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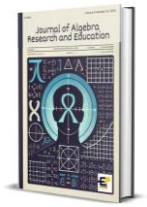

Analysis of Mathematical Representation Ability of Grade VIII Students Reviewed from Self Efficacy in MTs Naming

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Abstract

This study aims to describe the ability of students' mathematical representation on the material of a two-variable linear equation system reviewed from Self Efficacy. The type of research used is qualitative research with descriptive methods. The sampling technique used is purposive sampling. The data collection technique used a test of students' mathematical representation ability, self-efficacy questionnaire, semi-structured interviews, and documentation. The data obtained was then analyzed in 3 stages, namely data reduction, data presentation and conclusion drawn. The results showed that students with a high self-efficacy category met all three indicators of mathematical representation ability, namely using visual representations to solve problems, solving problems by involving mathematical expressions and writing Steps to solve mathematical problems with words. Students with the category of self-efficacy Moderate meet two indicators of mathematical representation ability, namely using visual representation to solve problems and solve problems by involving mathematical expressions. Students with low self-efficacy meet one indicator of mathematical representation ability, namely solving problems by involving mathematical expressions.

Keywords: Mathematical Representation Ability; Self Efficacy; Two-variable Linear Equation System.

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1. Introduction

Mathematical representation plays a pivotal role in the learning process by serving as a bridge between abstract concepts and the learner's understanding. Through various forms such as verbal expressions, written symbols, diagrams, or physical objects, students can externalize their internal cognitive processes. This not only makes the learning process more tangible but also facilitates a deeper understanding of mathematical concepts (Sabirin, 2014). According to Puspitasari et al. (2019), representation is not merely about creating visual or symbolic models but is a critical tool for translating mental models into forms that can be shared, discussed, and analyzed. This helps students develop problem-solving skills by enabling them to visualize mathematical relationships, identify patterns, and work through problems systematically. Yulinawati & Nuraeni (2021) further argue that mathematical representation empowers students to communicate their reasoning, connecting various mathematical domains and making abstract ideas more concrete and accessible.

In the classroom, teachers can leverage mathematical representation to engage students in meaningful ways. For example, when studying functions, teachers may ask students to represent verbal descriptions as graphs, fostering critical thinking and improving comprehension. By encouraging students to use different representations, such as tables, graphs, and equations, teachers help them recognize how these forms are interconnected and interchangeable for solving problems. The development of these skills extends beyond individual mathematical concepts, contributing to overall mathematical thinking. It fosters analytical and flexible problem-solving approaches, enabling students to adapt their strategies as needed. In conclusion, the ability to represent mathematical ideas in diverse forms enhances both understanding and communication, which is essential for developing mathematical literacy and helping students solve problems, grasp abstract concepts, and express their reasoning effectively.

The ability to represent mathematical concepts is one of the essential skills in mathematics learning, as it helps students construct concepts, generate mathematical ideas, and develop solutions to problems (Sutrisno et al., 2019). Representation is crucial in mathematics learning because it serves as the foundation for how students understand and use mathematical ideas to solve problems (Dahlan & Juandi, 2011). Several previous studies have examined students' mathematical representation abilities, including those conducted by Suningsih & Istiani (2020), Pasehah & Firmansyah (2020), and Amieny & Firmansyah (2021). These studies indicate that students' mathematical representation abilities are generally low. A preliminary study conducted in Class VIII at MTs Menaming revealed that the average test score of mathematical representation ability, based on three assessed indicators, was 39.8 out of a maximum score of 100. Based on previous research and preliminary study results, it is evident that students' mathematical representation abilities remain low.

Lunenburg (Indayani, 2020) explained that, beyond the ability to represent mathematical ideas, students' confidence in their capacity to express these ideas is crucial to their success in problem-solving. This confidence, which enables students to organize and direct their efforts effectively, is referred to as self-efficacy. Self-efficacy plays an essential role in a student’s ability

to approach tasks, overcome challenges, and persist in problem-solving. Bandura (Amari, 2023) defines self-efficacy as an individual's belief in their ability to organize and execute actions that meet specific performance goals. This belief shapes how students approach challenges and tasks, influencing their motivation, perseverance, and the strategies they choose. In this context, self-efficacy is not merely a mental state but a foundational attitude that drives action. According to Kusaeri (2011), this attitude forms the basis for action and reflects an individual's belief in their ability to succeed. For students, high self-efficacy enables them to approach tasks with confidence, engage with problems more effectively, and persist despite difficulties, while those with low self-efficacy may struggle to do so.

The relationship between self-efficacy and problem-solving is reflected in how students tackle challenges. Research shows that students with high self-efficacy are more likely to engage with complex problems, applying multiple strategies to solve them. Their confidence in their abilities leads them to take risks, try different approaches, and view failure as a temporary setback rather than a reflection of their capabilities. Conversely, students with lower self-efficacy may avoid difficult problems or give up easily when faced with obstacles, which can stunt their learning and growth. The impact of self-efficacy extends beyond problem-solving; it influences goal-setting, the effort a student invests, and their emotional response to setbacks. Students who believe in their abilities are more likely to view challenges as opportunities to grow, resulting in more positive outcomes in their learning journey. Thus, fostering self-efficacy in students is fundamental to enhancing academic performance, especially in subjects like mathematics, where persistence, resilience, and the ability to solve complex problems are key to success.

Thus, self-efficacy and mathematical representation ability are interconnected. This relationship necessitates further investigation to assess students' mathematical representation ability from the perspective of self-efficacy. Given the importance of students' mathematical representation ability in relation to self-efficacy, this study aims to analyze students' mathematical representation ability from a self-efficacy perspective in mathematics learning. This analysis will serve as a foundation for teachers to improve both mathematical representation ability and self-efficacy in the learning process. The findings may also provide valuable insights for teachers in designing future mathematics lessons. Therefore, this study focuses on "Analysis of Eighth-Grade Students' Mathematical Representation Ability in the Topic of Linear Equations in Two Variables from a Self-Efficacy Perspective at MTs Menaming." This research aims to describe the mathematical representation ability of eighth-grade students in the topic of linear equations in two variables and determine the relationship between mathematical representation ability and self-efficacy.

2. Methods

This study utilizes a qualitative approach with a descriptive method, which, according to Creswell (2014), is designed to explore and understand the meanings that individuals or groups ascribe to a social problem. The descriptive method aims to provide a detailed, accurate, and comprehensive description of a phenomenon as it exists in its natural setting (Ibrahim, 2018). Creswell (2019) further emphasized that descriptive qualitative methods are employed to

examine phenomena or events in-depth, considering their context and the related circumstances. The data collection techniques used in this research include tests, questionnaires, interviews, and documentation. The study seeks to analyze the mathematical representation ability of eighth-grade students (Class VIIIA) on the topic of linear equations in two variables from the perspective of self-efficacy. The research was conducted at MTs Menaming in Rambah District, Rokan Hulu Regency, with 19 students from Class VIIIA selected through purposive sampling, a technique where participants are chosen based on specific criteria relevant to the research (Sugiyono, 2017).

The research process is divided into three stages: preparation, implementation, and data analysis. The data collection instruments consist of problem-solving test questions, a self-efficacy questionnaire, and an interview guide. Data analysis follows the Miles and Huberman model (Sugiyono, 2017), which involves three key stages: data reduction, data presentation, and conclusion drawing. To enhance the validity and reliability of the data, the study employs triangulation of techniques, a method used to test the credibility of data by examining it through different techniques from the same source (Sugiyono, 2017).

3. Results and Discussion

3.1 Results

The analysis of the description of students' mathematical representation abilities was reviewed from self-efficacy. This aims to see the level of students' mathematical representation ability reviewed from self-efficacy. The results of the level of students' mathematical representation ability are reviewed from the self-efficacy presented in Table 1.

Table 1 - Students' Mathematical Representation Ability Level Reviewed from Self-Efficacy

No	Self Efficacy Level	Number of Students	Average students' mathematical representation ability	Category
1	High	4	81	High
2	Medium	11	48	Medium
3	Low	4	35	Medium

Based on Table 1, it can be observed that there are four students categorized under high self-efficacy, with an average mathematical representation ability score of 81. The medium self-efficacy category consists of 11 students, who have an average score of 48, while the low self-efficacy category contains four students, with an average score of 35. To ensure a representative sample for the interviews, subjects were selected using the Purposive Sampling Technique. In total, six students were chosen for interviews—two from each self-efficacy category (high, medium, and low). These students were specifically selected based on their high mathematical representation ability scores within their respective categories. To streamline the research process and facilitate data analysis, each of the six selected students was assigned a unique code. The details of these students are shown in Table 2.

Based on the classification that has been presented, then analysis and selection of subjects to be interviewed with the Purposive Sampling Technique, and 6 subjects were selected to be interviewed from each category of high, medium and low self-efficacy taken two students as representatives for each category, two students in each category were taken

with the highest mathematical representation ability score in each category of self-efficacy. To facilitate the implementation of research and data analysis, a code is given to students who will be interviewed. The 6 students can be seen in Table 2.

Table 2 – Self-efficacy Subject Code

No	Self Efficacy	Subject Code
1	High	SE
2	Medium	IY
3	Low	RN

The consideration for the selection of the subject is that he has obtained the material of the two-variable linear equation system in Class VIII and was selected based on the self-efficacy category. The reason why the researcher took the subjects of RK and SE was because in high self-efficacy, the subjects of SE had the highest value of mathematical representation ability. The reason why the researcher chose IY is because it has the highest representation ability value in the self-efficacy category, then IY subjects, the answer sheets for the representation ability test of IY subjects have clear and understandable answer sheets. The reason why the researcher chose RN subjects as representatives of students with low self-efficacy is because RN subjects have the lowest mathematical representation ability scores in the low self-efficacy category. Analysis of students whose self-efficacy is from the high category with SE scores. The presentation of the results of the written test that the SE subject has explained in solving question number 1.

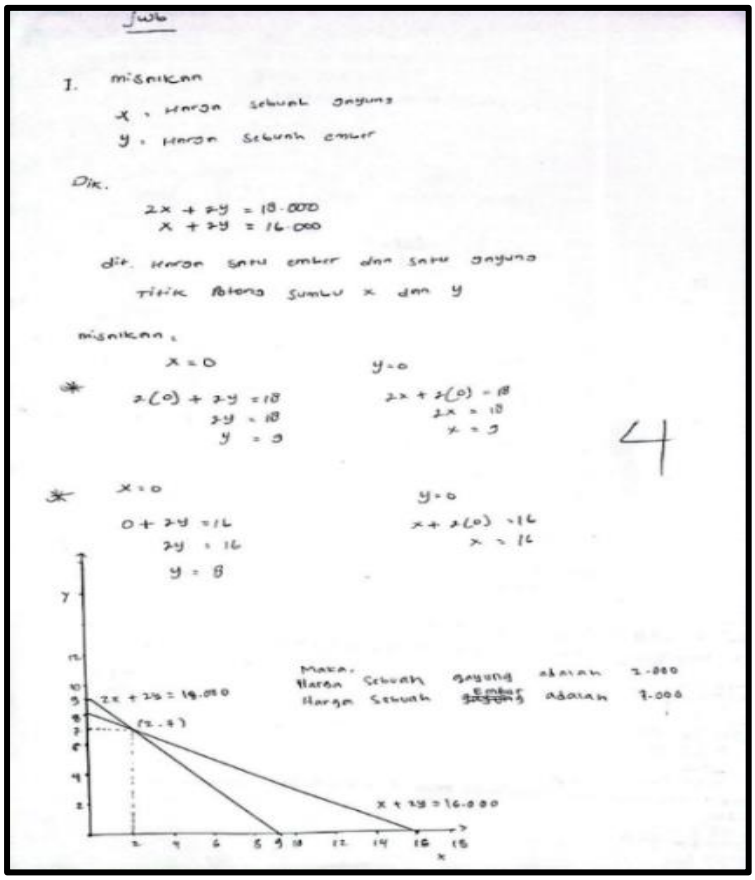

Figure 1 Answer Number 1 Subject SE

For further information, an interview was conducted with Subject SE. Below is an excerpt from the interview with Subject SE:

P: Do you understand the meaning of question number 1?
SE: Yes, I understand.
P: Are you confident that you can solve this question?
SE: Yes, I am confident because I understand the meaning of the question.
P: Do you feel challenged in solving this question?
SE: Yes, I feel challenged to find the answer.
P: What information is given in question number 1?
SE: The price of two dippers and two buckets is 18,000, and the price of one dipper and two buckets is 16,000.
P: What method should be used to answer this question?
SE: The graph method.
P: What needs to be determined when creating a graph?
SE: The x and y points.
P: So how do you determine the intersection points of x and y?
SE: By assuming x = 0 and y = 0 for each equation.
P: What is the next step you take?
SE: Drawing the graph, kak, by plotting the x and y points obtained earlier, then finding the intersection point of the two equations.
P: So, what is the price of one dipper and one bucket that you found?
SE: The price of one dipper is Rp 2,000, and the price of one bucket is Rp 7,000.

Based on the written test and interview conducted with Subject SE on question number 1, it can be concluded that Subject SE demonstrates a high level of competence in using visual representation to solve mathematical problems. SE's ability to effectively identify both the given and required information in the problem shows a clear understanding of the problem's structure. Moreover, SE was able to model the mathematical relationships correctly and accurately draw the graph, which is essential for solving the problem. SE also demonstrated proficiency in determining the intersection points with the x- and y-axes, a key step in solving the problem, and was able to do so without error. This indicates that SE not only understands the concept but can also apply it effectively in a practical context.

Additionally, the analysis of SE's self-efficacy, categorized as high, further supports this conclusion. High self-efficacy suggests that SE possesses a strong belief in their ability to succeed in solving mathematical problems, which may have positively influenced their approach and performance on the test. Students with high self-efficacy tend to approach problems with greater confidence and persistence, leading to more successful outcomes. The following section will present the results of the written test as explained by Subject SE in solving question number 2, providing further insights into SE's problem-solving abilities and mathematical representation skills.

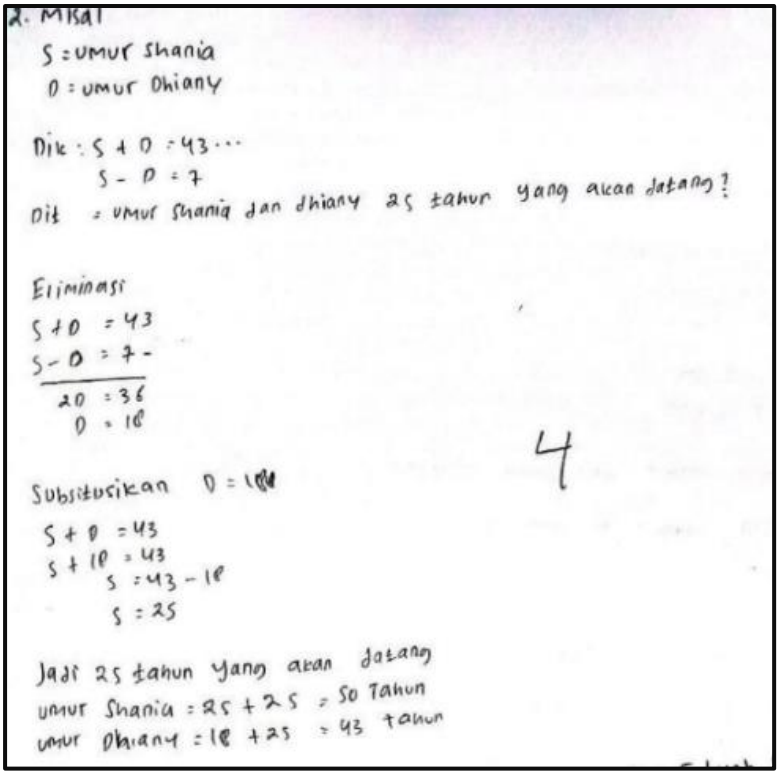

Figure 2 Answer Number 2 of SE subject

For further information on Subject SE's answers, an interview was conducted. Below is the presentation of the interview results with Subject SE:

P*: Do you understand the meaning of question number 2?*
SE: Yes, I understand.
P: Are you confident that you can solve question number 2?
SE: Yes, I am confident because I understand the meaning of the question and know the appropriate method to solve it.
P: What method is suitable for this question?
SE: The elimination and substitution methods.
P: Based on the answer you provided for question number 2, are you sure it is correct?
SE: Yes.
P: Why are you so sure that your answer is correct?
SE: Because I have checked my answer and recalculated it before submitting it to ensure there are no mistakes or omissions.
P: Can you explain how you solved question number 2?
SE: First, I created a mathematical model by assuming S as Shania's age and D as Dhiany's age. Then, I formed the equations given in the problem: S + D = 43, S - D = 7. The question asks for Dhiany's and Shania's ages 25 years from now.
P: Why did you represent their ages with S and D?
SE: Just to make it easier, kak, based on the initials of their names.
P: If you used different letters, would it still work?
SE: Yes.
P: After identifying the given and required information, what is the next step?

SE: Applying the elimination method, kak, which gives D = 18. Then, substituting D into one of the equations to find S = 25.

P: So, what conclusion did you reach?

SE: Dhiany's age 25 years from now will be 43 years, and Shania's age 25 years from now will be 50 years.

Based on the written test and the interview conducted with Subject SE for question number 2, it can be concluded that Subject SE was able to extract the information given in the problem, correctly write and explain the mathematical model, and obtain the correct solution. Analysis of students whose self-efficacy is from the high category with SE scores. The presentation of the written test results that the SE subject has explained in solving question number 3.

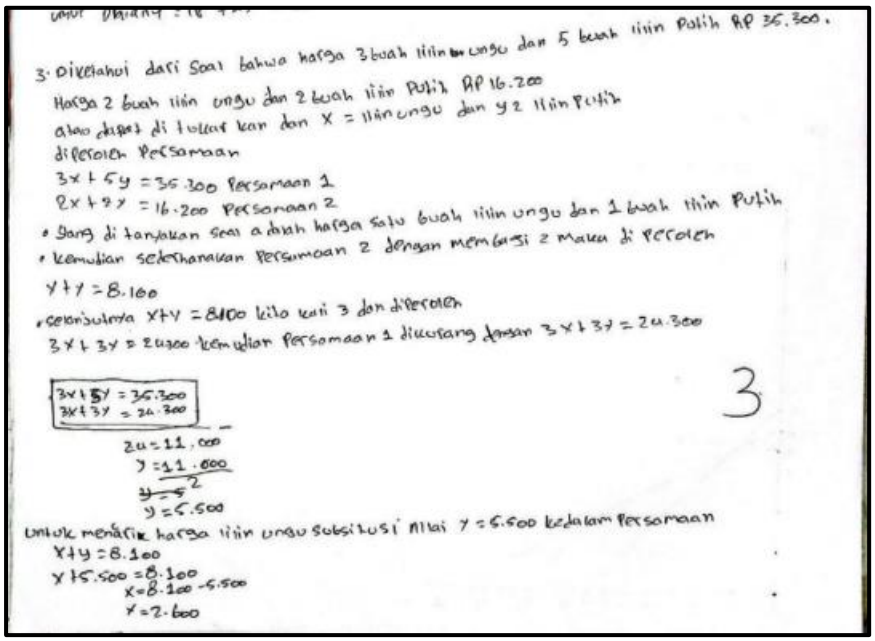

Figure 3 Answer Number 3 Subject SE

For further information on Student SE's answers, an interview was conducted, and the excerpt of the interview is as follows:

P: Please read question number 3 first.

SE: (Reads the question)

P: Are you able to solve this question?

SE: InshaAllah, I can.

P: Can you explain what you understand from the question?

SE: Three purple candles and five white candles cost Rp. 35,300, and two white candles and two white candles cost Rp. 16,200.

P: What is being asked in question number 3?

SE: The price of one purple candle and one white candle.

P: Can you explain how you solved it?

SE: The first step is to write down the given information and what is being asked.

P: What conclusion can be drawn from this question?

SE: The price of one purple candle is Rp. 2,600, and the price of one white candle is Rp. 5,500.

P: Are you sure your answer is correct?
SE: Yes.
P: Okay, your answer is correct.
P: Why didn't you write the final conclusion on your answer sheet?
SE: I forgot, because time was running out.

Based on the written test and interview conducted with Subject SE for question number 3, it can be concluded that Subject SE is capable of writing the steps to solve a mathematical problem correctly. However, SE had a minor shortcoming in solving the question, which was not writing the final conclusion. Nevertheless, SE was able to acknowledge this mistake during the interview. This is demonstrated by SE's ability to correctly determine and explain the steps from start to finish with confidence in the answer. Analysis of students whose self-efficacy is from the Moderate category with IY subjects. The following are the results of the written test that the subject of IY has explained in solving question number 1.

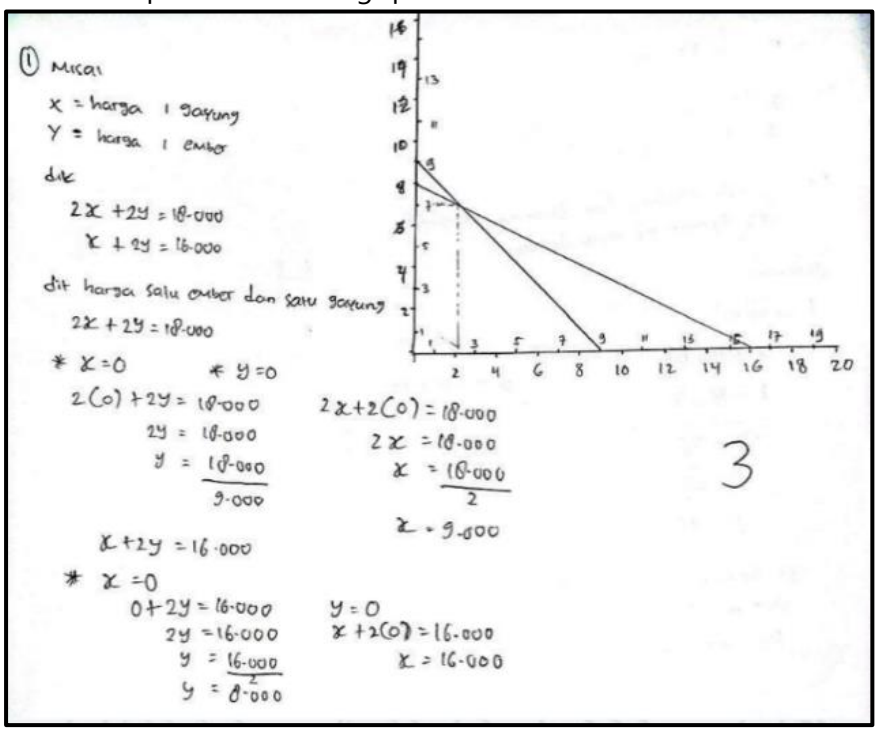

Figure 4 Answer Number 1 of the subject of IY

For further clarification on Student IY's answers, an interview was conducted, and the excerpt is as follows:

P*: Do you understand the question?*
IY: Yes.
P: Are you sure that the answer you wrote is correct?
IY: Yes.
P: Have you studied this material before? Do you understand it?
IY: Yes, I understand it quite well.
P: Do you think question number 1 is difficult?
IY: No.
P: Can you explain again what information you obtained from the question?

IY: Determining the price of one bucket and one dipper.
P: How did you solve the question?
IY: I assumed x as the price of one dipper and y as the price of one bucket. The question asks for the price of one bucket and one dipper. I then determined the intersection points for x and y, and after that, I plotted the graph using the obtained intersection points.
P: How do you determine the intersection points with the x-axis and y-axis?
IY: By assuming x = 0 and y = 0.
P: Can you explain in more detail?
IY: Sure.
P: After determining the intersection points for x and y, what do we do next?
IY: We create the graph.
P: Take a look at the graph you made. Is it correct?
IY: Yes.
P: So, what is the final answer for question number 1?
IY: The price of a dipper is Rp. 2,000, and the price of a bucket is Rp. 7,000.
P: Rp. 2,000 is the price for how many dippers?
IY: One dipper.
P: Are you sure your answer is correct?
IY: Yes.
P: So, you understand the concept, right?
IY: Yes.

Based on the written test and the interview conducted with Subject IY for question number 1, it can be concluded that Subject IY is able to represent the problem situation in a graph. This indicates that Subject IY can solve the question correctly and effectively utilize visual representation in answering question number 1. Analysis of students whose self-efficacy is from the Moderate category with IY subjects. The following are the results of the written test that the IY subject has explained in solving question number 2.

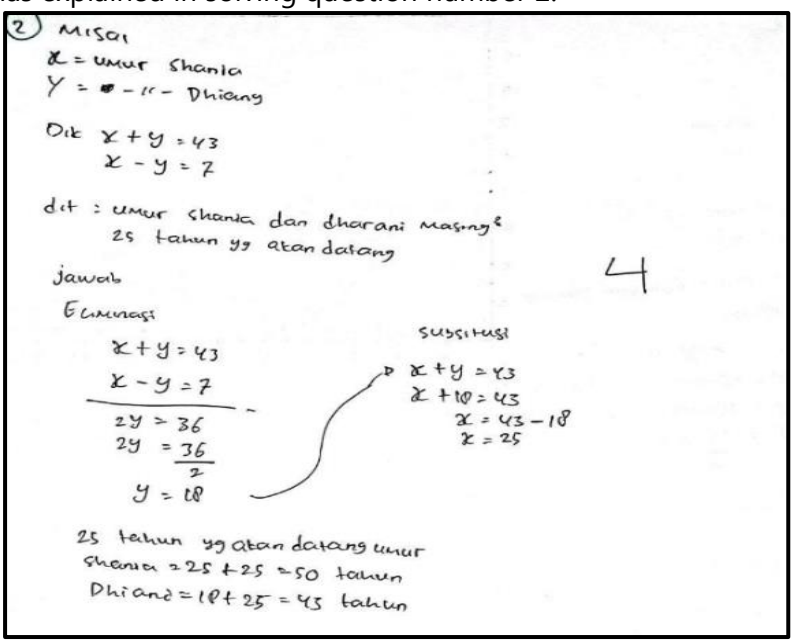

Figure 5 Answer Number 2 of the subject IY

For further clarification on Student IY's answers, an interview was conducted, and the excerpt is as follows:

P*: Please read question number 2 first.*

IY: (Reads the question)

P: Do you understand how to solve this question?

IY: Yes.

P: Can you explain how you solved the question?

IY: First, I assigned s as Shania's age and d as Dhiany's age. Then, I identified the given information and what was being asked. The given information from the problem is s + d = 43 and s - d = 7. The question asks for Shania's and Dhiany's ages 25 years from now. Next, I used the elimination method on the two given equations and found that d = 18, meaning Dhiany is currently 18 years old. Then, I substituted d into one of the equations and found that Shania is 25 years old. To determine their ages 25 years from now, I added 25 years to each: Dhiany: 18 + 25 = 43 years. Shania: 25 + 25 = 50 years

P: Do you think your answer is correct?

IY: Yes, I believe it is correct.

Based on the written test and the interview conducted with Subject IY for question number 2, it can be concluded that Subject IY is capable of solving the problem by using mathematical expressions. This is demonstrated by the fact that Subject IY correctly identified the given information, created a mathematical model, and used elimination and substitution methods to accurately determine the solution to the question. Analysis of students whose self-efficacy is from the moderate category with IY subjects. The following are the results of the written test that the IY subject has explained in solving question number 3.

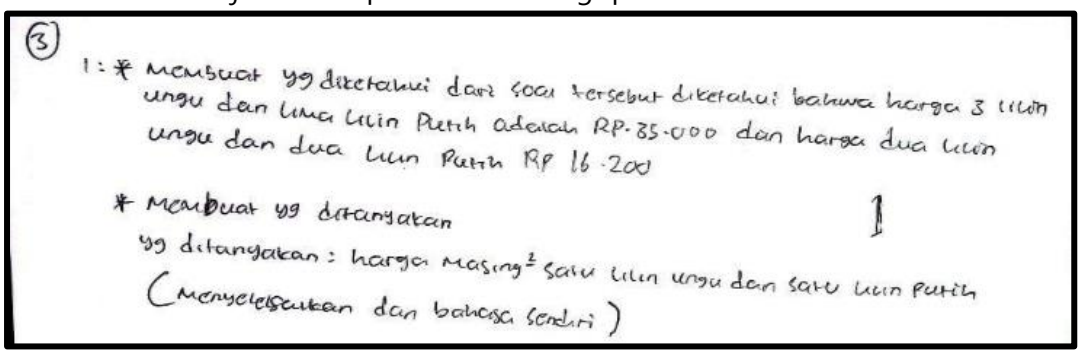

Figure 6 Answer Number 3 of the Subject of IY

P*: Do you think this question is difficult?*

IY: Yes.

P: Are you able to solve it?

IY: No.

P: What information is given in the question?

IY: 3 purple candles and 5 white candles cost Rp. 35,300, and 2 white candles and 2 white candles cost Rp. 16,200.

P: What is being asked in the question?

IY: To determine the price of one purple candle and one white candle by writing the solution steps in my own words.

P: How do you solve this question?

IY: The first step is to write down the given information, then identify what is being asked. From the problem, we know that: 3 purple candles and 5 white candles cost Rp. 35,300

2 white candles and 2 white candles cost Rp. 16,200. We can define x as the price of a purple candle and y as the price of a white candle. This gives us the following equations: 3x + 5y = 35,300. 2y + 2y = 16,200. Next, I would write down what is being asked, which is the price of one purple candle and one white candle.

P: What will you do next?

IY: I don't know. I can only solve question number 3 up to this point.

Based on the written test and interview conducted with Subject IY for question number 3, it can be concluded that Subject IY is unable to write the solution steps for the mathematical problem correctly. This is demonstrated by the fact that the subject could not determine the solution steps from start to finish accurately and completely. Analysis of students whose self-efficacy is from the low category with RN subjects. The following are the results of the written test that the RN subject has explained in solving question number 1.

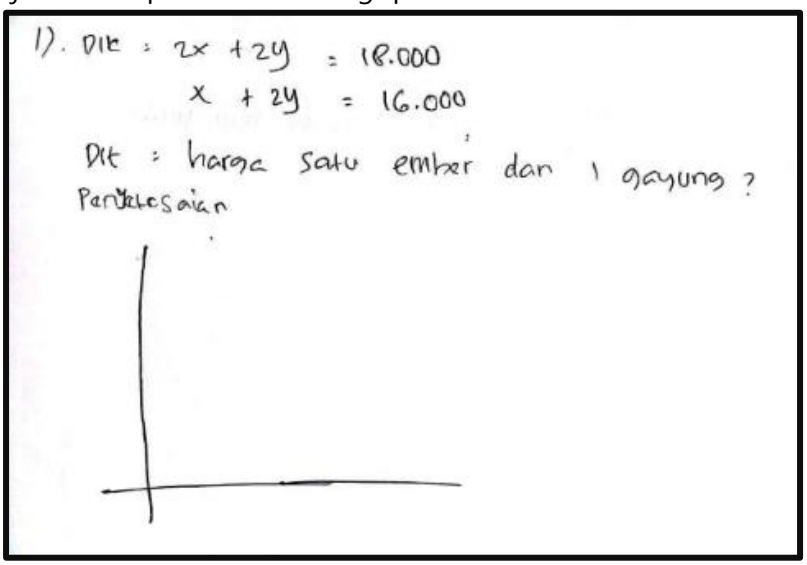

Figure 7 Answer Number 1 RN Subject

For further information regarding student RN's answer, an interview was conducted, with the following excerpts:

P*: Are you able to solve it?*

RN: No.

P: What information is given in the question?

RN: The price of two dippers and two buckets is Rp. 18,000, and the price of one dipper and two buckets is Rp. 16,000.

P: What is being asked?

RN: The price of one bucket and one dipper.

P: What method should be used to solve question number 1?

RN: The graphing method.

P: Can you explain how you answered question number 1?

RN: First, I wrote down the given information, which is 2x + 2y = 18,000, then x + 2y = 16,000.

P: Why didn't you draw the graph on your answer sheet?

RN: I don't know how.

P: Have you learned this before?

RN: Yes, but I forgot how to do it.

Based on the written test and interview conducted with subject RN for question number 1, it can be concluded that RN was unable to solve the question using the graphing method due to a lack of understanding of how to apply the method correctly. As a student with low self-efficacy, RN did not meet the indicator of using visual representation in solving mathematical problems. Analysis of students whose self-efficacy is from the low category with RN subjects. The following are the results of the written test that the RN subject has explained in solving question number 2.

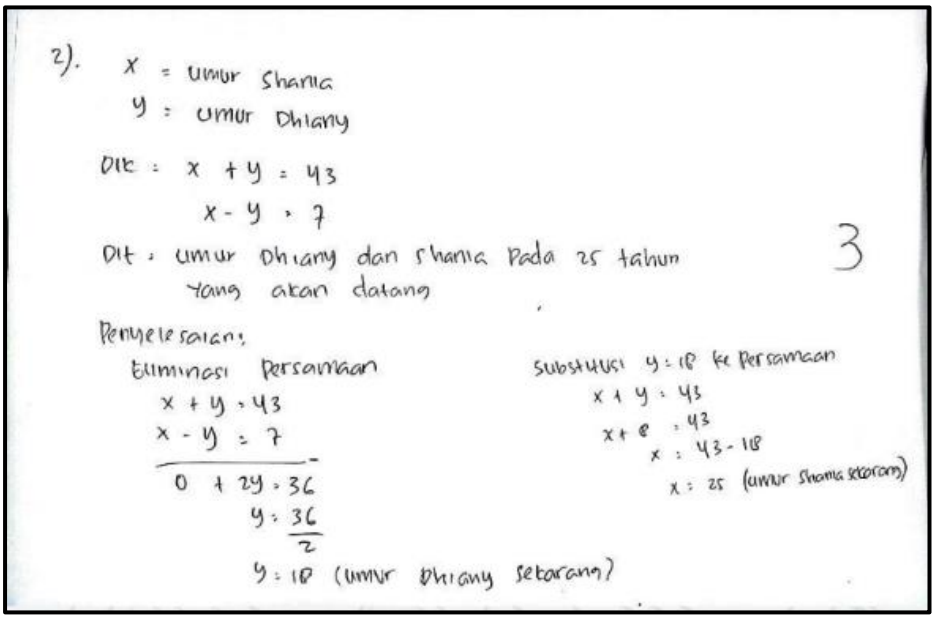

Figure 8 Answer Number 2 RN Subject

For further information regarding student RN's answer, an interview was conducted, with the following excerpts:

P: Can you read question number 2 first?

RN: (Reads the question)

P: Do you understand the meaning of the question?

RN: Yes.

P: Is this question difficult?

RN: Yes, it's quite difficult.

P: Do you feel challenged to solve this question?

RN: A little bit challenged.

P: What information is given in the question?

RN: The total age of Shania and Dhiany is 43 years, and Shania is 7 years older than Dhiany.

P: What is being asked in the question?

RN: The ages of Shania and Dhiany 25 years from now.

P: How do you solve question number 2?

RN: First, I defined s = Shania's age and d = Dhiany's age, then I wrote down the given information and what was being asked. The given equations are s + d = 43 and s - d = 7. The question asks for their ages 25 years from now. I eliminated the two equations and found that d = 18 years. Then, I substituted d into one of the equations and found that Shania's current age is 25 years. So, 25 years from now, Dhiany will be 18 + 25 = 43 years old, and Shania will be 25 + 25 = 50 years old.

P: So, how old will Dhiany and Shania be in 25 years?

RN: Shania will be 43 years old, and Dhiany will be 50 years old.

P: Do you think your answer is correct?

RN: I think so.

P: Why do you seem uncertain?

RN: I'm afraid I made a mistake.

P: Your answer sheet does not contain the final ages of Shania and Dhiany 25 years from now. Why?

RN: I didn't have time, because the time was almost up.

P: The allocated time was 90 minutes, but I see that your answer sheet only contains answers for questions 1 and 2. Why did you say you ran out of time while working on question 2?

RN: Because I was trying to understand question number 1 first, kak. Then, I moved on to question 2. I was also still trying to figure out which method was appropriate to solve it. Since I spent too much time thinking, I eventually ran out of time.

Based on the written test and interview results with subject RN, it can be concluded that RN was able to understand the problem and solve it using mathematical expressions. The subject successfully identified the given information and what was being asked and correctly formulated the mathematical model. However, RN did not complete the question fully, as the final answer was not written in the response sheet. Despite this, during the interview, RN was able to state the correct answer accurately. This indicates that RN, as a student with low self-efficacy, was able to meet the indicators of mathematical representation ability in problem-solving involving mathematical expressions. However, based on the interview, RN still had doubts and lacked confidence in the accuracy of their written answer. Analysis of students whose self-efficacy is from the low category with RN subjects. The following are the results of the written test that the RN subject has explained in solving question number 3.

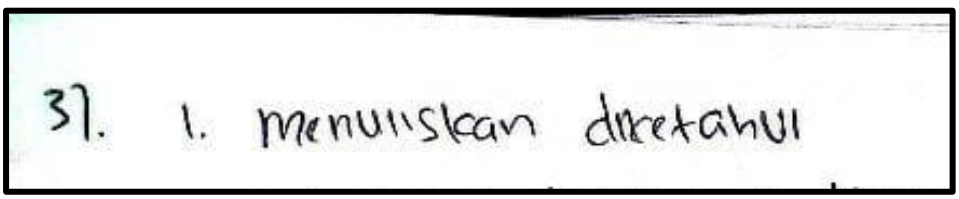

Figure 9 Answer Number 3 RN Subject

An interview was conducted to gather more insights into subject RN's response, with the following excerpts:

P: Do you understand the meaning of this question?

RN: Yes.

P: Do you think this question is difficult?
RN: Yes, it is difficult.
P: Can you tell me what you know from the question?
RN: Three purple candles and five white candles cost Rp. 35,300, and two white candles and two purple candles cost Rp. 16,200.
P: What step did you take next?
RN: I identified what was being asked in the question, kak, but then I got confused about how to solve it because the question required me to explain the solution using my own words.
P: What is being asked in the question?
RN: The price of the purple and white candles.
P: So, how do you solve question number 3?
RN: I don't know. I don't understand.

Based on the written test and interview results regarding question number 3, it can be concluded that RN did not fully understand the question. RN was unable to solve the problem by writing out the steps of the mathematical solution in words. This indicates that RN, as a student with low self-efficacy, was unable to fulfill the indicator of explaining mathematical problem-solving steps in words. The self-efficacy aspect observed here is that students with low self-efficacy tend to struggle with solving tasks and give up easily when encountering difficult questions.

3.2 Discussion

This study aims to describe students' mathematical representation ability in solving problems related to linear equation systems in two variables based on their self-efficacy in Class VIIIA at MTs Menaming. The discussion is focused on analyzing students' representation abilities based on three categories: high, medium, and low self-efficacy. Based on the test results and interviews, the researcher obtained data regarding students' mathematical representation abilities in solving linear equation systems in two variables problems in relation to their self-efficacy levels, as follows: Mathematical Representation Ability in Students with High Self-Efficacy. Students with high self-efficacy demonstrated strong problem-solving skills and confidence in understanding, solving, and successfully completing mathematical problems. Indicator 1: Using visual representation to solve problems. These students were able to write down given information and what was asked, and correctly used the graphing method to solve the problem. Their worksheets showed that they successfully modeled the problem mathematically and wrote down the steps from start to finish, leading to a correct answer. Thus, students with high self-efficacy met the first indicator of using visual representation to solve problems. Indicator 2: Solving problems using mathematical expressions. High self-efficacy students were able to clearly write the given problem information, create a mathematical model, and fully solve the problem correctly. Some students made calculation errors, but during the interview, they were able to correctly state the final answer. Thus, these students successfully met the second indicator. Indicator 3: Writing problem-solving steps in words. These students could create a story-based explanation based on the mathematical representation given. They outlined the given information, the question asked, and the problem situation in their own words. Although some students did not write a final conclusion

or made minor calculation mistakes, they were able to state the correct answer during the interview. This suggests that students with high self-efficacy successfully met the third indicator.

Students with high self-efficacy were very confident in their answers and were able to master all three indicators of mathematical representation. This finding aligns with research which concluded that students with high self-efficacy use all mathematical representation indicators more effectively than students with medium or low self-efficacy. Mathematical Representation Ability in Students with Medium Self-Efficacy, from the three given questions, students with medium self-efficacy were able to translate problem situations into mathematical models and solve them despite some minor shortcomings. Indicator 1: Using visual representation to solve problems. These students could identify given information and what was asked, and they were able to draw a graph, although with some inaccuracies such as missing labels or an untidy graph, which led to an incorrect answer. However, during the interview, they were able to explain their problem-solving process correctly. Indicator 2: Solving problems using mathematical expressions. Medium self-efficacy students completed question 2 correctly and thoroughly. Interviews confirmed that these students correctly wrote down given information, created mathematical models, and used elimination and substitution methods to solve the problem. Thus, they successfully met the second indicator. Indicator 3: Writing problem-solving steps in words. These students only wrote down what was given and what was asked, but they could partially solve the problem. During the interview, they admitted that they struggled to structure their explanations in words.

In conclusion, students with medium self-efficacy were able to meet two out of three indicators: Using visual representation, Solving problems using mathematical expressions, Mathematical Representation Ability in Students with Low Self-Efficacy For students with low self-efficacy, the following observations were made: Indicator 1: Using visual representation to solve problems. These students only managed to write down the given information and what was asked but could not represent the problem visually. This suggests a weak understanding of the material. Indicator 2: Solving problems using mathematical expressions. These students were able to identify given information, what was asked, and use elimination and substitution methods to solve problems. However, calculation errors led to incorrect answers. Despite this, during the interview, they were able to recognize their mistakes. Thus, they met the second indicator. Indicator 3: Writing problem-solving steps in words. Students were unable to complete this step, as shown by blank answer sheets where only the given information and question were written. During interviews, they struggled to interpret the problem, determine what was given, and identify what was being asked. These students also did not make an effort to solve the problem. Thus, students with low self-efficacy only met one indicator: Solving problems using mathematical expressions. This aligns with the findings which indicate that students with low self-efficacy struggle to solve mathematical problems and fail to understand the context of questions.

Based on the test results and interviews with students from the high, medium, and low self-efficacy categories, it was observed that each category demonstrated different problem-solving abilities. This confirms that students' mathematical representation abilities vary depending on their self-efficacy levels. This is consistent with Albert Bandura's self-efficacy theory (Setyawati et al., 2020), which states that: A person's self-efficacy influences their

actions, effort, persistence, flexibility in problem-solving, and achievement of personal goals. Self-efficacy shapes a person's ability to succeed before action is taken and plays a key role in determining performance outcomes. It is developed through specific learning processes and does not form automatically. Individuals must go through various stages to build confidence in their abilities and succeed in academic tasks or challenges.

4. Conclusions

The research results show that students with high self-efficacy meet all three indicators of mathematical representation ability, namely using visual representation to solve problems, solving problems involving mathematical expressions, and writing the steps to solve mathematical problems in words. Students with moderate self-efficacy meet two indicators of mathematical representation ability, namely using visual representation to solve problems and solving problems involving mathematical expressions. Students with low self-efficacy meet only one indicator of mathematical representation ability, which is solving problems involving mathematical expressions. For mathematics teachers, it is advisable to explore students' knowledge and understanding of mathematical representation skills and encourage them to practice problems that can enhance their mathematical representation ability. Teachers are also expected to apply various approaches, methods, and techniques and provide motivation to students in every learning process to improve their self-efficacy. For students, it is recommended that they develop the habit of solving problems independently to sharpen their representation skills in mathematics learning.

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