

ANALYSIS OF STUDENT MATHEMATICS REPRESENTATION IN SOLVING MINIMUM COMPETENCY ASSESSMENT PROBLEMS BASED ON MATHEMATICS ABILITY

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Abstract: Representation is a form of interpretation of students' thoughts on a problem. One of the evaluation tools organized by the Ministry of Education and Culture is the Minimum Competency Assessment which is used to measure students' cognitive abilities where the aspects measured are reading literacy skills and numeracy literacy. From the results of observations, students are still not ready to face the minimum competency assessment and are still unable to answer mathematical problems mathematically. It is necessary to know how the students' mathematical representation abilities in solving the minimum competency assessment problems. This research is qualitative descriptive research. with data collection techniques in the form of tests and interviews. The subjects in this study were three students with different mathematical abilities taken from class VIII-A of SMPN 1 Pamekasan. The results showed that students with high, medium, and low abilities gave representations of mathematical equations or expressions and representations of words or written texts, but only high and moderate abilities met all indicators. Only students with high math abilities involve precise visual representations, students with moderate math abilities do not correctly involve visual representations and students with low math abilities do not show visual representations.

Key Words: Mathematical representation; Mathematical Ability; Minimum Competency Assessment

Introduction

Education is an effort to master knowledge obtained from formal and non-formal environments in order to create quality human resources. Aziizu (2015: 300). Mathematics has an important position in science. As a science, mathematics is needed in various fields, both in mathematics itself and in other fields. This is as stated by Suherman, et al (2001:29) that mathematics is the queen of science. This implies that as a science, mathematics also functions as a source of other sciences. Many sciences whose discovery and development depend on mathematics. In other words, mathematics grows and develops for itself as a science, and is also useful to serve the needs of other sciences in its development. The importance of mathematics in science makes mathematics an important science for students to learn, therefore mathematics is used as one of the subjects that must be taught in schools.

Studying mathematics according to the National Council of Teachers of Mathematics (NCTM, 2000:4) there are five Process Standards that students need to have and master, namely: (1) problem solving (problem solving); (2) reasoning and proof (reasoning and proof); (3) communication (communication); (4) connections (connections); and (5) representation. The ability of representation is one of the important things that students need to master to support their success in the mathematics learning process. Representation is a form of

interpretation of students' thoughts on a problem, which is used as a tool to find a solution to the problem. The form of student interpretation can be in the form of words or verbal, writing, pictures, tables, graphs, concrete objects, mathematical symbols and others (Sabirin, 2014:35).

The results of observations found by researchers at SMPN 1 Pamekasan when students were working on material exercises for the two-variable linear equation system found that students had difficulty understanding problems in the form of story questions, it made students in how to communicate answers to questions mathematically still lacking capable. Students misunderstand the data in the problem so that in the preparation of mathematical equations an error occurs. In the process of solving the elimination of two equations to determine the result, students cannot find the values of x and y needed in their solution. This shows that students cannot answer the questions well mathematically and explain the problem solving that has been done. From these problems, it shows that students need to have a standard learning process, namely representation.

Mathematical representations are said to be important and needed by students because ability representation can support students in understand the concepts and ideas being communicated or their ideas in learning mathematics (Syafri, 2017: 49). The importance of the ability to represent is also stated in Permendikbud No. 21 of 2016 concerning communication skills, in which this communication ability includes the ability to represent. If students have good communication skills, they will be able to convey mathematical ideas more clearly and more effectively. Therefore, mathematical representations can help students in solving mathematical problems in minimum competency assessment questions because they can play a role in exploring understanding and helping students organize their thoughts when solving problems in line with (NCTM, 2000:280) that representation is central to learning mathematics. , students can develop and deepen their understanding of mathematical concepts. So that it can optimize the ability to think mathematically, the ability to understand concepts, and the ability to communicate in improving mathematical competence.

According to (Villegas et. al., 2009) mathematical representation ability can be categorized into three forms of representation, namely symbolic, image, and verbal. What is represented is an elaboration of the external representation. The following are the three forms of representation that have been described by Villegas in his research: 1) Symbolic representation, this form of representation is in the form of mathematical symbols and models or mathematical equations formed by these mathematical symbols; 2) Image representation, this form representation can be in the form of tables, diagrams, graphs, or in the form of images; and 3) Verbal representation, this form of representation is in the form of a statement that is described orally or in writing of the given problem.

When students are required to solve a mathematical problem, it is possible for students to try various representations as a manifestation of their ideas and strategies. From the various forms of mathematical representation that students will use depends on individual abilities because basically every student has different mathematical abilities. In this case, the level of students who are capable of high, medium, low. This is similar to the research conducted by Warisi (2016: 125) which is known that the level of students' mathematical ability affects the variety of representations used by students to solve mathematical problems.

In the learning process there needs to be an evaluation to determine the level of students' mathematical abilities, the extent to which students have understood the material that has been conveyed with Uman (2007: 91), suggesting that the evaluation process is to try to adjust objective data from the beginning to the end of the program implementation as a basis for assessment. towards program objectives. One of the evaluation programs organized by the Ministry of Education and Culture is the National Assessment. The assessment itself is an activity to reveal the quality of the learning process and results (Resti, 2020). Minimum Competency Assessment is an assessment of the basic competencies needed by all students in order to develop their own abilities and play an active role in society in activities that have positive values (Mendikbud 2020). Minimum Competency Assessment is used to measure students' cognitive abilities where the aspects measured are reading literacy and numeracy literacy (Nanda, 2021:174).

Numerical literacy means the knowledge and skills to (1) acquire, interpret, use, and communicate a wide variety of numbers and mathematical symbols to solve practical problems in a variety of life contexts; (2) analyze the information displayed in various forms to make decisions (Pangesti 2018:568). The Ministry of Education and Culture (2020) has conducted a trial. The minimum competency assessment has been carried out since the 2020/2021 school year and since then schools have begun to prepare students for the minimum competency assessment. One of the schools that has carried out this minimum competency assessment trial is SMPN 1 Pamekasan.

From the results of interviews with mathematics teaching teachers at SMPN 1 Pamekasan regarding the pilot implementation of the minimum competency assessment in the 2020/2021 school year, it shows that students are still not ready to face trials. Many students still feel unfamiliar with the minimum competency assessment. In terms of understanding the questions that contain literacy and numeracy as well as in solving the minimum competency assessment questions.

From this explanation, researchers are interested in conducting research with the title "Analysis of Students' Mathematical Representation Ability in Solving Minimum Competency Assessment Problems Based on Mathematical Ability" in order to find out the mathematical representation of students in solving Minimum Competency Assessment (literacy-numerical) problems, especially on the material of linear equation systems. two variables so that it can

be used as a reference as an improvement in the quality of learning and students' readiness in dealing with Minimum Competency Assessment problems.

Method

This research is a qualitative descriptive research. This study is intended to obtain and understand information as well as to provide an overview of the mathematical representation of students in solving minimum competency assessment questions based on mathematical abilities, especially on the material of the two-variable linear equation system. The research was conducted at SMPN 1 Pamekasan Raden Abdul Azis No.125, Rw. 02, Jungcangcang, Kec. Pamekasan, Pamekasan Regency. The subjects in this study were class VIII students of SMP Negeri 1 Pamekasan for the academic year 2021/2022. Data collection techniques used in this study were tests and interviews, where the tests used were in the form of tests of mathematical abilities and tests of mathematical representation abilities. The data analysis technique used in this study refers to the stages of qualitative data analysis, namely data reduction, data presentation and conclusion drawing. This study uses time triangulation in testing the validity of the data obtained. The research design carried out by the researcher is: the Introduction Phase, Planning Phase, Implementation Phase, Data Analysis Phase and Research Result Reporting Phase.

Results and Discussion

The results of this study were students with high mathematical abilities and were bringing up the representation of mathematical equations or forms correctly, but for students with low mathematical abilities they were still less precise in representing mathematical equations or expressions. All students are less precise in the representation of words or written texts in solving problems. Meanwhile, for visual representation, only students with high math skills are correct according to the indicators, students with moderate math abilities are less precise in visual representation and students with low math abilities do not display visual representations.

Referring to the grouping of mathematical representation abilities proposed by Mudzakir (Suryana 2012:40-41), the following are indicators of the relationship between mathematical representation abilities and problem solving which will later become a benchmark for knowing and describing mathematical representation abilities, especially in the matter of linear equations of two variables can be seen in table 1 below:

Table 1. Indicators of Students' Mathematical Representation Ability in Solving Minimum Competency Assessment Questions

No	Representation	Indicator
1	Mathematical equations or expressions	<ul style="list-style-type: none"> Students make mathematical equations or models from the data or information in the questions. Students solve problems involving mathematical expressions using methods of solving systems of linear equations of two variables such as elimination, substitution, or mixture.
2	Visual	<ul style="list-style-type: none"> Students present data or information from a representation in the form of a graph on the coordinate plane. Students use visual representations in the form of graphs on the coordinate plane to facilitate problem solving.
3	Written words or text	<ul style="list-style-type: none"> Students can write down each step of the settlement in accordance with the interpretation needed in the settlement, by providing information in the form of words in the steps of solving the problem. Students can arrange stories according to solving problems that are done by students. Students can provide conclusions from the results of solving problems.

Based on the results of the mathematical representation ability test and interviews of SMPN 1 Pamekasan students in solving the minimum competency assessment problem based on mathematical ability as follows:

Mathematical Representation of Students with High Mathematical Ability

The following are the results of test 1 and test 2 about the minimum competency assessment material for the system of linear equations of two KOM subject variables:

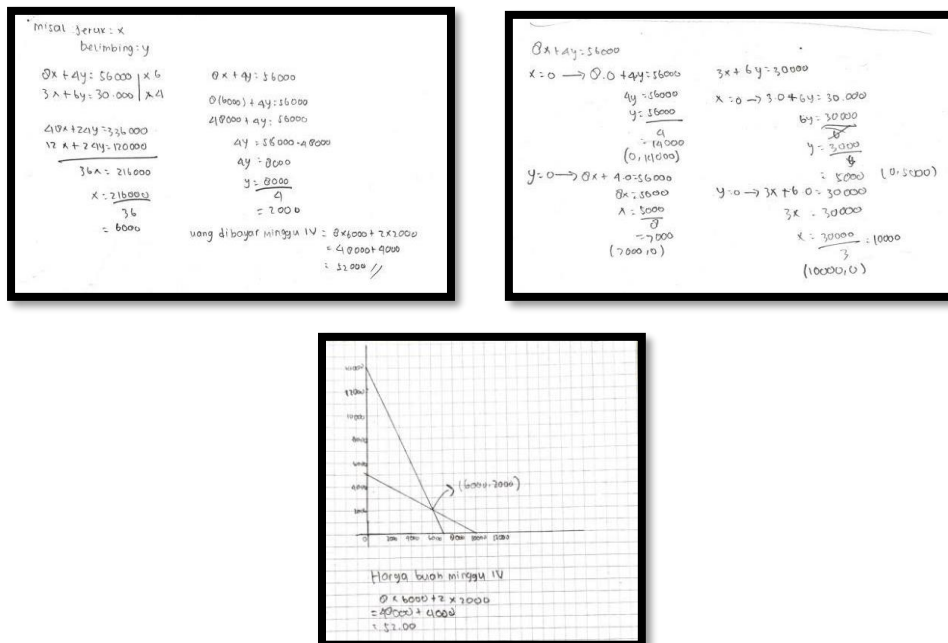


Figure 1. Results of the 1st representat 1

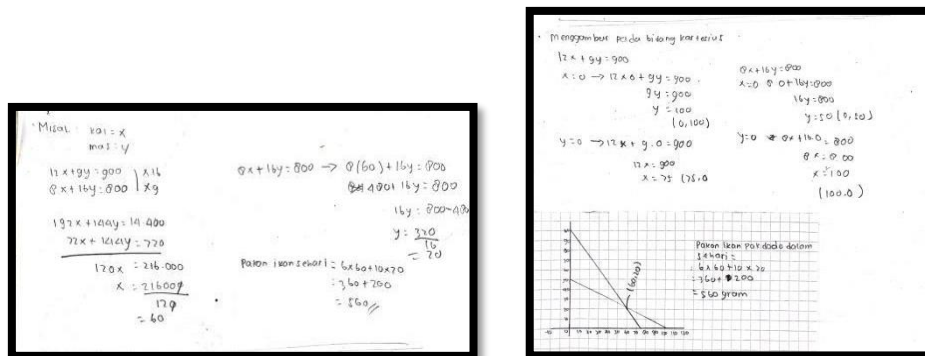


Figure 2. Results of the 2nd representat 1

The following is an excerpt of an interview with the subject of KOM:

Q : "Can you explain what you have been doing?"

KOM : "Yes, Sis, I will make a mathematical form first by assuming what is known as the variables x and y , then working using a mixed method (elimination substitution) to determine the value of the variables x and y after that we can find the final value of this problem, bro."

"Working using the coordinate plane, from this equation I look for the point of intersection on the x and y axes, after in the second picture the equations can be seen the point of intersection of the two lines, now from the intersection point it can be a value for x and y so that the final result can be seen"

Q : "Are you not used to giving conclusions on the final results of the solutions you are working on?"

KOM : "No Sis, just doing as usual"

Referring to Figures 1 and 2, the subject of KOM fulfills the indicators for the representation of mathematical equations or expressions, namely making mathematical equations or models from the data or information contained in the problem and solving problems by involving mathematical expressions using mixed methods. It also fulfills the visual representation indicators, namely presenting data or information from a representation in the form of graphs on the coordinate plane and using graphs on the coordinate plane to facilitate problem solving. If you pay attention to the work process in Figures 1 and 2 and also the interview quotes, the subject of KOM has not met the indicators of representation of words or written text, which is less precise in providing information in the form of words in problem solving steps and does not provide conclusions on the results of the research. problem solving, but the subject of KOM can meet the indicators for compiling stories in accordance with solving problems that are done by students.

Based on the data analysis of the results that have been described, it can be seen that students with high mathematical abilities bring up representations of mathematical equations or expressions in line with research by Irawati (2022:84). from Rizki (2021:1097) who found high-ability students could solve problems with visual representation indicators

by being able to make graphs well. in solving the given problem correctly. while the representation of words or written text is raised but there are still indicators that have not been met. In line with research (Adabiah, 2018) where there are still many students who have not met the indicators of representation of words or written texts because there are still many students who have not been able to give conclusions from correct answer given.

Mathematical Representation of Students with Medium Mathematical Ability

The following are the results of test 1 and test 2 about the minimum competency assessment of the material for the linear equation system of two DNA subject variables:

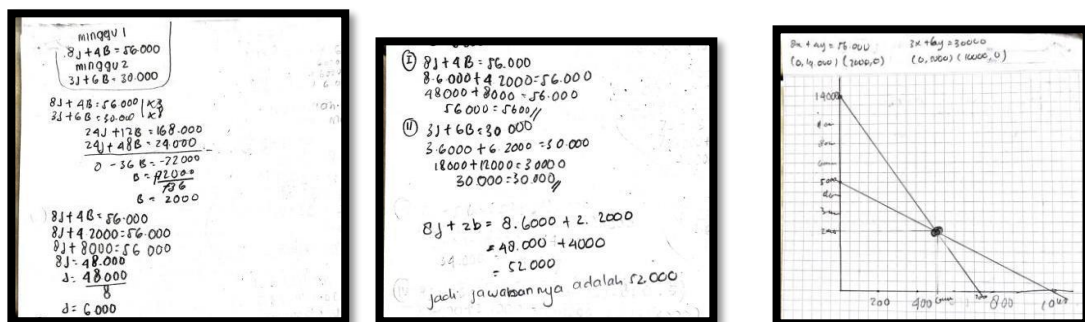


Figure 3. Results of the 1st representat 1

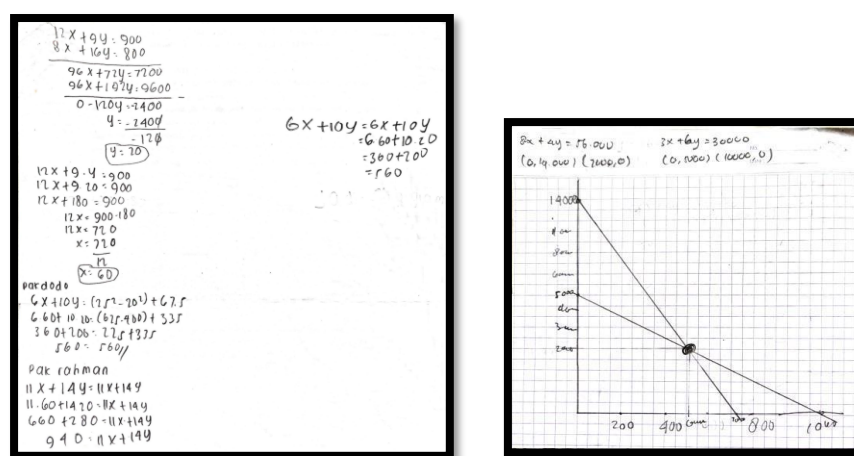


Figure 4. Results of the 2nd representat 1

The following is an excerpt of an interview with a DNA subject:

Q : "Can you explain what you have been doing?"

DNA : "I'll say J and B for test 1 and x and y for test 2 and then create mathematical equations, after that, do using substitution elimination and find the x and y values so that the final result can be obtained."

"Working on the coordinate plane by describing the two new equations after that find the point of intersection, Sis, but I can't draw well, Sis, just like this."

Q : "Are you not used to giving conclusions on the final results of the solutions you are working on?"

DNA : "No, Sis, I invite you."

Referring to Figures 1 and 2, the DNA subject fulfills the indicators for the representation of mathematical equations or expressions, namely making mathematical equations or models from the data or information in the problem and solving problems by involving mathematical expressions using mixed methods. For a visual representation of the subject DNA has not met the indicators using a graph on the coordinate plane to facilitate problem solving. If you pay attention to the work process in Figures 1 and 2 and also the interview quotes, the DNA subject does not meet the indicators of representation of words or written text, which is less precise in providing information in the form of words in the steps of problem solving and does not provide conclusions on the results of the research. problem solving, but the DNA subject can meet the indicators for compiling stories in accordance with solving problems that are done by students.

Based on the data analysis of the research results that have been described, it can be seen that students with mathematical abilities are students with mathematical abilities who are bringing up representations of mathematical equations or expressions correctly. In visual representations and representations of words or written texts are raised but there are still indicators that have not been fulfilled so that problem solving is still not quite right. This is in line with research from Rizki (2021:1099) which shows that moderately capable students can solve problems with indicators of representation of mathematical equations or expressions and have not met the indicators of representation of words or written text because students are still unable to convey ideas in the form of words.

Mathematical Representation of Students with Low Mathematical Ability

The following are the results of the work of test 1 and test 2 of the minimum competency assessment of the material for the linear equation system of two DNN subject variables:

The figure shows two pages of handwritten mathematical work. The left page shows the elimination method for solving a system of linear equations in two variables (SLTV). The equations are $8x + 4y = 56.000$ and $3x + 6y = 30.000$. The student multiplies the first equation by 3 and the second by 8 to get $24x + 12y = 168.000$ and $24x + 48y = 240.000$. Subtracting the first from the second gives $0 + -36y = -72.000$, leading to $36y = -72.000$ and $y = -2.000$. The student then finds $y = 71.964$ and $y = 71.964$. The right page shows the substitution method. The equations are $8x + 71.964 = 56.000$ and $8x = 56.000 - 71.964$. This leads to $8x = -15.964$ and $x = -1.995,5$. The student then substitutes $x = -1.995,5$ into the second equation: $3x + 6y = 3(-1.995,5) + (1995,5)$, which simplifies to $3(-3.991) + 1995,5 = -11.973 + 1995,5 = -9.978$.

Figure 5. Results of the 1st representat 1

$$\begin{array}{r}
 12x + 9y = 900 \text{ gram} \quad \times 8 \\
 8x + 16y = 800 \text{ gram} \quad \times 12 \\
 \hline
 96x + 72y = 7200 \text{ gram} \\
 96x + 192y = 9600 \text{ gram} \\
 \hline
 0 + (-117) = -2400 \\
 -117y = -2400 \\
 y = \frac{-2400}{-117} \\
 y = 20,51
 \end{array}$$

$$\begin{array}{r}
 y = 20,51 \\
 12x + 9y = 900 \\
 12x + 9(20,51) = 900 \\
 12x = 900 - 184,59 \\
 12x = 715,41 \\
 x = \frac{715,41}{12} \\
 x = 59,62
 \end{array}
 \qquad
 \begin{array}{r}
 8x + 16y = 8(73,29) + 16(20,51) \\
 = 586,32 + 328,16 \\
 = 914,48
 \end{array}$$

Figure 5. Results of the 2nd representat 1

The following is an excerpt of an interview with the subject of DNN:

Q : "Can you explain what you have been doing?"

DNN : "First I made an equation, Sis, after that I subtracted the equation and found the y value, after that I entered the y value into one of the equations, and then I found the x and y values. After that I put it into the remaining equation so that's the end result."

Q : "Are you able to work using the coordinate plane?"

DNN : "I can't, Sis."

Q : "Are you not used to giving conclusions on the final results of the solutions you are working on?"

DNN : "No, Sis, I invite you."

Referring to Figures 1 and 2, the DNN subject meets the indicators for the representation of mathematical equations or expressions, namely making mathematical equations or models from the data or information in the problem but does not meet the indicators for solving problems by involving mathematical expressions using mixed methods because they are still not precise in the process. The DNN subject gives no visual representation. If you pay attention to the working process in Figures 1 and 2 as well as the interview quotes, the DNN subject does not meet the indicators of representation of words or written text, which is less precise in providing information in the form of words in the steps for solving problems and does not provide conclusions on the results of the research. problem solving, but the subject of DNN can meet the indicators for compiling stories in accordance with solving problems that are done by students.

Based on the data analysis of the research results that have been described, it can be seen that students with low mathematical abilities bring up representations of mathematical equations or expressions and representations of words or written texts but are not precise because there are indicators that have not been met in line with Purnama's research (2019:34) finding that the mathematical representation of students with low math abilities is not good because it gives illogical sentences. the same thing with what researchers found that students could not show the correct mathematical representation. and low-ability students do not bring up visual representations in solving the problems given in line with research from purnama (2019:23) revealing in his research it was stated that students in the low category in solving problems did use graphs, but the graphs made by students were not right because the students were themselves cannot look at the problems given properly, then the way of solving and the calculations are not correct.

Conclusions

From the results of the research that has been carried out, it shows that students with high mathematical abilities and are bringing up the representation of mathematical equations or forms correctly but for students with low mathematical abilities are still less precise in the representation of mathematical equations or expressions. All students are less precise in the representation of words or written texts in solving problems. As for the visual representation, only students with high math abilities are right according to the indicators, students with moderate math abilities are less precise in visual representations and students with low math abilities do not show visual representations.

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