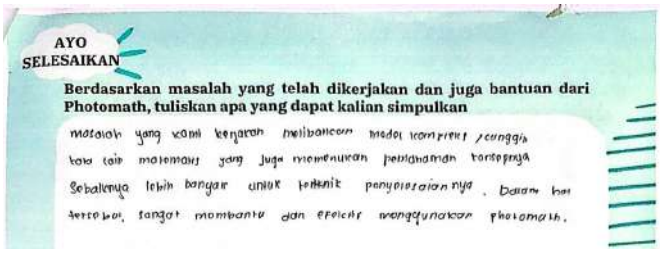


Figure 12 .Answer to Question No.1 Making Incorrect Conclusions

This student misinterpreted the statement. Students comment on the learning carried out while instructed is to make conclusions. Students wrote "the problem we are working on involves a computer/advanced model, in other words, mathematics that also finds an understanding of the concept. It is better to have more for the solving technique, in which case it is very helpful and effective to use *Photomath*". There are also students who do not draw conclusions from the problem.

Furthermore, the researcher guided students to solve problem two. Problem 2 is deliberately designed that there is no single solution that will result students later. From the students' answers, it can be seen that the whole group is able to identify problems and make models for problem 2.

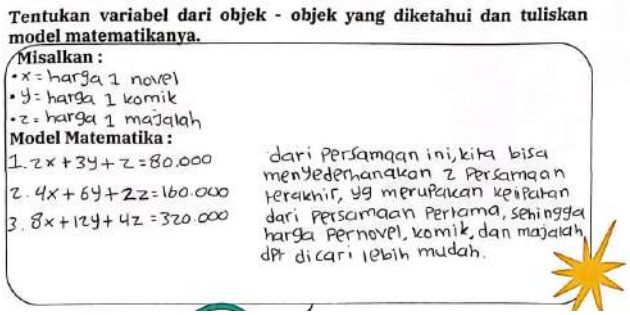


Figure 13. Answer to Question No.2 on the Indicator of Developing a Completion Plan

The next step is to use the Photomath application to find out if the problem has a solution, does not have a solution or has many solutions. The researcher directs students to open the Photomath application. The researcher told the students to prove by entering the equation into Photomath, so that the results came out so that the problem had a solution.

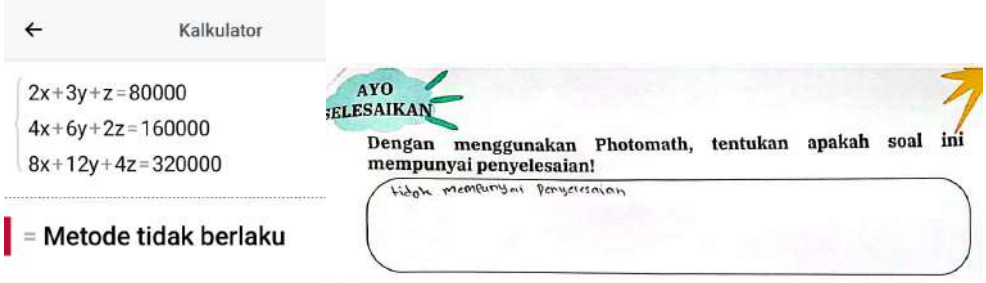


Figure 14. Answer to Question No.2 on Use *Photomath*

At this stage learners think why problem 1 has a solution while problem 2 does not have a solution. In problem 2 the results of equations 1 and 2, 1 and 3 and 2 and 3 are equal signs (=) so this problem has many solutions. With this coefficient comparison, learners can understand why when using Photomath the results do not have a solution. All groups have understood that this problem has no solution.

At this stage learners solve the problem using the elimination method. The first step learners take is to eliminate x from equations 1 and 2, then eliminate x from equations 2 and 3. However, when eliminating x from equations 2 and 3 results in a value of $0 = 0$ so this problem has many solutions.

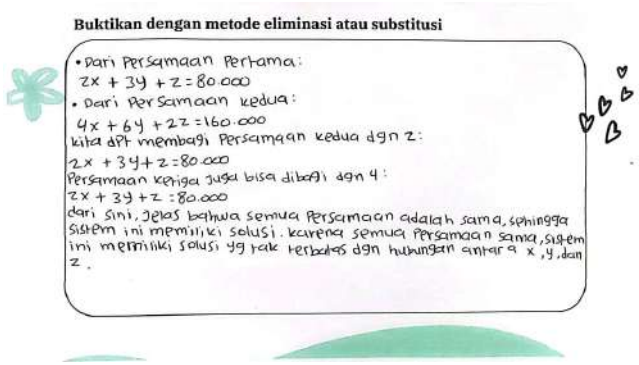


Figure 15. Answer to Question No.2 on the Indicator of Implementing Completion

However, there are also students who do not use the solution method. They use logic. In the second equation the student divides by 2 so that it becomes $2x + 3y + z = 80.000$, while in the third equation the student divides by 4 so that it becomes $2x + 3y + z = 80.000$. Furthermore, students explained that all equations are the same so that they have infinite solutions.

Furthermore, students are directed to make conclusions. At this stage, it is in line with the indicator of rechecking the answer. In question 2, students only wrote "no solution". However, the answer is not correct because the results of the coefficient comparison obtained many solutions. But there are also detailed students, as can be seen from the picture below. Students explained that this system of equations can be solved by relationships between variables, but cannot get the exact value of each variable. The meaning of the student's statement is that the value of these variables is unlimited.

4. Developing the work

The researcher provides opportunities for students to work together in groups in an effort to find solutions to the problems given. The researcher asked students to open the Photomath application again to check the results obtained to ensure that the results obtained were correct. The researcher asked students to discuss the results that had been obtained.

At this stage, the aim is to get students used to seeing, re-checking and observing the results of Photomath answers. Students subtitute the results that have been obtained into the initial equations, namely equations 1, 2 and 3 and the results are proven. However, there are also students who do not check the answers they get, which are as follows. In question 2, students write the word "cannot check the answer again because they do not have a solution". However, there are also students who do not answer.

5. Analyzing and Evaluating the Problem-Solving Process

After all the problems are solved, the students in their respective groups present solutions to the problems in front of the class orally. Researchers are welcome from other groups to ask questions and provide comments related to the solutions presented. The other group responded by questioning a different answer from the other group and discussing a more appropriate answer. After the presentation and discussion, the

researcher provided a more in-depth explanation of the concepts and theories related to the three-variable linear equation system. The researcher conveyed the definition, and types of questions.

In the closing activity, the researcher gave students the opportunity to ask questions about things they still did not understand. Then the researcher guides students in drawing conclusions about the three-variable linear equation system. After that, the researcher informed the material that would be discussed at the next meeting, and the researcher closed the learning by saying greetings.

Likewise, the second meeting was carried out with problem-based learning and photomath assistance. The problem in LKPD meeting 2 is a little more difficult to make a mathematical model because the information is comparative.

In the third meeting, a test consisting of 2 questions was carried out to see the students' problem-solving skills. The test uses three-variable linear equation system material, with questions that are arranged based on indicators of problem-solving ability and have been validated. The following is a solution to the problems of students.

Table 2. Test Result Percentage

Value	Frequency	Percentage	Category
$81 \leq x < 100$	9	27,2727%	Excellent
$61 \leq x < 80$	17	51,5152%	Good
$41 \leq x < 60$	3	9,09091%	Enough
$21 \leq x < 40$	4	12,1212%	Less
$0 \leq x < 20$	0	0%	Very Less
Sum	33		
Average	70,6229		
Category	Good		

It can be seen from the table above, that the average score obtained by students is 70,6229 which is categorized as good.

Analysis of Students' Answers to Question Number 1

NZA subjects were able to solve problem number 1 well and accurately, NZA was able to meet all four indicators of problem-solving ability. The following is the answer to question number 1 of the NZA subject.

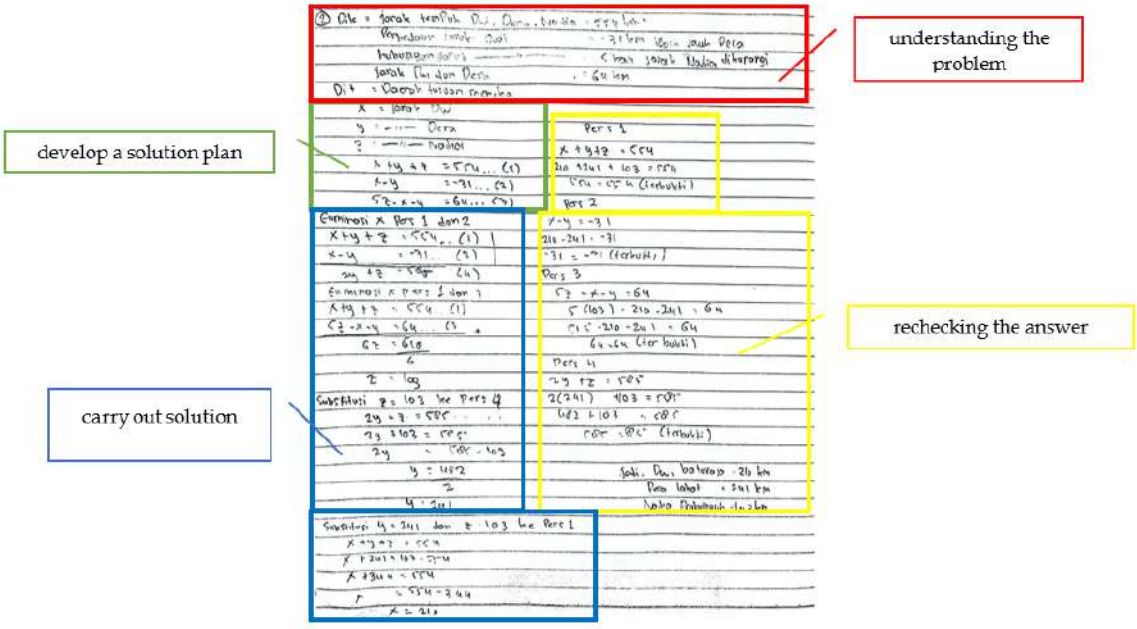


Figure 16. NZA Subject Answers to Question Number 1

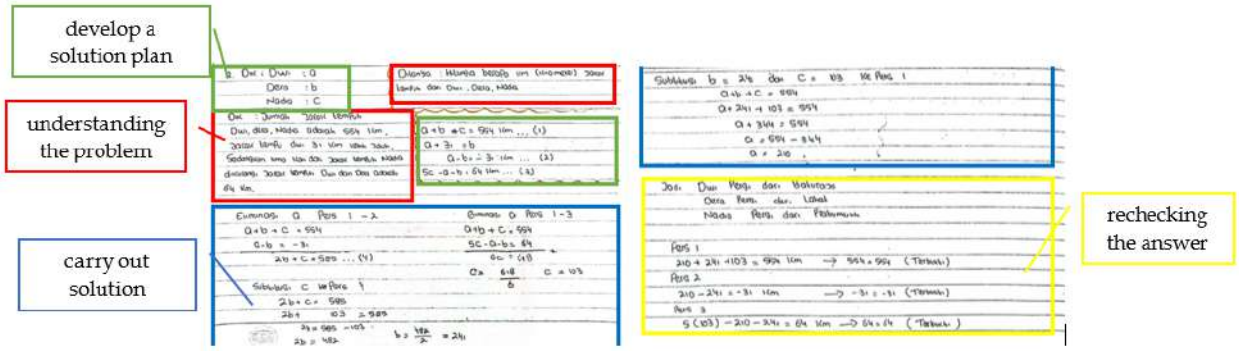


Figure 17. DAP Subject Answers to Question Number 2

In contrast to NZA, in the first indicator the DAP subject only got a score of 2. This is because the DAP subject wrote what was asked incompletely. The DAP subject wrote what was asked with the word calculate how many KM (kilometres) the distance from Dwi, Dera and Nadia, the subject did not make the word determine the destination of Dwi, Dera and Nadia. When interviewed the subject was confident in the answers he wrote, the following are the results of the interview.

P : *How do you make it known and asked about the problem in the question?*
DAP : *To make what is known, I first read the question and observe it, after that I can know where it is known. If I ask you what I see, I see in the last sentence*
P : *Are you sure of the answer to number 1 part known and asked?*
DAP : *Believe.*
P : *Why are you sure of the answer?*
DAP : *Because I followed the question.*

In the indicator of preparing a solution plan, the DAP subject gets a score of 2, this is because when making a memorization the words are not complete. Subject DAP only wrote the words Dwi, Dera and Nadia, Dwi's distance $= a$, Dera's distance $= b$ and Nadia's distance $= c$. For modelling, DAP subject has made the right and ordered. For the first equation the subject made $a + b + c = 554$, in the second equation the subject subtracted b and 31 in both segments which initially $a + 31 = b$ so that it became $a - b = -31$ and the third equation $5c - a - b = 64$. The DAP subject did not understand when making a memorization, but the subject could when making modelling. The following are excerpts of the results of the researcher's interview with the subject DAP.

P : *How do you make a reasoning from the problem?*
DAP : *To make a reasoning I looked at the existing name.*
P : *Are you sure of the reasoning?*
DAP : *Believe.*
P : *Why can you be sure?*
DAP : *Because the question was Dwi, Dera and Nadia.*

In the indicator of carrying out the completion of the DAP subject using the combined method. The first step of the DAP subject eliminates a from equations 1 and 2 so as to get equation 4. Then eliminates a from equations 1 and 3 so as to get the value of the variable c. Then substitute c into equation 4 so as to get the value of b. After getting the value b. The last step the subject substituted b and c into equation 1 so as to get the value of a.

In the indicator of rechecking the answer, the DAP subject makes conclusions and rechecks the answer by substituting the value into equations 1, 2 and 3. However, the conclusion is incomplete because the subject did not add the distance travelled by Dwi, Dera and Nadia, but the subject did not realise that the conclusion was incomplete, the

subject was confident in the answer. This is reinforced by the results of the interview with the subject DAP.

P : Did you draw conclusions?
DAP : Create.
P : Are you sure of this conclusion?
DAP : Believe.

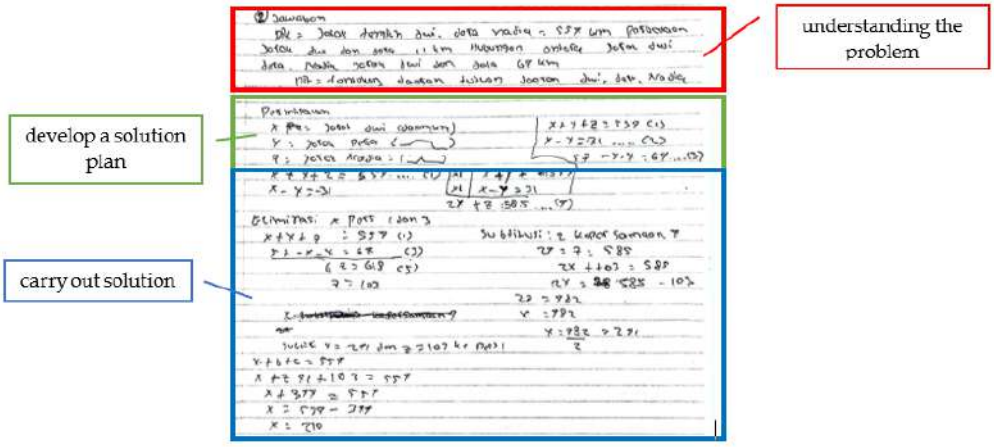


Figure 18. KW Subject Answer to Question Number 1

Next is the subject KW. In the first indicator, the subject KW makes it known completely, but the part that the subject asks is incomplete. The KW subject did not add how much distance Dwi, Dera and Nadia traveled. Subject KW did not realize that when writing this, this can be seen from the interview.

P : How do you make it known and asked about the problem in the question?
KW : From the question
P : Are you sure of the answer to number 1 part known and asked?
KW : Believe.
P : Why are you sure of the answer?
KW : Because I saw the question.

The subject modelled x as Dwi's distance (in KM), y as Dera's distance (in KM) and z as Nadia's distance (in KM). Subject KW was correct in modelling the first equation $x + y + z = 554$, in the second equation $x - y = -31$ and in the third equation the subject modelled $5z - x - y = 64$.

Subject KW did not draw conclusions and double-checked the answers. The subject lacks time so the subject does not make it, this can be seen from the interview.

P : Do you draw conclusions and double-check the answers?
KW : Not making.
P : Why don't you make a conclusion and don't double-check the answers?
KW : Because time was running out, I didn't make it.

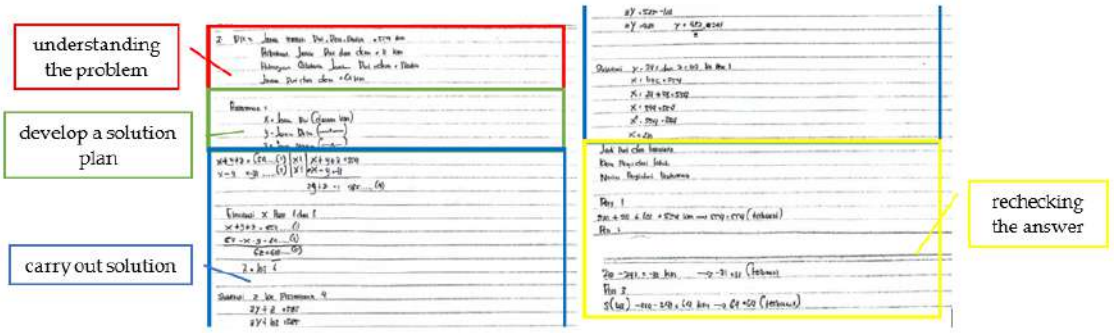


Figure 19. SA Subject Answer to Question Number 1

In the first indicator SA subject only makes known. In the second known part SA subject wrote wrong, he wrote 11 KM should be 31 KM. The subject did not make known because the subject forgot.

P : How do you make it known and asked about the problem in the question?
HIS : I looked at the question and immediately wrote.
P : Are you sure of the answer to number 1 part known and asked?
HIS : Believe.
P : Why don't you make it asked?
HIS : I forgot.

In the indicator of compiling a solution plan, subject SA is incomplete when making a memorization and when modelling the subject writes the wrong equation 1, he writes C54 which should be 554. The following are excerpts of the results of the researcher's interview with subject SA. In the indicator of compiling a solution plan, subject SA is incomplete when making a memorization and when modelling the subject writes the wrong equation 1, he writes C54 which should be 554. The following are excerpts of the results of the researcher's interview with subject SA.

P : How do you make a reasoning from the problem?
HIS : Asked about the distance between Dwi, Dera and Nadia.
P : Are you sure of the reasoning?
HIS : Believe.
P : Why can you be sure?
HIS : Because what was discussed was the journey from Dwi, Dera and Nadia.
p : How do you construct a mathematical model to answer the problem?
HIS : See what is known.
P : Why is there in equation 2?$C54$
HIS : Owh, that's a misspelling 554

In the indicator of implementing the SA subject's solution using the combined method. The first step of subject SA eliminates x from equations 1 and 2 so as to get equation 4. Then eliminate x from equations 1 and 3 so as to get the value of the variable z. Next, substitute z into equation 4 to get the value of y. After getting the value of y. The last step the subject substituted y and z into equation 1 to get the value of x.

P : What method do you use to solve the problem?
HIS : Combined method.
P : Are you sure of the answer?
HIS : Believe.

In the indicator of rechecking the answer, the subject made a conclusion and rechecked the answer by substituting the value into equations 1, 2 and 3. However, the conclusion is incomplete because the subject did not add the distance travelled by Dwi, Dera and Nadia, but the subject did not realise that the conclusion was incomplete, the

subject was confident in the answer. This is reinforced by the results of interviews with SA subjects.

P : Did you draw conclusions?
SA : Create.
P : Are you sure of this conclusion?
SA : Believe.

Analysis of Students' Answers to Question Number 2

NZA subjects were able to solve problem number 2 well and precisely, NZA was able to meet all four indicators of problem-solving ability. The following is the answer to question number 2 from the NZA subject.

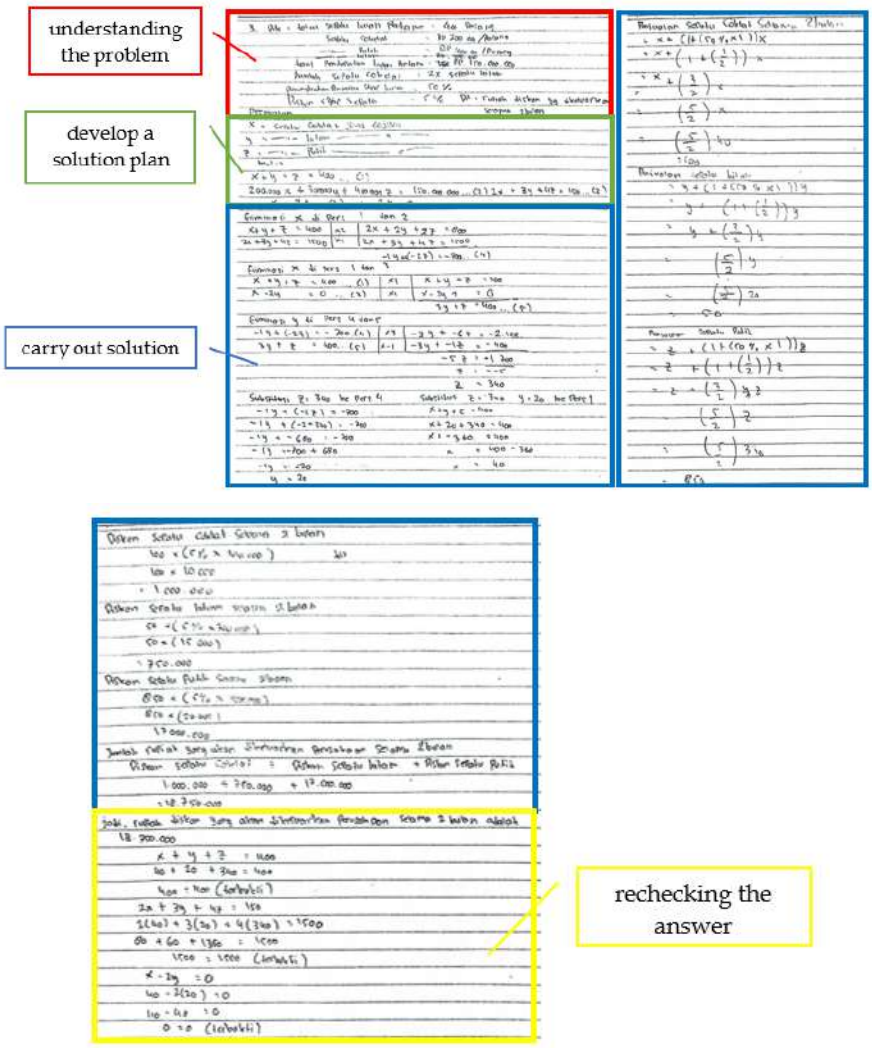


Figure 20. NZA Subject Answers to Question Number 2

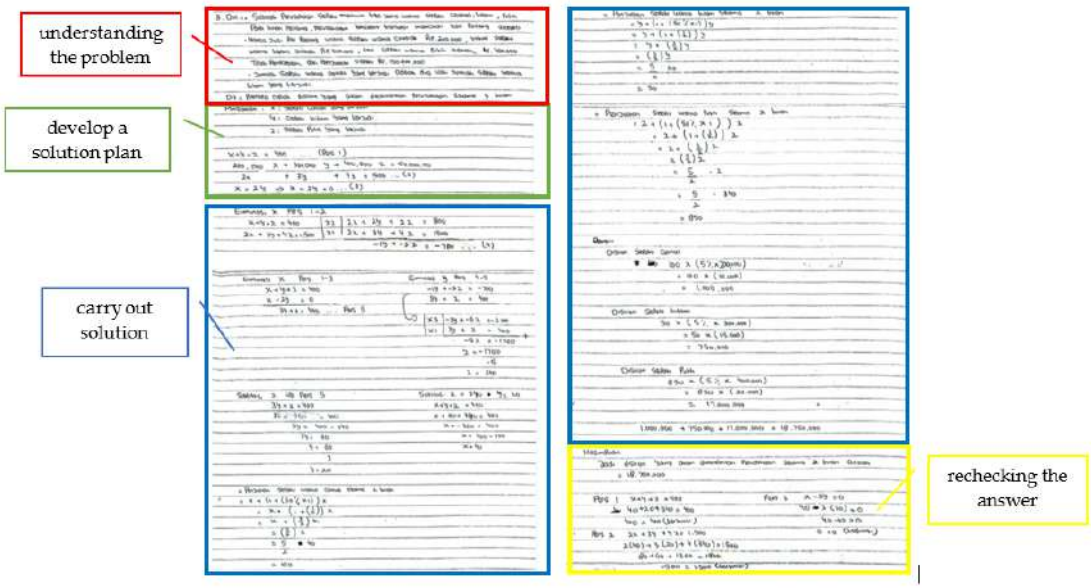
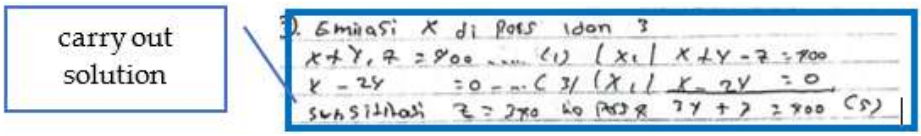


Figure 21. DAP Subject Answers to Question Number 2

Likewise with the DAP subject, it has fulfilled the first indicator This is seen from the DAP subject who understands the problem and writes down the information provided. The subject of DAP wrote that it was known in detail and asked. The DAP subject has also met the indicators of preparing a solution plan, this is because the subject can make reasoning and has been correct in making modeling of the problem. DAP subjects have also met the indicators of implementing solutions, subjects using a combined method. DAP subjects have also met the indicator of rechecking answers, this is because the subject makes conclusions and checks answers.



Picture 22. KW Subject Answer to Question Number 2

However, it is different from the subject of KW. In the first indicator, the subject of KW does not make known and asked. The subject of confusion when writing is known and asked, this can be seen from the interview.

P : How do you make it known and asked about the problem in the question?
KW : I was confused when I was known and asked.
P : Where is your confusion?
KW : Because there are discounts so I am confused.

KW subjects also do not make reasoning and do not make modeling. The following interview results are the following.

P : How do you make the reasoning and modeling of the problem?
KW : I immediately eliminated it without making a reasoning.
P : Why don't you do mathematical reasoning and modeling?
KW : Because time is running out, so I don't make it.

Subject KW only eliminated x from equations 1 and 2. Subject KW had run out of time to work on the problem. This can be seen from the interview result.

P : What method do you use to solve the problem?
KW : I use the combined method.
P : Why don't you solve the problem?
KW : Because I have run out of time.

P : If given time, how would you solve this problem?
KW : I'll look for the values of the x, y and z variables.
P : What will you do next?
KW : I don't know anymore, because I don't understand the problem.

Subject KW was unable to solve question number 3 because he had run out of time and the subject also did not understand the problem of the problem.

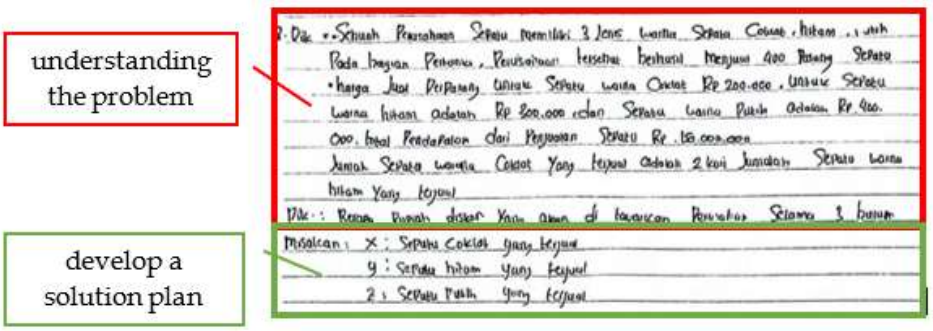


Figure 23. SA Subject Answer to Question Number 2

On the first indicator that the SA subject has met, he gets a score of 3. The subject of SA wrote that it was known and asked.

P : How do you make it known and asked about the problem in the question?
HIS : I looked at the question and immediately wrote.
P : Are you sure of the answer to number 1 part known and asked?
SA : Believe.

SA subject only made a memorization. SA subject did not make modelling of the problem. The subject was confused when modelling it because there were numbers in the tens of thousands. The subject was also confused to solve the problem because there was a 50% increase in sales demand and a 5% discount on the price of shoes. This is reinforced by the results of the interview.

P : How do you make a reasoning from the problem?
SA : The reasoning is seen from the company's sales consisting of brown, black and white shoes.
P : How do you model the problem?
SA : I don't make models.
P : Why don't you create a mathematical model?
SA : Because the question is that there are tens of thousands and there are also percentage figures, so I am confused about modeling it.

Subject SA is unable to solve problem number 3. The subject is unable to meet the indicators of completing and rechecking the answers. The SA subject did not answer because he was asked about a discount for 2 months. In addition, SA subjects do not listen during learning and do not help when completing LKPD assignments.

Based on the results of the study, it can be concluded that the students' problem-solving ability in problem-based learning on the material of the three-variable linear equation system with the help of Photomath is relatively good. The causes of problem-solving skills are classified as good, among others, because students have difficulty understanding problems, inaccuracy when solving problems, do not understand basic concepts, lack of interest or motivation to learn, and lack of experience or practice in dealing with story problems.

Based on the results of tests that have been carried out using the Problem Based Learning learning model with the help of Photomath, it shows that the problem solving skills of students are classified as good. This can be seen from students being able to understand the problem in the problem, make a mathematical model, solve the problem

using the right procedure, compile the answer conclusion from the steps that have been taken and recheck the answer. This is influenced because students actively participate in participating in learning by using Problem Based Learning and students also utilize Photomath as an aid during the learning process. However, there are still students who have difficulty understanding the problem, inaccuracy when solving problems and do not understand basic concepts.

Learning with the application of the PBL model improves problem solving skills significantly better than learning using lecture or direct learning (Oktaviana & Haryadi, 2020). The PBL learning model carried out by the teacher greatly influences the learning motivation of students in learning mathematics so as to improve problem solving skills (Payung et al., 2022). The PBL learning model makes students active in learning because students are required to work together in groups to work on LKPD (Adinia et al., 2022). This process encourages learners to think critically in identifying, analyzing and solving problems so that it can improve learners' problem solving skills. The use of contextual problems allows learners to apply the knowledge learned in real-life concepts.

During the learning process, students are very enthusiastic when using the Photomath application, so that the use of the Photomath application is effective in increasing students' interest in learning (Handayani, 2022) and the use of Photomath is also effective on student learning outcomes (Hediyawati, 2024) because it helps students understand how the problem can be solved by providing a step-by-step solution so that students know the procedure or concept of working on SPLTV (Aisyah & Yahfizham, 2024). thus increasing students' interest in learning, then indirectly problem solving skills will increase, one of which is in the third indicator. Photomath also teaches students that not all SPLTV problems have solutions. However, the use of Photomath makes students dependent because students still make many calculation errors.

There are still students who have poor category problem solving skills because there are still students who are not careful in solving problems (Ruswati et al, 2018) because the problem is too long so that it makes students bored and tired so that it can interfere with students' concentration. Without full concentration, students tend to rush and are not careful in paying attention to the steps needed.

CONCLUSION

Based on the results of the study, it can be concluded that the application of Problem Based Learning to SPLTV materials assisted by SPLTV can develop problem-solving skills. This can be seen from students being able to understand the problems in the problem, create mathematical models, solve problems using Photomath, compile answer conclusions from the steps that have been taken, and check the answers again using Photomath. The use of Photomath as a tool in problem-based mathematics learning has a positive impact on students' ability to solve mathematical problems. The PBL learning model provides real and situational context in learning, while Photomath as a tool allows students to explore solutions, find out if the problem has a solution, and check the answers by substitution. Thus, learning that combines PBL with Photomath as a tool has the potential to develop mathematical problem-solving skills.

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