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Analysis of Answering Process on Problem Solving Ability Through Problem-Based Learning Model

Analisis Proses Jawaban Kemampuan Pemecahan Masalah Melalui Model Problem-Based Learning

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ABSTRAK

Penelitian ini dibuat untuk mengetahui bagaimana proses penyelesaian jawaban dari mahasiswa dalam menyelesaikan tes kemampuan pemecahan masalah melalui pembelajaran dengan model *problem-based learning*. Adapun proses penyelesaian jawaban tes kemampuan pemecahan masalah matematik ditinjau dari 2(dua) aspek yaitu:1) prosedur yang digunakan dalam memecahkan masalah dan, 2)kesalahan-kesalahan yang dilakukan mahasiswa dalam menjawab soal/masalah tersebut. Populasi penelitian ini adalah seluruh mahasiswa semester III jurusan manajemen informatika pada semua STMIK di Kota Medan dan sampel diambil acak dan terpilih dua STMIK dengan akreditas B dan C. Jenis penelitian ini adalah analisis deskriptif kualitatif dengan istrumennya adalah tes kemampuan pemecahan masalah. Penelitian ini memberikan hasil bahwa proses penyelesaian masalah yang dilakukan mahasiswa melalui pembelajaran berbasis masalah lebih baik daripada pembelajaran konvensional, yakni hasil yang pertama adalah jumlah mahasiswa dalam mengerjakan tes yang memperoleh kategori penilaian “baik” pada kelas eksperimen lebih banyak daripada kelas kontrol ($N_{ekperimen}= 67 > N_{kontrol} = 17$). Hasil yang kedua yakni pada tes yang diberikan secara keseluruhan dapat dikerjakan dengan baik oleh mahasiswa sesuai dengan perintah soal/masalah yang ada, walaupun mereka masih ada yang selalu terlupa melakukan pemeriksaan jawaban. Selain itu pada setiap pertemuan masih saja ada anggota kelompok yang tidak aktif dalam berdiskusi dengan teman kelompoknya. Mereka selalu disibukkan dengan hal lain, hal ini menyebabkan teman di satu kelompoknya menjadi terganggu. Hasil dari penelitian ini dapat digunakan sebagai referensi bagi pengajar yang ingin melakukan penerapan pembelajaran berbasis masalah.

Kata kunci: Proses Jawaban, Pemecahan Masalah, PBL

ABSTRACT

This study was made to find out how the process of completing student answers incompleting the problem-solving ability test through a problem-based learning model.The process of completing the answers to the mathematical problem solving ability test can be viewed from 2 (two) aspects, namely:1) the procedure used in solving the problem and, 2)the mistakes made by students in answering the questions/the problems.The population of this study were all third semester students majoring in informatics management at all STMIK in Medan and samples were taken at random and two STMIKs were selected with accreditations B and C. The type of this research was a qualitative descriptive analysis with the instrument was the test of problem solving abilities. This study gave the result that the problem solving process carried out by students through problem-

based learning was better than conventional learning, the firs result is the number of students doing the test who obtained a "good" assessment category in the experimental class was more than the control class (Nexperiment = 67 > Ncontrol = 17). The second result is the test given as a whole it could be done well by students in accordance with the existing questions/problems, although some still forgot to check the answers. In addition, at every meeting there were group members who werenot active in discussing. They always busy with other things, it caused friends in one group to be disturbed.The results of this study can be used as a reference for teachers who want to implement problem-based learning.
***Keywords**: Answering Process, Problem Solving, PBL*

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PRELIMINARY

Classroom learning generally uses a conventional approach, one of the characteristics of which is that learning is centered on lecturers/educators and learning is still an activity of transferring information from lecturers to students (Sari, 2019). It can effect when the students solve problems, the solution process is definitely based on the algorithm/steps carried out by the lecturer without any potential development in students.It causes the solution process to not vary (Sari, 2018). The problem solving process is a variation of students' answers that are systematic and related to students' mathematical problem solving abilities.

The problem-based learning approach is student-centered learning, and one of the benefits of employing this technique is that it can increase students' abilities, as students are required to be actively involved, democratic, and free to think for themselves (Sari, 2019). In addition, the learning environment emphasizes the central role of students, not lecturers. So with this demand, it is suspected that there will be many variations/types of student processes in solving problems based on the three problem-solving processes in (Napitupulu E, 2011), the 3 (three) processes, namely: 1) making a mathematical model of a situation related to real-world problems, 2) choosing the right problem solving strategy, and 3) explaining the answers obtained and check their correctness.

The term problem-based learning with contextual characteristics is closely related to new ideas about the character of cognition and learning. This study is currently a very popular debate among educators and psychologists. Each story about learning is basically evidence of the importance of context in the learning process. According to (Arends, 2008) "The purpose of problem-based learning education is to develop research and problem-solving ability, provide role experiences for adults, and enable students to be confident in their abilities, think and learn for themselves." The formulation of the problem in this study is how is the process of solving students' answers related to problem-solving abilities in problem-based learning and conventional learning?.

METHOD

This type of research is a qualitative descriptive analysis that will explain how the process of completing the answers carried out by students. The population in this study were all third semester students majoring in informatics management at all STMIKs in Medan. From the study population consisting of 11 STMIKs in Medan, two STMIKs with accreditation B and C were taken as samples, namely the first STMIK with accreditation B and the second STMIK with accreditation C. In the sample, 2 classes were taken randomly in each STMIK to be used as a control class and an experimental class. Russefendi (1998) said that one way to get a random sample is to number each class on paper and then draw a lottery. Samples were taken from 4 classes, 2 classes were used as experimental classes and 2 other classes were used as control classes. The total students in the experimental class were 51 and 55 in the control class.

Data Processing

To describe the process of completing the answers made by students in solving problems related to mathematical problem solving abilities in both learning and each lesson analyzed descriptive analysis. There are two aspects that can be seen in the answer-solving process, namely the procedures used in solving problems by linking them to the three problem-solving processes and the errors made by students in answering the questions/problems. The answer solution process can be seen from the maximum score of the indicator. The following is a table of criteria from the processes of answers-solving on problem solving abilities.

Table 1. Criteria for the Answering Process on Problem Solving Ability

Problem Solving Ability Indicator	Student's Answer Process Indicator	Interval Value	Category Evaluatio
Making mathematical models	Complete solution steps and correct answer	$10 < x \leq 15$	Good
	Incompletesolution step and correct answer	$5 < x \leq 10$	Enough
	Incomplete solution steps and incorrect answers	$0 < x \leq 5$	Poor

Problem Solving Ability Indicator		**Student's Answer Process Indicator**	**Interval Value**	**Category Evaluatio**
Choosing the right solution strategy		Complete solution steps and correct answer	10 < x ≤ 15	Good
		Incomplete solution step and correct answer	5 < x ≤ 10	Enough
		Incomplete solution steps and incorrect answers	0 < x ≤ 5	Poor
Explain the answer and check its correctness	Explaining Answers	Complete solution steps and correct answer	10 < x ≤ 15	Good
		Incomplete solution step and correct answer	5 < x ≤ 10	Enough
		Incomplete solution steps and incorrect answers	0 < x ≤ 5	Poor
	Checking the truth	Complete solution steps and correct answer	10 < x ≤ 15	Good
		Incomplete solution step and correct answer	5 < x ≤ 10	Enough
		Incomplete solution steps and incorrect answers	0 < x ≤ 5	Poor

Source: (Sari et al, 2020)

Based on the table above, it could be seen that the number of students with good, enough or poor answer criteria, where the criteria for completing the students' answers process in the experimental class was said to be better than the control class if the number of students who got the "good" assessment category in the experimental class was more than the control class. For more details, see the following table:

Table 2. Criteria for Solution Process

Number of Students Answering with "Good" Category	Conclusion
$N_{Experiment} < N_{Control}$	Bad
$N_{Experiment} = N_{Control}$	Equal
$N_{Experiment} > N_{Control}$	Better

RESULT AND DISCUSSION

Based on students' answer sheets, the following would present the process of completing the mathematical problem solving ability test answers for each item in the two learning classes, which were viewed from 2 (two) aspects, namely:

1. The procedure used in solving the problem was to relate it to three problem solving processes,
2. Errors made by students in answering these questions/problems.

For the process of completing the answer to the problem-solving ability test, it includes 3 (three) processes to find answers, namely:1) make a mathematical model, 2) choose the right problem-solving strategy, and 3) explain the answer and check its correctness. Similarly, the mistakes made by students in answering questions/problems are also seen based on these 3 processes.The following is described for each item of the question.

1. Item Number 1

In question number 1, students had almost fulfilled the steps of the answer process according to the indicators of problem solving ability. The student had been able to understand the problem correctly, gathered information from the problem and wrote down what the real problem was. Students had also been able to plan a solution by first making an example using "x and y" as a replacement variable for the missing data so that they could solve the problem on the item. Based on the procedure used in solving the problem, namely linking it with three problem solving processes. For the first problem solving process; made mathematical models in the problem-based learning class (experimental class). The number of students who were able to make mathematical models correctly was 28 people. While in the control class, 22 students were able to make mathematical models for the first item. Based on the mistakes made by students in answering questions/problems in this process, it could be seen that there were still students who were wrong in making the model. The expected mathematical model was

$x + y = 30 \ldots\ldots\ldots\ldots$(i), and

$x - 4y = 0 \ldots\ldots\ldots\ldots$(ii)

The answer of one of the students in the control class was $30x + 2x + 4x = 0$ ……..(i), from this answer it could be seen that this student did not understand how to make a mathematical model and this only happened to 2 students in the control class. Overall, in making a mathematical model, the scores obtained were almost the same between the answers of the experimental class and the control class.

In the second solution process, namely choosing the right problem-solving strategy in problem-based learning, the number of students who were able to solve the problem correctly and choose the right solution strategy was 27 people, while in conventional learning there were 20 students who were able to solve the problem correctly and chosethe right solution strategy. Based on the mistakes made by students in answering questions/problems in this process, it could be seen that there were still many students using inappropriate strategies, for example, the expected strategy was elimination and substitution strategy, there were still students who answered in their own way but the result was wrong. The following was a picture of the process of choosing a strategy from one of the students in the control class:

From this answer, it could be seen that the student was still wrong in determining the solution strategy and this student was only trying to solve it. Overall in choosing the right problem-solving strategy, the answers in the experimental class were better than the control class.

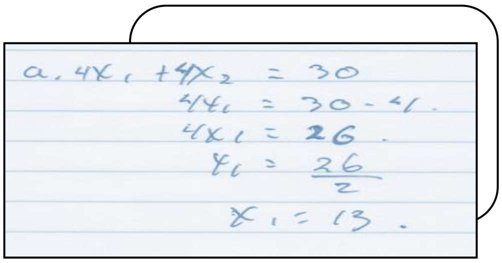


Figure 1. Choosing a strategy

In the third solution process, namely explaining the answers and checking their correctness, on the process of explaining problem-based answers in class, In this experimental class, there are some students who have not been able to check the answers correctly and completely. Meanwhile, in the control class, only 17 students were able to write an explanation of mathematical ideas correctly and completely. Looking from the mistakes made by students in explaining the answers that some of them only wrote "A is right", without any other explanation. Overall, the process of explaining the answers of the control class was better than the experimental class

Furthermore, for the process of checking the truth based on problems in the classroom there are some students who have not been able to check the answers correctly and completely. While in conventional learning, students who were able to check the results of answers correctly and completely were 7 stdents. Looking from the mistakes made by students in the process of checking answers, some of them made mistakes in writing and many of them did not check answers. Overall in this process almost every student did not check the answers to the first item. The following are the various processes for solving students' answers in problem-based learning and conventional learning:

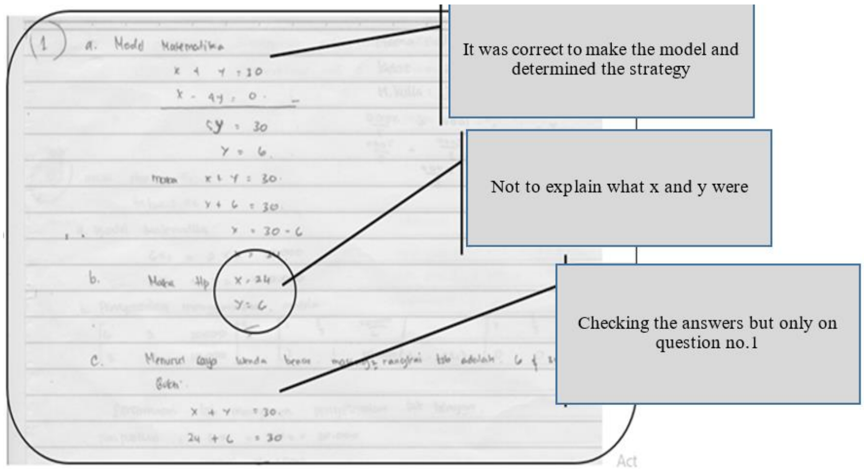


Figure 2. Example of the answering solution process in the experimental class item no.1

From Figure 2 it could be seen that the students were correct in making the mathematical model, and the strategy selection process was appropriate, but in the third process the students did not explain what the variables x and y were and the process of checking the answers was also incomplete. The following was an example of the answering solution process in the control class:

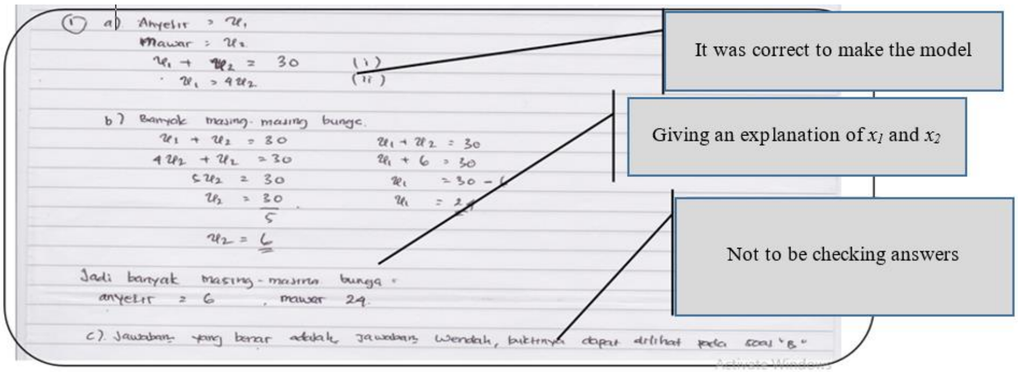


Figure 3. Example of the answering solution process in the control class item no.2

In Figure 3 it could be seen that students had correctly made a mathematical model and chose the right solution strategy,but did not carry out the third process, namely not to be checking the answers that had been obtained. The following figure showed the other answer variations in the control class:

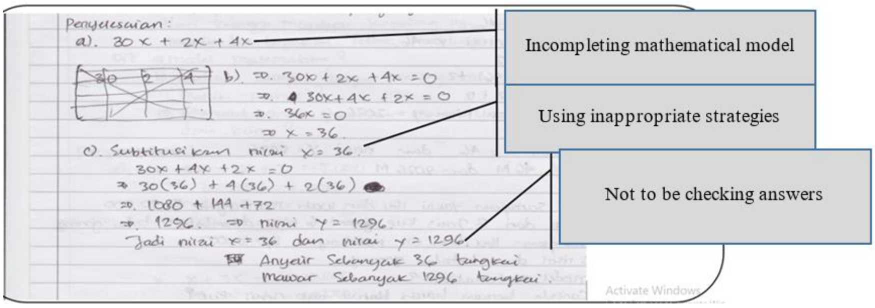


Figure 4. Variations of answers in the control class

Figure 4 was an example of the answer to item 1 in the control class, it could be seen that students made incorrect mathematical models, then use a solution strategy that was not appropriate and did not carry out the third process, namely not to be checking answers.

2. Item Number 2

In this second item, for the process of solving the first problem; created a mathematical model in the problem-based learning class (experimental class), the number of students were able to make mathematical models correctly and completely were 47 students, While in conventional learning (control class) there were 43 students who were able to make mathematical models correctly and completely. Looking at the mistakes made by students in answering questions/problems in this process, it could be seen that almost all students made mathematical models well, from each class only 10% of students did not make mathematical models.Overall, in making a mathematical model for this second item, the scores obtained in the experimental class were higher than in the control class.

In the second solutiont process, namely choosing the right problem-solving strategy in problem-based learning, there were 24 students who were able to solve the problem correctly and chose the right solution strategy, while in conventional learning, the number of students who were able to solve problems correctly and chose the right solution strategy was 29 students. Looking at the mistakes made by students in answering questions/problems, in this process it appeared that there were still students who made the wrong calculations. Even though it was correct to make a mathematical model, it was still wrong to rewrite the equation in the chosen strategy.Overall in choosing the right problem-solving strategy when viewed from the percentage, the answers in the control class were better than the experimental class in this process.

Furthermore, in the third solution process, namely explaining the answers and checking their correctness, in the process of explaining problem-based answers in the classroom, as many as 31 students were able to write an explanation of mathematical ideas correctly and completely.Meanwhile, in the control class, 23 students were able to write an explanation of mathematical ideas correctly and completely. Looking at the mistakes made by students in explaining the answers that they did not understand very well how the form of a system of linear equations that had no solution.Overall, for the process of explaining the answers correctly, the experimental class was better than the control class, which was 60.8%.

Furthermore, for the process of checking the correctness based on problems in the classroom, there were 21 students who were able to check the answers correctly and completely, while in conventional learning, there were 13 students who were able to check the answers correctly and completely.Overall in this process problem-based learning (experimental class) was better than the control class.

The following is a picture of the various processes of solving student answers in problem-based learning and conventional learning:

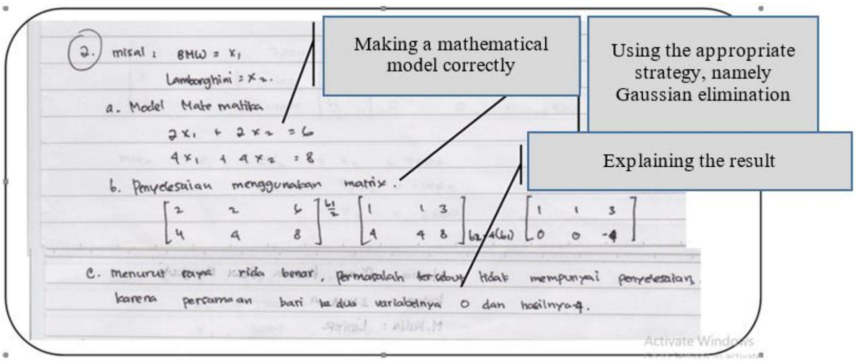


Figure 5. Example of the solution process in the experimental class item 2

In Figure 5 it could be seen that students could make mathematical models correctly and use appropriate solution strategies and carry out the 3rd process correctly.The following is a picture of the solution process in the control class.

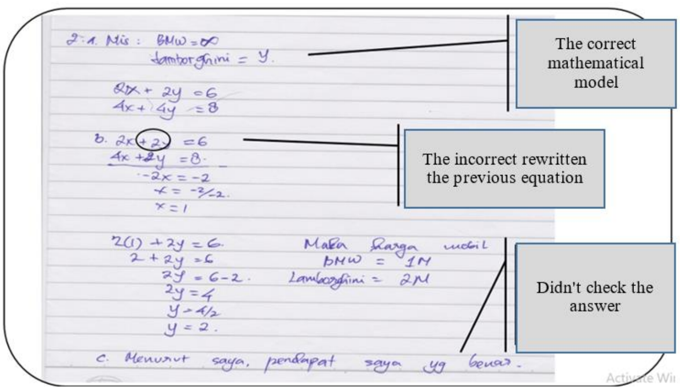


Figure 6. Example of the solution process in the control class item 2

In Figure 6 above, it could be seen that the students had correctly made the mathematical model, but when solving the problem, the student made an error in rewriting the equation that had been made, causing the results obtained to be wrong. Then students did not check the answers they had obtained.

3. Item Number 3

In this third item, as a whole, from the steps of the problem solving process, it could be seen that there were still students who had not been able to make mathematical models either in the experimental class or in the control class.with a larger percentage of the control class than the experimental class, in other words there were still more control class students who had not been able to make mathematical models.In choosing the right problem solving strategy in the experimental class was as many as 25 students and in the control class was as many as 3 students. The errors that occured in the control class were experienced by students who did not understand the concept of a system of linear equations that had infinite solutions, many of them answered that this third item was SPL that had no solution, different from the experimental class, almost half of them were able to understand the questions/problems given. It could be seen from the percentage of students who answered correctly in this process was greater in the experimental class then to the control class.

Furthermore, in the third solution process, namely explaining the answers and checking their correctness, in this process, the number of capable students in the experimental class was 35 students and in the control class only 3 students were able to explain the answers correctly. Overall, for the process of explaining the answers to this item, the percentage of the experimental class was greater than the control class (68.6% > 5.5%).

Furthermore, for the process of checking the truth in problem-based classes, students who did not check the answers were 17 people (33.3%) and students were able to check the answers correctly and completely as many as 25 students (49%). While in conventional learning students who did not check the results of the answers were 53 students (96.4%), and no student was able to check the answers correctly and completely. Looking at the mistakes made by students in the process of checking answers, namely in the control class, 96% of them did not check. After using a problem solving strategy they stopped there without checking the results they had obtained. Overall in this process almost evenly from the control class did not carry out inspections, when there should be many values that could be substituted in the system of equations, because the SPL had infinite solutions.

The following were the various processes for solving student answers in problem-based learning and conventional learning:

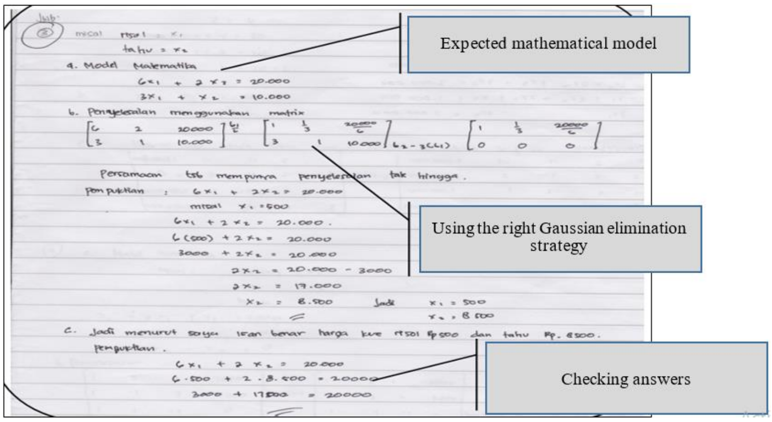


Figure 7. Example of the solution process in the experimental class item 3

In the figure above, it could be seen that the student had been able to carry out all steps in problem solving, namely, making mathematical models, determining the right strategy, and checking answers.

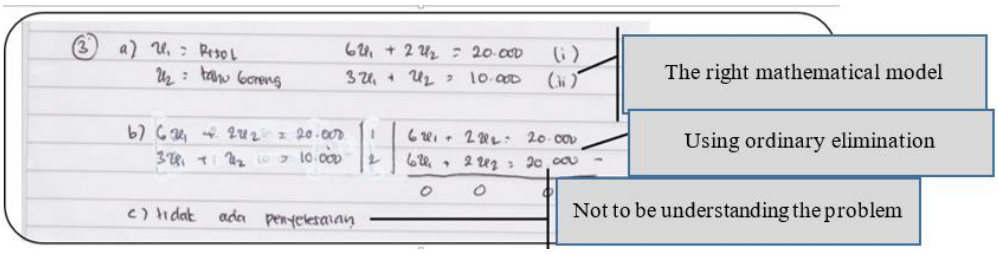


Figure 8. Example of Answering Solution Process in the control class Item Number 3

Figure 8 above was an example of student answers in the control class, it could be seen that students were able to make mathematical models correctly, but in determining the strategy was still not right, they used ordinary elimination which should use Gauss Jordan elimination, and in the 3rd process of problem solving, it looked like the student had not understood the problem given so that he had difficulty in completing the 3rd process.

4. Item Number 4

In this fourth item, overall students had difficulty in making mathematical models, either in the experimental class or in the control class. Looking at the mistakes made by students in answering questions/problems in this process, it was seen that there were students who were wrong in making equations/models. The expected mathematical model was:

$x+2y+z=7$ equation (i)
$x-y+3z=10$ equation (ii)
$x+y-z=0$ equation (iii)

The answer of one of the students in the control class:

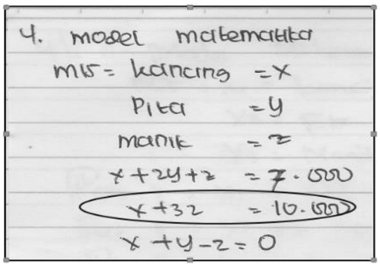
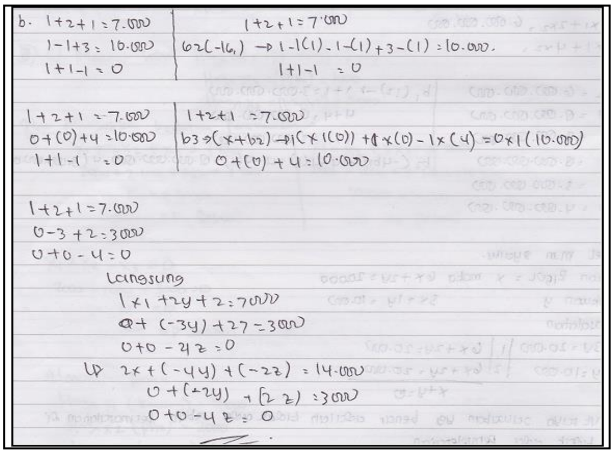


Figure 9. Example answers to make wrong mathematical model

From this answer, it could be seen that the student was less careful in reading the questions/problems. the error he made in the second equation that ignored the variable. Overall, in making mathematical models, the experimental class was better than the control class, which was 70.6% > 34.5%. In the second solution process, namely choosing the right problem-solving strategy in the experimental class was only 17 students and in the control class was only 11 students were able to determine the right solution strategy. Looking at the mistakes made by students in answering questions/problems in this process, it appeared that there were still many students who were confused when faced with a problem by freely choosing the appropriate strategy, e.g. the expected strategy was the usual elimination strategy or with Gaussian elimination, but in fact there were still students



who answered in their own way but it was not appropriate as shown below:

Figure 10. Example answers

From these answers, it could be seen that the way they did it was just trying to enter any value in the variable. And it did not produce the solution as expected. Furthermore, in the third completion process, namely explaining the answers and checking their correctness, In this process there were 21 (41,2%) students who were able to write the explanation correctly and completely, while in the control class none of the students were able to write explanation of mathematical ideas. Overall for the process of explaining the answers, many of them, both the experimental class and the control class, did not check the results they obtained. In the experimental class, only one person checked the answers to the fourth item.

The following were the various processes for solving students' answers in problem-based learning and conventional learning:

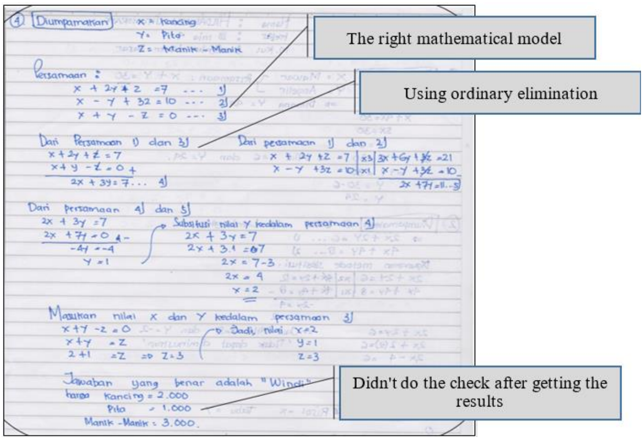


Figure 11. Example of the solution process in the experimental class item 4

In Figure 11 above, it could be seen that students did not carry out the second process, namely recheck, and it was also seen that the strategies used were still not appropriate.

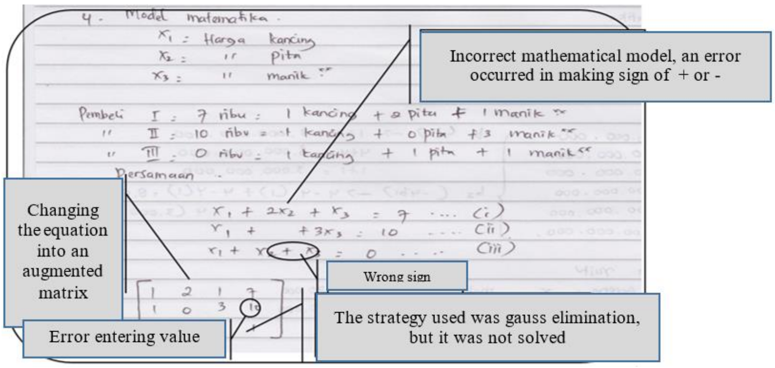


Figure 12. Example of the Solution process in the control class item 4

In Figure 12 it could be seen that students made an inaccurate mathematical model, an error occurred in making a positive or negative sign, and when changing the form of the equation into the augmented matrix also made an error entering the value. It seemed that students were still confused in solving problems.

5. Item Number 5

The fifth item was included in the category of difficult questions for the first problem solving process; made a mathematical model in the problem-based learning class (experimental class), the students didn't make the mathematical model were 33 students (64.7%), and only 17 students who were able to make mathematical models correctly and completely, while in conventional learning (control class) there were 51 studenta (97.7%) who could not make mathematical models, and students who were able to make mathematical models correctly and completely were as many as 4 students (7.3%). Looking at the mistakes made by students in answering questions/problems in this process, it could be seen that they were less careful in reading and analyzing questions. In the experimental class was only 17 out of 51 students were able to make mathematical models correctly, while in the control class was only 4 out of 55 students were able to make mathematical models as expected.

In the second solution process, namely choosing the right problem-solving strategy in problem-based learning, the number of students who did not use any strategy was 34 people (66.7%), while in conventional learning the number of students who did not use any strategy was 52 students (94.5%), and there were no students who were able to solve the problems correctly and chose the right solution strategy, either the control class or the experimental class. So none of the students between the two classes was able to solve this item problem correctly. Most of them only got to the step of modeling and forming an augmented matrix, as shown below:

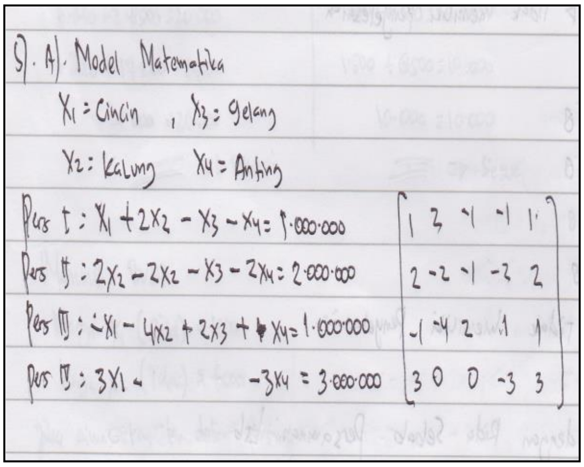


Figure 13. Example of the answer of one student in the control class for item 5

Furthermore, in the third settlement process, namely explaining the answers and checking their correctness, in the process of explaining the answers, the students could not write the explaination for the answer getting were 47 students (92,2%), and in control class, the students did not write the explaination for the answer were 52 students (94,5%), and no one from the experimental class and control class was able to explain the answer, in other words more than 90% in both classes did not provide an explanation as expected. Furthermore, for the process of checking the truth in problem-based learning and in conventional learning none of the students was able to check the results of the answers, because none of them answered completely. The following were the various processes for solving student answers in problem-based learning and conventional learning:

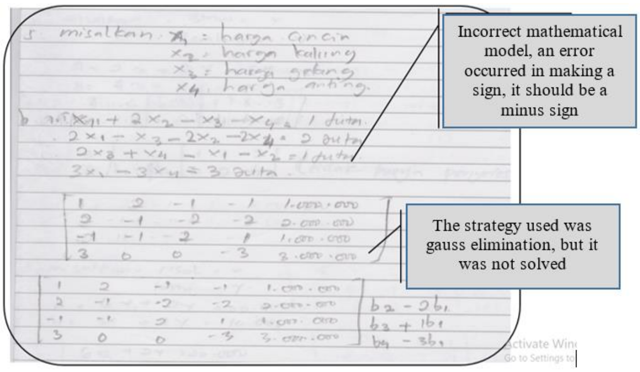


Figure 14. Example of the Answer Process in the experimental class for item 5

In Figure 14 it could be seen that the students made an inaccurate mathematical model, an error occurred in making a negative sign. Even though it was correct in choosing a strategy, it seemed that it was still difficult to solve it.

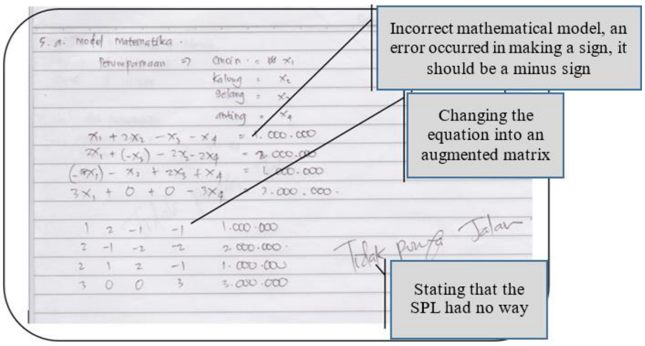


Figure 15. Example of the Answer Process in the control class for item 5

Figure 15 was an example of a control class student's answer, from the figure it could be seen that students were still having trouble making mathematical models, it was appropriate to determine the solution strategy but it was not resolved, the description of the completion process was almost the same as the student's answer in the experimental class.

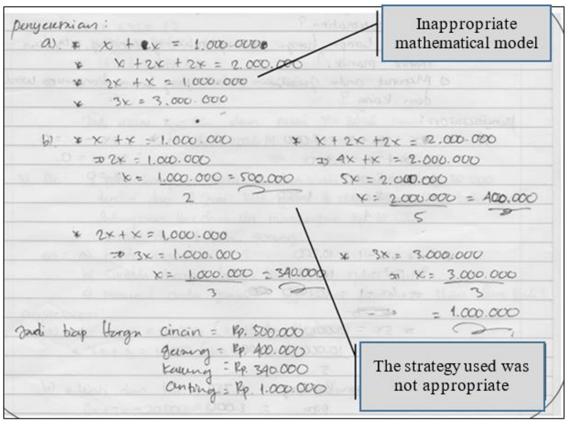


Figure 16. Example of the Answer Process in the control class for item 5

The figure above was an example of an answer from the control class, it could be seen that the student was still having trouble making a mathematical model and also in choosing a solution strategy that was still not right.

After the description of the student's answer process from the five questions, the following table is obtained which is a summary of the student completion process in the two classes.

Table 3. Summary of the Students' Process of Completing the Answers to Questions in the Experimental Class and Control Class

No. Question/ problem	Class	Problem Solving Process: Making Mathematical Model		Choosing a problem solving strategy		Explaining answer		Checking the truth	
		N	%	N	%	N	%	N	%
Item 1	Experiment	28	54.9%	27	52.9%	32	62.7%	0	0.0%
	Control	22	40.0%	20	36.4%	17	30.9%	7	12.7%
Item 2	Experiment	47	92.2%	21	41.2%	31	60.8%	21	41.2%
	Control	43	78.2%	29	52.7%	23	41.8%	13	23.6%
Item 3	Experiment	41	80.4%	25	49.0%	35	68.6%	25	49.0%
	Control	39	70.9%	3	5.5%	3	5.5%	0	0.0%
Item 4	Experiment	36	70.6%	17	33.3%	21	41.2%	1	2.0%
	Control	19	34.5%	11	20.0%	0	0.0%	0	0.0%
Item 5	Experiment	17	33.3%	0	0.0%	0	0.0%	0	0.0%
	Control	4	7.3%	0	0.0%	0	0.0%	0	0.0%

There are 3 criteria for the process of completing student answers, namely good, sufficient and not good. Good criteria if the score is in the interval 10 < x 15, the criteria is sufficient to be in the interval 5 < x 10, while the unfavorable criteria are in the interval 0 < x 5. In Table 4. below it can be seen the difference in the two classes sample.

Table 4. Criteria for the Solution Process of Students' Answers indicators in the Experiment Class and Control Class

Indicator of Problem solving Ability	Student Answer Process Indicators		Interval Value	Category Evaluation	Exp. Class	Control Class
Making mathematical models	Complete solution steps and correct answer		$10 < x \leq 15$	Good	34	16
	Incompletesolution step and correct answer		$5 < x \leq 10$	Enough	13	34
	Incomplete solution steps and incorrect answers		$0 < x \leq 5$	Poor	4	5
Choosing the right solution strategy	Complete solution steps and correct answer		$10 < x \leq 15$	Good	18	1
	Incomplete solution step and correct answer		$5 < x \leq 10$	Enough	21	32
	Incomplete solution steps and incorrect answers		$0 < x \leq 5$	Poor	12	22
Explain the answer and check its correctness	Explaining Answers	Complete solution steps and correct answer	Good	Good	0	0
		Incomplete solution step and correct answer	Enough	Enough	12	23
		Incomplete solution steps and incorrect answers	Poor	Poor	39	32
	Checking the truth	Complete solution steps and correct answer	Good	Good	15	0
		Incomplete solution step and correct answer	Enough	Enough	24	7
		Incomplete solution steps and incorrect answers	Poor	Poor	12	48

Based on Table 4, it can be seen that for the good rating category for each indicator, namely, the first indicator obtained the experimental class as many as 34 students while the control class was as many as 16 students, for the second indicator obtained the experimental class was as many as 18 students while the control class was only 1 student, for the third indicator in both classes both were 0, while for the last indicator obtained the experimental class was as many as 15 students while the control class did not exist. If the four indicators were added together, Experiment = 67, and Ncontrol = 17. From these results, based on the criteria for the process of completing student answers in the experimental class, it was said to be better than the control class if the number of students who got the "good" assessment category in the experimental class was more than the control class (Nekperimen > Ncontrol). Thus, from the description above, it could be concluded that the process of solving students' answers through problem-based learning was better than conventional learning.

There have been numerous research on the implementation of problem-based learning models, some of which involve varying abilities in mathematics and others do not. In this study, the problem-based learning approach was related with problem-solving skills, although the researcher only discussed the pattern of answers students provided in response to the supplied issues. The findings of this study are extremely valuable for mathematics educators who wish to implement problem-based learning strategies in their classrooms. This research can assist educators, particularly instructors, in identifying the optimal learning model based on the characteristics of their pupils.

CONCLUSION

Out of the three rounds of problem-solving that the students went through, the first stage of creating mathematical models yielded the most accurate responses, with 34 out of 51 students answering properly. During the second and third levels of "choosing the correct method" and "explaining the answer," just 26-30% of students answered correctly. Based on the results of research on the analysis of the answer process, it was found that the number of students in the good category was Experiment = 67, and Ncontrol = 17, based on the criteria for the process of completing student answers in the experimental class it was said to be better than the control class if the number of students who obtained the category of "good" assessment in the class more experimental group than control class (Experiment > Ncontrol). Thus, from the description above, it can be concluded that the process of solving student answers through problem-based learning is better than conventional learning.

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