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The Analysis of Vocational Students' Metacognition in Solving Mathematical Problems Based on Self-Efficacy

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ABSTRACT
This study aims to analyze the metacognition of vocational students in solving mathematical problems based on their levels of self-efficacy. This is qualitative research with a descriptive method. Data collection techniques used questionnaires, tests, and interviews. The subject of this study were 6 students with different levels of self-efficacy who are selected using the purposive sampling technique. The results indicate that vocational students who have high self-efficacy in solving mathematical problems were able to use their metacognitive activities to the maximum, namely being able to understand and identify problems, make a plan of completion and implement it, check every step work carefully, and evaluate the thought process. Students with medium self-efficacy are less than optimal in using their metacognitive skills, can identify information that is known but not focused on the core of the problem so that she is less able to plan settlement strategies, so when monitoring and evaluating she doubts of the process and don't realize that the result is not appropriate. Students with low self-efficacy tend not to carry out their metacognitive activities properly, namely cannot understand the problems and not planning a solution strategy thus causing activities at the monitoring and evaluation not activated properly.

Keywords: *Metacognition, Problem-solving, Self-efficacy.*

1. INTRODUCTION

Mathematics is a subject that is taught in all education levels, as well as in vocational high schools. Mathematics learning is taught to develop students' abilities in understanding mathematical concepts and creativity in solving mathematical problems [1]. Therefore, mathematics has a crucial role in preparing students to think critically, logically, creatively, systematically, and analytically. Problem-solving is the main focus and has an important role in mathematics learning [2], [3]. This is due to the fact that mathematical problem solving is an activity that involves cognitive processes and thinking activities using knowledge and understanding of mathematical concepts possessed to find solutions to the problems encountered.

The success of students in solving mathematical problems is influenced by various factors, one of which is metacognition [4], [5]. Metacognition is a person's understanding, awareness, and control over the process and results of his thinking in problem-solving and choosing the best strategy by formulating plans, monitoring implementation, and evaluating his thinking processes [6]. As for planning, monitoring, and evaluation are sub-components in metacognitive regulation [7]. Metacognitive regulation ability plays an important role in supporting student learning success [8]. Emphasizing the metacognition process

in learning habits can help students to be able to analyze their learning necessity, formulate learning goals, and devise appropriate learning strategies [9]. Students' metacognition influences how they choose and implement strategies, monitoring and evaluating whether the strategies have been implemented correctly, and how they examine and reflect on the results of their work [10]. Therefore by using metacognition, students can find out what strategies should be used and be aware of the difficulties that occur when solving problems, thus helping in adjusting the actions used in solving mathematical problems. So, students' metacognition skills in online learning during pandemics are interesting to study because online mathematics learning forces students to independently learn and use all their cognitive and metacognitive abilities to understand the material presented, monitor, or manage the actions and strategies used when solving math problems.

In addition to the metacognitive aspect, self-efficacy has a significant impact on students' mathematical problem-solving ability [11]. Self-efficacy in online mathematics learning during pandemic is also interesting to study because students need to have. Self-efficacy is beliefs on the ability and capability of a student to achieve and accomplish learning tasks with a target predetermined time [12]. Self-efficacy affects students' abilities in the learning process, motivation, and student performance because someone will be more enthusiastic and try to learn and do something only on problems that she believes will succeed [13]. Students who have self-efficacy when faced with situations that hinder their success will confidently be able to overcome these situations and will try hard to exert all their abilities to be able to regulate and control themselves to be able to achieve the expected results well. This is appropriate with [14] that high self-efficacy is related with better metacognition, including the use of problem-solving strategies and more efficient time management, greater effort, and the ability to persist in solving problems, especially in the face of obstacles or difficulties.

This indicates that self-efficacy is a factor that is believed to affect students' metacognition to succeed in solving mathematical problems. Self-efficacy is related to why students choose to engage in certain tasks and beliefs about their ability to organize and perform a task to attained the goals, while metacognition have a role as a catalyst to generate the use of self-regulation strategies include understanding a problem, monitoring strategies, evaluating results, or even changing strategies if it is considered that the strategy used is not successful in solving the problem [15]. Thus analyzing students' metacognition based on self-efficacy is very important to study because it impacts students' success in learning and solving mathematical problems. The majority of research on metacognition abilities is associated with learning achievement [16], students' metacognitive abilities in problem-solving [17], [18], and about the metacognitive level of students in solving problems [19]. However, no research has been found that analyzes the metacognition of vocational students' based on self-efficacy at arithmetic sequences and series in online mathematics learning during the COVID-19 pandemic. Therefore, the purpose of this study is to analyze the metacognition of vocational students' in solving mathematical problems based on self-efficacy in online mathematics learning, especially on arithmetic sequences and series.

2. RESEARCH METHOD

This study used qualitative research with a descriptive method. The participants were collected from 32 students of class X-MM 1 at SMK Negeri 1 Binangun. The subjects were taken based on the results of the self-efficacy questionnaire which was given in an online way via a google form. The subject of this study were 6 students with self-efficacy levels of high, medium, and low who were selected using purposive sampling technique. Purposive sampling is the selection of subjects that are selected by using certain considerations held by the researcher [20], which is chosen based on the consideration of the ability to communicate well in expressing opinions orally and in writing so that researchers can obtain information deeper into students' metacognitive processes in solving mathematical problems.

The data analysis technique used Miles and Huberman's interactive model, including data reduction, data presentation, and conclusions, while the validity of the data used triangulation methods [20]. The triangulation method is used to compare interview methods with tests and data collection was carried out by two different methods in successive timescales. The data of test results is used as a reference for conducting interviews and the data can be said to be valid if the results of the test are in accordance with the results of interviews. The instruments used self-efficacy questionnaires, tests, and interview guidelines which have been validated by 3 people who are experts in developing research instruments. Data collection of self-efficacy uses a validated questionnaire contains 35 items with indicators developed based on the self-efficacy

Table 1. Indicators of self-efficacy

Aspect	Indicators
Magnitude	Believe in their abilities to accept difficult tasks
	Believe in their abilities to complete difficult tasks
Strength	Believe in the effort made to complete assignments
	Believe in their abilities that the amount of effort made can achieve goals abilities
Generality	Believe in their abilities possessed in dealing with or completing various kinds of tasks
	Believe in their abilities in overcoming various situations when facing problem

dimensions proposed by [12]. Aspects and indicators of self-efficacy can be seen in Table 1.

Data collection of metacognition using tests and semi-structured interviews. The test method in this study was carried out by collecting data on students' metacognitive abilities when solving test questions. Therefore, the test in this study was used to obtain information about students' metacognitive processes in solving mathematical problems. While interviews are used to get in-depth answers that cannot be obtained from written tests, this is done because not everything in the mind of the subject is written down on the answer sheet, so it is necessary to conduct interviews to explore students' metacognitive processes when solving math problems. There are the indicators of the subcomponents in the metacognitive regulation based on [7]. Explanation of metacognition indicators in Table 2.

Table 2. Indicators of metacognition

Aspect	Indicators
Planning	Identifying all known components
	Identifying the problems being asked
	Planning the completion steps to becarried
Monitoring	Implementing the completion plan coherently and complete
	Checking the completion steps taken in accordance with the known information
Evaluation	Checking the correctness of the steps at the completion stage and concluding the completion correctly

Based on the results of the questionnaire that has been filled by 32 students, the mean value was 95,94 and the standard deviation was 11,79. The categorization of self-efficacy in this study is in accordance with [21] namely high, medium, and low. The data from the analysis of the self-efficacy questionnaire are presented in Table 3.

Table 3. Data analysis of self-efficacy

Statistics	Category	Respondent	Percentage
$x \geq \bar{x} + SD$	High	5	16%
$\bar{x} - SD < x < \bar{x} + SD$	Medium	22	68%
$\bar{x} - SD \geq x$	Low	5	16%

Then to analyse students' metacognition, the students from 3 categories were selected to serve as subjects in this study, so that there are 6 students selected. But in this article, there will be presented 3 subjects to represent, the first subject who has high self-efficacy (S1), the second subject who have medium self-efficacy (S2), and the third subject who have low self-efficacy (S3). Furthermore, metacognition data were collected by giving a mathematical problem-solving test about arithmetic sequences and series and conducted semi-structured interviews to reveal or find out more deeply information about how students' metacognitive processes in solving mathematical problems.

3. RESULTS AND DISCUSSION

Student metacognition is related to the ability of students to express the process and results of their thinking in solving the problems faced. To find out how students' metacognition especially when she solves math problems, then the only way to make them able to express their thought processes is by asking their planning stage, monitoring stage, and evaluation stage. So, the following will discuss the results of the metacognitive analysis of students who have high, medium, and low self-efficacy seen from metacognitive activities at the planning stage, monitoring stage, and evaluation stage. The test questions used to gauge students' metacognitive process are shown in Figure 1 below.

In a theater hall, there are 20 row of seats. In the first row there are 10 seats, the second row has 13 seats, the third row has 16 seats, and in the next row the difference in seats is always the same. The ticket price for the seats in the first row is Rp. 120,000.00 and the ticket price for the seats in the next row is always reduced by Rp. 8,000.00, until the price of seats in a certain row is free. How many seats are free?
Based on the problems above, provide a solution to the problem by answering the following questions:
a. Write down all the information know in the questions!
b. Write down the problem asked in the question!
c. Write down the steps that will be used to solve the problem completely!
d. Using the information in points a, b, and c, calculate solution of the problem correctly!
e. Are you sure that the answers that have been done are correct? Give the reason!
f. Check the problem-solving steps, then write down conclusions from the answers correctly!

Figure 1 Mathematical problem-solving test

3.1. Results

Metacognition analysis based on students' answers in solving mathematical problems on arithmetic sequences and series and then was conducted using semi-structured interviews with R as a researcher, S1 as a subject with high self-efficacy, S2 as a subject with medium self-efficacy, and S3 as a subject with low self-efficacy.

3.1.1. Students' Metacognition with High Self-Efficacy in Solving Math Problems

The problem-solving result of subjects who have high self-efficacy in the planning stage can be seen in Figure 2 below.

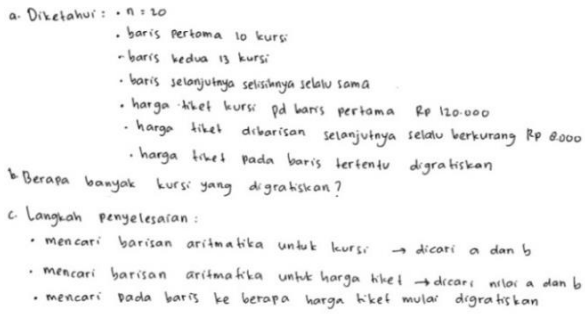
a. Diketahui : • n = 20
• baris pertama 10 kursi
• baris kedua 13 kursi
• baris selanjutnya selisihnya selalu sama
• harga tiket kursi pd baris pertama Rp 120.000
• harga tiket dibarisan selanjutnya selalu berkurang Rp 8.000
• harga tiket pada baris tertentu digratiskan
b. Berapa banyak kursi yang digratiskan?
c. Langkah penyelesaian :
• mencari barisan aritmatika untuk kursi → dicari a dan b
• mencari barisan aritmatika untuk harga tiket → dicari nilai a dan b
• mencari pada baris ke berapa harga tiket mulai digratiskan

Figure 2 The planning stage of S1 subject

Based on the answer of subject S1 in Figure 2, it shows that the subject can understand the problems, identify the problems presented, and can develop a good resolution plan. This can be seen from the subject who has written down all the information known, the problem that's asked, and written down the steps plan strategy to solve it properly. The result of the interview also reveals that the subject is conscious of her thought process when identifying the information that exists in the problem, because when explaining the strategies the subject can categories related ideas, identify the strategies used and uttered the reason for using these strategies. It can be seen in the snippet of interviews below.

R : Do you understand the meaning of the question?
S1 : Understood ma'am.
R : Then how do you identify the problem after understanding the problem?
S1 : After reading and trying to understand every sentence of the question, I finally understood. I try to identify the problem by arranging the known things, then converting it to mathematical models. After I finished writing down all the information in the question, I finally understood what the problem was, so I could think about what the next step would be.
R : Did you make a plan to solve this problem? Explain what your plans are to get it done!
S1 : Yes, ma'am, after I understood what was being asked about how many seats were free, then I thought about what steps I would take. Based on the first information I will look for an arithmetic sequence for a total of seats in each row so that I know the values of a and b. After that, based on the information in the next sentence, I will look for an arithmetic sequence for the ticket price for seats in each row, so that the values of a and b are obtained as well. Furthermore, based on the latest information, it is known that the price of seats in a certain row is free, then Un=0, meaning I will look for the value of n or in what row the price of seats starts for free. After that, I can count the total of seats that have been freed.
R : Why did you make a settlement plan like that?
S1 : I made a plan like that because I want to make it work coherently, so that it looks easier to complete, so it's not confusing.

The problem-solving result of subject who have high self-efficacy in the monitoring stage can be seen in Figure 3 below.

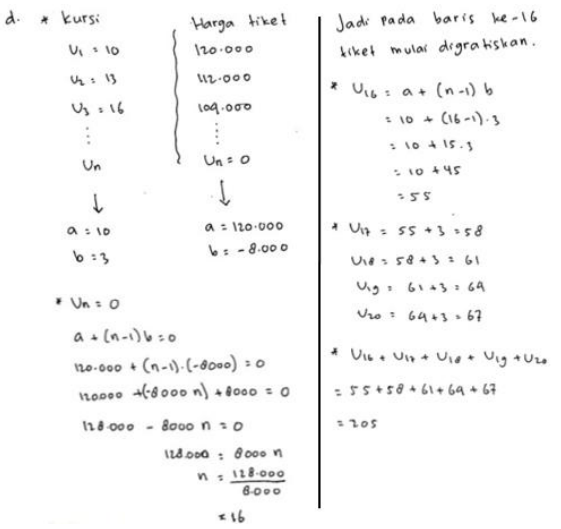

Figure 3 The monitoring stage of S1 subject

Based on the answer of subject S1 in Figure 3, it shows that the subject can be able to implement the settlement plan completely. It can be seen from the subject who has written down steps to look for the value of a and b in the arithmetic sequence for seats and ticket prices, can find on price the tickets were starting for free, and can calculate how many seats were free properly. The result of the interview also shows that the subject can explain the steps of solving the problem clearly and believe that the work steps are done according to known information and the formula used in accordance with the concept. It can be seen in the snippet of an interview below.

R : Are the settlement plans that you made smoothly?
S1 : Yes, because I have made a detailed plan for the completion of the steps according to the information described in the problem, so it's just a matter of calculating it, which must be careful so that it is not wrong, especially regarding the positive and negative symbols.
R : Then how do you solve this problem?
S1 : First I look for the values of a and b in the arithmetic sequence for seats and ticket prices. Then I get the value $a = 10$, and $b = 3$ for the arithmetic sequence of total seats in each row, and the value of $a = 20$, and $b = -8$ for the arithmetic sequence of ticket prices in each row. Next, I used clue $U_n = 0$ to find on price the tickets were starting for free, and the result was $n = 16$. Then I just counted how many the seats were free by means of $U_{16} + U_{17} + U_{18} + U_{19} + U_{20}$.
R : Are the formulas you used in the work steps in accordance with the concept?
S1 : According to my understanding it's appropriate

The problem-solving result of subject who have high self-efficacy in the evaluating stage can be seen in Figure 4 below.

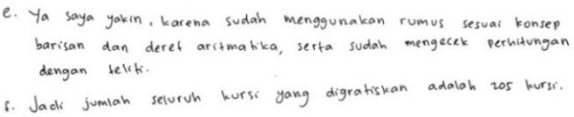

Figure 4 The evaluating stage of S1subject

Based on the answer of subject S1 in Figure 4, it shows that the subject did not experience errors. It can be seen from the subject who has written down conclusions that refer to the purpose of the problem and evaluates the results of the implementation of the complete plan in accordance with the steps used. The result of the interview also shows that the subject revealed that she believes the solution obtained was right because she has checked the steps and calculations one by one carefully, although at first the subject was confused in determining what strategy to be used to solve the questions. It can be seen in the snippet of an interview below.

R : Do you have difficulty in solving the problems of the questions?
S1 : Yes ma'am, at the beginning I was confused and had difficulties.
R : Then what difficulties did you experience when solving the questions?
S1 : I was confused when I was thinking about the strategy for the solution, confused where I should start working on it, because what was being asked was how many seats were free, while what was known was a lot. But after I tried to do it by writing every purpose of the information in the question, I finally understood and was able to do it.
R : Did you check your answer again after finding the answer?
S1 : Yes, I have re-checked the steps of completion and calculations.
R : Are you sure that the solution you got is correct?
S1 : I'm sure it's correct ma'am.
R : How do you know if your answer is correct? How do you convince yourself that what you have done in solving the problem is correct?
S1 : Because I have done it according to the concepts and I've calculated every step carefully, so I'm sure the answer is correct.

3.1.2. Students' Metacognition with Medium Self-Efficacy in Solving Math Problems

The problem-solving result of subject who have medium self-efficacy in the planning stage can be seen in Figure 5 below.

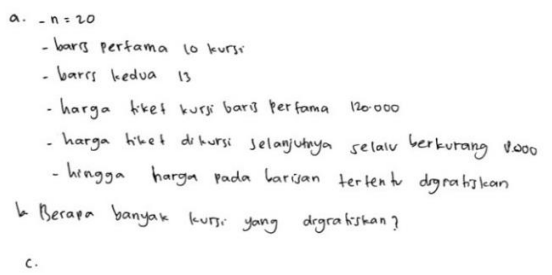

Figure 5 The planning stage of S2 subject

Based on the answer of subject S2 in Figure 5, it shows that the subject can understand the problem and identify what information is known and the problem asked, but the subject has difficulty in planning a settlement strategy and is less aware of what to do when solving the problem. It can be seen from the subject who has written down all the information known and the problem that's asked, but she didn't write the ways or strategies to solve this problem. This is in accordance with the information from the interview excerpts that she can consciously reveal what is known and asked from the questions, but she has difficulty finding a suitable way or strategy to solve the problem. However, when the researchers asked their version of the strategy, she was able to reveal their version of the strategy although she doubted the strategy she used, but she still tried to work on and solve the problem. It can be seen in the snippet of an interview below.

R : Do you understand the meaning of the question?
S2 : I understand ma'am.
R : How do you identify the questions after understanding them?
S2 : I try to understand every sentence of the problem, then write down what is known and convert it into math models. After reading it over and over again, I finally understood what the actual problem was.
R : Did you make a settlement plan to solve this problem? Explain the settlement plan you are doing!
S2 : Actually I was thinking about how I would solve the problem, but I was confused so I immediately tried it. Based on what I know, I look for the values of a and b for each sequence, namely the arithmetic sequence for the total of seats and for the ticket price for seats in each row. But after getting it I'm confused about what the next step should be.

Then the problem-solving result of subject who have medium self-efficacy in the monitoring stage can be seen in Figure 6 below.

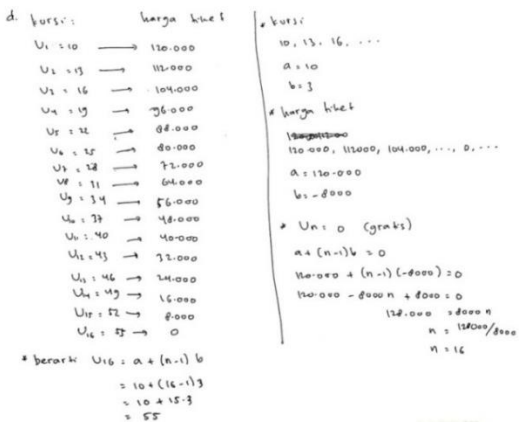

Figure 6 The monitoring stage of S2 subject

The monitoring stage based on the answer of subject S2 in Figure 6 shows that the subject didn't understand the first steps that must be used to solve the problem, so she started by manually calculating Un for how many of seats in each row until it was found what row is ticket prices Rp. 0. The subject is also only for calculation until the stage of looking for the value of n. It means that the subject doesn't realize that the solution she finds is not answering the question, because the question asks how many seats are free while the subject's answer is only to find out in which row the seats start free. The result of the interview also shows that the subject was able to express his version of the solution strategy, but also doubt because he did not know what strategy was suitable to be used to solve it systematically so that after getting the value of n she was confused about how to relate the formula who had been learned to the problem that is being asked about. It can be seen in the snippet of an interview below.

R : Are the plan strategies that you made smoothly?
S2 : Not too smooth ma'am, but after looking for the values of a and b, I'm confused about the next step.
R : Then how do you solve this problem?
S2 : I tried to manually calculate the ticket price for each row of seats until I got the ticket price for free or Rp. 0. Then I tried to calculate $U_n = 0$ according to the known information, and I got the value $n = 16$. Because I was confused as to what else to do, so I checked again whether it was true that $U_{16} = 55$, it turned out to be true ma'am. So I think that the answer is 16 according to the value of n that you are looking for.
R : Are the formulas you used in the work steps in accordance with the concept?
S2 : According to my understanding, it's appropriate, but I'm also confused about

how to relate the formula that I have got to the problem that is being asked about.

The problem-solving result of subject who have high self-efficacy in the evaluating stage can be seen in Figure 7 below.

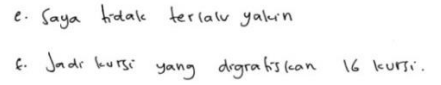

Figure 7 The evaluating stage of S2 subject

Based on the answer of subject S2 in Figure 7 shows that the subject doesn't understand the problem that is actually asked. It can be seen from the conclusion that the total number of seats that are free is 16, while it is only to find out in which row the seats start free. In addition based on the interview snippet, the subject also stated that he was unable to convince himself because she was hesitant when working, so when asked to check the correctness of the completion steps he looked confused and hesitant.The subject also evaluates and tries to improve it even though the result of the settlement is not sure whether it is right or wrong. It can be seen in the snippet of an interview below.

R : Did the plan or strategy you used work according to your thoughts when working on the problem?
S2 : Yes, ma'am.
R : What are the difficulties that occur when solving this problem?
S2 : At first I had difficulty finding a suitable way or strategy to solve the problem, but in the end, I still tried to solve it by describing what I knew.
R : Then did you re-examine your work steps after finding the answer?
S2 : Yes ma'am, I have re-checked the steps of completion and calculations.
R : Are you sure that the solution you got is correct?
S2 : I have doubts about the result, whether it is right or wrong.
R : Why are you hesitating, which part of the step do you doubt?
S2 : I doubt at the end, whether there are steps that have been missed and have not been completed or not.

3.1.3. Students' Metacognition with Low Self-Efficacy in Solving Math Problems

The problem-solving result of subject who have low self-efficacy in the planning stage can be seen in Figure 8 below.

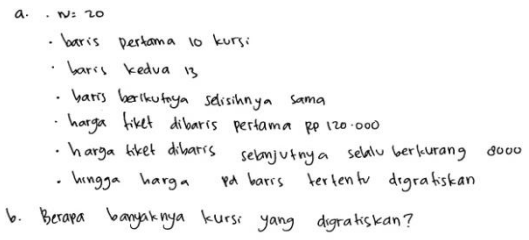

Figure 8 The planning stage of S3 subject

The planning stage based on the answer in Figure 6 shows that the subject know the information is known of the question but do not understand the problem that is actually being asked. The subject has difficulty in understanding the question and does not know the concept of working on the problem. It can be seen from the subject who has written down the information known but she didn't write the ways or strategies to solve this problem. It can also be seen from the interview snippet who explains that the subject confused what's step to do solve the problem, because she was confused think about how the relationship between the formula U_n and S_n in the sequence and series of arithmetic with the question asked on the question. This indicates that the subject is not aware of the process and results of his thinking before developing an action plan to solve that problem so that the subject is not able to develop a plan of completion properly. It can be seen in the following snippet of interviews between researchers (R) with the subject S3 below.

R : Do you understand the meaning of the question?
S3 : I don't really understand ma'am.
R : Then how do you try to understand the problem in this question?
S3 : I tried to read it and understand every sentence of the question. I try to write down the information that is known in each sentence and write down what the problem is actually being asked. But I'm confused about the right step to do it.
R : Did you make a plan to solve this problem?
S3 : No ma'am.
R : Why is that?
S3 : Because I don't know what steps I should take to solve this problem. I'm confused thinking the right way, confused thinking about how the relationship between the formula U_n and S_n in the sequence and series of arithmetic with the question asked on the question.

Then the problem-solving result of subject who have low self-efficacy in the monitoring stage can be seen in Figure 9 below.

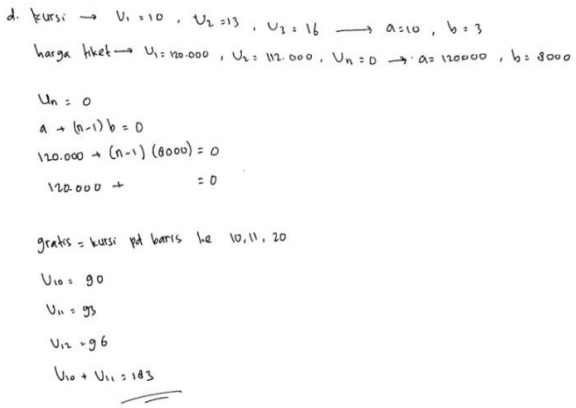

Figure 9 The monitoring stage of S3 subject

The monitoring stage based on the answer in Figure 9 shows that the subject has difficulty in solving problems so that only write down based on their known. The subject does not know the concept of working on the problem. This can be seen from the completion steps that are not systematic, there is an error in the calculation, and don't complete the calculations correctly. Otherwise based on the result of the interview obtained information that this happens because the subject does not know what the next steps and the concept should be used to solve the problem so that the subject resolves the problem by assuming that the price of seat tickets would be free from the 10^{th}row of seats. This indicates that the subject did not carry out activities to monitor the strategy correctly because she did not carry out planning activities properly. It can be seen in the excerpt of interviews below.

R : Are the plans you used implemented according to your thinking in solving the problem?
S3 : Yes, but I'm confused about how to solve it.

R : Then how do you solve the problem?
S3 : I'm trying to find the right way, but I'm also confused about how it should be. So I started by trying to list the number of seats and the price of the seats in each row to find the values of a and b. Then I continued to work on the $U_n = 0$, but it wasn't finished because I was confused about how to calculate it, so I continued to work carelessly, by assuming that the price of seat tickets would be free from the 10th row of seats.
R : Are the formulas you used in the work steps in accordance with the concept?
S3 : According to my understanding the formula is in accordance, but I am confused in doing the calculations.

The answers of subject S3 at the evaluation stage can be seen in Figure 10 below.

Figure 10 The evaluating stage of S3 subject

The evaluation stage based on Figure 10 shows that subject S3 did not do an evaluation activity because the subject did not do the problem-solving strategy properly. It can be seen from the subject who blank the answers. Otherwise, based on the result of interviews obtained the subject did not do an evaluation because she was doubtful about the steps she had done and did not know the answer to be written. It can be seen in the excerpt of interviews below.

R : Do you have difficulty in solving the problems?
S3 : Yes ma'am, I encountered many difficulties.
R : Then what difficulties did you experience when solving the questions?
S3 : I have a hard time thinking of a strategy for the solution, confused about finding the right way to solve the problem, so I don't know how to start working on it. Besides that, I am also confused about the calculation.
R : Did you check your answer again?
S3 : Yes ma'am, I have repeatedly checked the completion steps and calculations according to my understanding, but it can only be like that.
R : Are you sure that the solution you got is correct?
S3 : I'm not sure ma'am.
R : Why is it like that?
S3 : Because I was confused, I just did it according to my understanding.
R : In what part of the steps did you go wrong?
S3 : It seems I was wrong in the calculation, in the positive and negative signs too.

3.2. Discussion

The results of the research above indicate that the metacognition of vocational students who have high, medium, and low self-efficacy have different abilities in solving mathematical problems. The student who have high self-efficacy can achieve all indicators in the components of metacognition regulation, this can be seen when the student can solve mathematical

problems given well, namely being able to understand the problem and identify problems, develop a plan of completion well, realize what to do when will solve problems, carry out the solution plan well, examine each step of the work carefully, and always evaluate the results of their work. This is in line with research conducted by [22] that students with high self-efficacy can understand problems, plan problem-solving, carry out problem-solving plans correctly and completely, and always re-examine completion steps. The results of this study are also in accordance with [14] and [23] that high self-efficacy associated with better metacognition, including the use of problem-solving strategies, more efficient time management, maximum effort exertion, and being able to survive when facing obstacles or difficulties in solving problems. So it can be concluded that students with high self-efficacy use their metacognitive activities at the planning, monitoring, and evaluation stages to the maximum which results in success in solving the problems they face.

Based on the results of the research, students who have medium self-efficacy can understand the problem by expressing what is known and asked, but lack focus on the core of the problem so that they are unable to determine the appropriate solution. This indicates that students don't understand the questions well and don't plan optimally, so that when monitoring and evaluating students doubt the steps taken and do not realize that what is being done is different from what is expected about the problem. However, students still try to work on it and complete it. This is in line with [22] that students who have medium self-efficacy can understand problems, implement problem-solving plans, but are unable to find other ways when the strategies used are stuck. This happens because students with moderate self-efficacy always doubt their abilities when faced with difficult math problems [24]. Therefore, it can be concluded that students with medium self-efficacy are less than optimal in using metacognitive skills in planning, monitoring, and evaluation aspects.

Meanwhile, students who have low self-efficacy in solving mathematical problems tend not to carry out their metacognitive activities well and give up more easily. Students cannot understand the problem well, lack focus and are not sure that they can solve it, and do not plan a solution strategy well. This causes metacognitive activities at the monitoring and evaluation stages to not be activated because the planning, monitoring, and evaluation stages are stages of successive and synergized metacognitive strategies. This is in line with the results of research [11] and [25] that students who have low self-efficacy tend to show behavior that is easy to give up and do not have the belief that they can succeed in solving problems, so they will take little or no action. even avoid it. Student distrust of their abilities will affect the effort and tenacity of students, causing students' low ability to solve problems and not running well in metacognitive activities [23], [26].

4. CONCLUSION

The results of this study shows that the students of vocational high school who have high self-efficacy in solving mathematical problems could fulfill all the indicators in the metacognitive regulations component, namely being able to use metacognitive activities at the planning, monitoring, and evaluation stages to the fullest. Students can identify the problem, realize what must be done to solve the problem, develop a plan of completion and implement it well, examine each step of the work carefully, and evaluate the thinking process. This happens because the students with high self-efficacy always try their best, have efficient time management, and can survive when facing difficulties in solving problems. The students with medium self-efficacy are less than optimal in using their metacognitive skills. Students can identify information that is known but lack focus on the core of the problem, lack of optimal planning of completion strategies, so that when monitoring and evaluating students doubt the work steps taken and do not realize that what is being done is different from what is expected. This happens because the student with medium self-efficacy always doubts their abilities when faced with difficult math problems. Meanwhile, students with low self-efficacy in solving mathematical problems tend not to carry out their metacognitive activities well. Students cannot understand the problem well and do not plan a solution strategy, causing activities at the monitoring and evaluation stage to not be activated properly. This happens because students who have low self-efficacy tend to give up easily, exert effort that is not optimal, and do not have confidence that with their abilities they can succeed in solving problems.

Every students has different characteristic, therefore teacher should be more pay attention to the self-efficacy all of students in the process of learning mathematics. For the next research, it is better to use different material or use a subjects in others education levels to obtain more in-depth information related to students' metacognition processes in solving mathematical problems.

AUTHORS' CONTRIBUTIONS

All authors contributed to the writing of this paper. The first author contributed to the design and implementation of the research, analysis of the data result, and writing of the manuscript in consultation with the second author and the third author. All authors discussed the result and commented on the manuscript.

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