The Process of Students' Mathematical Literacy in Solving System of Two Variables Linear Equation Based on Level of Ability

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Article Info	Abstract
	Mathematical literacy is very important to master because with mathematical literacy problems that exist in everyday life are easy to solve. Material that is closely related to everyday problems is a system of two-variable linear equations such as calculating the price of a grocery item and so on. This research was conducted to explore the process of mathematical literacy based on high, medium, and low abilities using a qualitative approach. To test this research, the researchers involved three class VIII students who obtained the results of tests, interviews, and documentation. From this test it was found that there were differences in the process of mathematical literacy. It can be seen that only student with high level ability is able to meet the four indicators of mathematical literacy. While the students with medium and low level ability are only able to fulfill one to two indicators of mathematical literacy. So for subsequent research, it is expected to be able to develop learning models to improve mathematical literacy skills.

INTRODUCTION

Mathematical literacy is an essential thing for students to master in learning mathematics. This is because mathematical literacy can be a support for solving everyday problems [1]. In addition, mathematical literacy makes a person able to think logically and critically in solving mathematical problems [4]. On the other hand, mathematical literacy does not only focus on mastering the material but also focuses on the use of reasoning, concepts, and facts in mathematics [2-3]. Therefore, the importance of mathematical literacy is a challenge for educators to be able to develop it in each student. It is hoped that students will have good mathematical literacy skills, so they can solve challenges in the future.

Mathematical literacy itself is defined as an ability to solve problems, analyze, assess and find practical solutions in different situations and fields [5]. Other researchers define mathematical literacy as an individual's capacity to think mathematically when solving problems that will be faced in the future and when making decisions by understanding the role of mathematics in the world and its surroundings [6]. Based on the definitions of these researchers,

mathematical literacy in this study is defined as an individual's ability to think mathematically in solving everyday problems, especially problems related to the material on the System of Two Variable Linear Equations (STVLE). STVLE material is one of the subjects in junior high school [9]. This STVLE material is closely related to solving everyday problems such as calculating the price of a grocery item, and so on [7], [8]. Therefore, STVLE material is closely related to mathematical literacy, where the required mathematical literacy is using an effective STVLE solving method [10]. Thus, the focus of mathematical literacy in this study is problem solving in the STVLE material.

The ability of students' mathematical literacy in STVLE material is still low. The results showed that students' mathematical literacy abilities were still in the low category in solving PISA-oriented STVLE problems [11-13]. Most students find it challenging to work on PISA questions because these questions are not questions they usually do, so they feel confused and have difficulty solving them [12]. Therefore, every student must have mathematical literacy skills, because mathematical literacy is a significant concern and is very much needed to face educational challenges in the cognitive aspect (knowledge) [14]. The various results of these studies in general can be said that students who experience errors in solving mathematical problems are caused by the factor of their lack of mathematical literacy.

The problem of low mathematical literacy needs to be an essential concern for researchers. There are several factors that influence mathematical literacy, namely personal factors, instructive factors, and environmental factors [1]. Personal factors that exist within students, instructive factors are related to intensity, quality and teaching methods, while environmental factors are related to teacher characteristics and the availability of learning media in schools [16]. This research focuses on personal factors. One of the personal factors is self-confidence [17] and having independence in learning [18]. On the other hand, another personal factor is the ability possessed by students. Thus the purpose of this study is to analyze students' mathematical literacy in solving problems of a two-variable linear equation system based on ability level.

METHODS

The method used in this research is to use a qualitative approach with a descriptive qualitative research type [20]. The reason researchers use a qualitative approach is because researchers want to see symptoms or phenomena and information based on observations during the research process. Meanwhile, the reason for using descriptive qualitative research is that researchers can analyze the data in more detail so that the research objectives are achieved. This research was conducted at MTs At-Taufiqiyah Aengbajaraja Bluto Sumenep in the even semester of the 2022/2023 academic year.
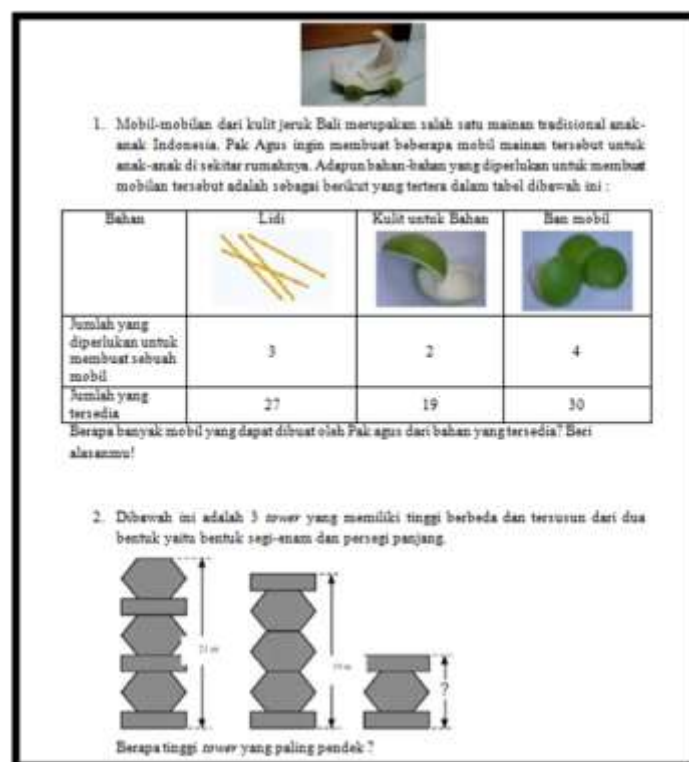
The subjects of this study were three subjects. The way to find research subjects is to use purposive sampling. The reason is because the subjects were selected based on their abilities and willingness to provide the information needed in this research so that this research can be carried out effectively and efficiently. The selection of subjects in this study was determined based on the results obtained in the initial ability test where the results were grouped into three categories, namely low, medium and high categories. Then the researcher chose one student from each category, namely by looking at the highest score from each category. Each student who gets the

highest score based on each category is used as a subject in this study. Mathematical literacy abilities based on each low, medium, and high category can be seen in Table 1 [13].

Table 1. Categories of Students' Mathematical Literacy Ability

Range of Mathematical Literacy Ability Test Scores	Categories
Test score ≥ 80	High
$60 \leq Test\ score < 80$	Medium
Test Score < 60	Low

Data was collected in this study in the form of subjects' work in completing mathematical literacy tests and interview transcripts. The test was carried out twice, the first test was carried out to find research subjects and the second test was carried out to find out the process of mathematical literacy. Interviews were conducted to find out in depth regarding the data obtained from the results of the mathematical literacy test. Thus the instrument in this study consisted of mathematical literacy test questions and interview guidelines. Mathematical literacy test questions can be seen in Figure 1. Before the researchers used the instrument, they first tested the validity of teachers and lecturers who had expertise in their field and were certified. The results of the validity test indicated that this instrument was valid to use in measuring students' mathematical literacy processes in solving STVLE problems. Thus the instrument can be used in this study.

Figure 1. Mathematical Literacy Instruments

The data analysis used in this study is in accordance with the data collected in this study. Data on the results of the subject's work in solving mathematical literacy questions were analyzed

based on the achievement of indicators of mathematical literacy. The indicators of mathematical literacy in this study are 1) formulating real problems in solving problems, 2) using mathematics in solving problems, 3) interpreting solutions in solving problems, 4) evaluating solutions in solving problems [19]. While the analysis of the data in the form of interview transcripts used coding, namely the parts of the interview transcripts that indicated suitability with the level of ability were given in bold and italics. Thus, through this data analysis it is hoped that the purpose of this study in the form of mathematical literacy in solving STVLE problems can be adequately identified.

RESULTS AND DISCUSSION

Based on the results of the initial ability test, it can be seen that there were 5 students in the low category, 10 students in the medium category, and 13 students in the high category. From each of these categories the researcher took one student for each category based on the highest score. For students in the low category, the researcher chose students with a score of 55. For students in the medium category, the researcher chose students with a score of 72. For students in the low category, the researcher chose students with a score of 95. After the researcher obtained the research subjects, the researcher gave a literacy test. Mathematical. From the results of the mathematical literacy ability test, the researcher analyzed the mathematical literacy process. The following is an explanation of the results of the mathematical literacy test based on the ability level of students.

Mathematical Literacy of Students in the Low Ability

Students with a low category are then referred to as the first subject (S1). The first subject experienced difficulty in solving mathematical literacy questions. This is proven based on the results of student work in Figure 2.

Figure 2. Low category (S1) student work results in question number 1

As shown in Figure 2. The results of students' work in the low category (S1) in question number 1. From the results of these answers it can be seen that undergraduate students are only able to fulfill two of the four indicators of mathematical literacy, namely being able to use mathematics in problem solving and being able to interpret solutions to these problems . This is because S1 is less thorough and still in doubt, when interviewed S1 is still confused about completing it properly. The following is an excerpt of the S1 interview on question 1:

Researcher	:	*How is the process for solving it?*
S1	:	*The method is divided, miss, but this is the other way around (while pointing to the answer) it should be the amount available divided by the materials needed. Then the results of the division, I took the material to make tires because if you take leather, the tires are not enough.*

The results of the interview indicated that S1 was able to solve the problems given, but S1 was unable to formulate real problems in problem solving, and did not re-evaluate the results of the answers so that out of the four indicators of mathematical literacy, only two indicators were achieved, namely being able to use mathematics in problem solving and being able to interpreting the solution to a problem. Based on the results of the analysis of test answers and the results of the S1 interview, it was found that the S1 had doubts in completing it so that the process or steps in solving it were not quite right.

Figure 3. Low category (S1) student work results in question number 2

Based on Figure 3 the results of students in the low category (S1) in question number 2, S1 are able to formulate real problems in problem solving and are able to use mathematics in problem solving. However, S1 has not been able to interpret solutions in solving problems and has not been able to evaluate solutions in solving problems. When interviewed it turned out that S1 did not know how to solve the problems given. The following is an excerpt of the S1 interview on question 2.

Researcher	:	*How is the process for solving it?*
S1	:	*Honestly, sis. Actually, about number 2, I don't know how to solve it because I've never worked on a question like that, but I'm trying to be able to answer it.*

The results of these interviews indicate that S1 is unable to solve the problems given, but S1 tries to formulate real problems in problem solving and uses mathematics in problem solving. However, S1 cannot re-evaluate the results of his answers and S1 also cannot interpret the solution to a problem. Based on the results of the analysis of test answers and the results of the S1 interview, it was found that the S1 was not used to being faced with non-routine questions. However, S1 is still trying to be able to solve it with the capabilities it has. From this description it can be concluded that students who are in the low category have very low mathematical literacy processes and need to be improved.

Mathematical Literacy of Students in the Medium Ability

Students in the moderate category (S2) are able to understand the problems given. This is evidenced in Figure 4.

Figure 4. Student work results in the medium category (S2) in question number 1

In Figure 4 the results of student work in the medium category (S2) in question number 1 show that, S2 is able to fulfill the four indicators of mathematical literacy, namely formulating real problems in problem solving, using mathematics in problem solving, interpreting solutions in problem solving, and evaluating solutions in solution to problem. When interviewed, S2 was also able to explain in detail the process of solving it and was able to conclude the results of the problems reasonably. The following is an excerpt of an interview with students in the moderate category on question 1.

Researcher	:	*How is the process for solving it?*
S2	:	*Of the materials available, the material most needed is material for car tires. So when all the materials were divided according to needs, I chose car tires, namely as many cars as 7 cars could be made, because if many cars were made based on many sticks, the materials for car tires would not be enough.*

Based on the results of the analysis of test answers and the results of interviews, the Masters were able to understand and analyze the process of solving these questions very well.

Figure 5. Student work results in the medium category (S2) in question number 2

From Figure 5. The results of student work in the medium category (S2) on question number 2, S2 are able to formulate real problems in problem solving and use mathematics in problem solving. However, S2 has not been able to interpret solutions in solving problems and

S2 has also not been able to evaluate solutions in solving problems. When interviewed, S2 was less thorough in solving problems. The following is an excerpt of an interview with students in the moderate category on question 2.

Researcher	:	*How is the process for solving it?*
S2	:	*First, suppose a hexagon (x) and a square (y) (while pointing at the picture). Then I solved it using mixed methods.*
Researcher	:	*Where do you get this one (pointing to the results of the students' answers*

$$(2x + 1y = \cdots ?\,)?$$

S2	:	*Because x and y are asked, so I use that equation. Oh yeah, it's upside down, you're right,* $x + 2y$.

Based on the results of the analysis of test answers and the results of the Masters interview, it was found that students were not careful in solving the problems given, so that the answers given were inaccurate. From this elaboration it can be concluded that the S2 mathematical literacy process is better than the S1 but still needs to be improved so that when faced with other problems the S2 is able to evaluate or cross-check the results of the answers before they are collected.

Mathematical Literacy of Students in High Ability

Students in the high category (S3) are able to understand the problems given. This is evidenced in the Figure 6.
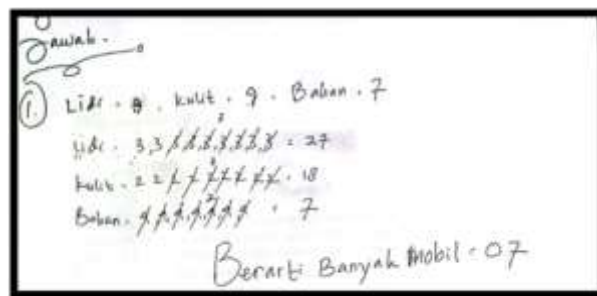

Figure 6. High category student work results on question number 1

In Figure 6. The work results of students in the high category (S3) in question number 1 show that, S3 is able to fulfill the four indicators of mathematical literacy. When interviewed, S3 was able to explain in detail the process of solving it and was able to conclude the results of the problems reasonably. The following is an excerpt from the interview (S3) on question 1.

Researcher	:	*How is the process for solving it?*
S3	:	*From this problem it is clear that the materials needed to make 1 toy car from orange peels require 3 sticks, 2 pieces of skin, and 4 car tires. Then, I counted the number of cars that could be made based on the available materials. It turned out that, counting the 7 car tires, there were 2 oranges, 4 peels, and 6 sticks left. When you want to add 1 more car, the car tires lack 2 oranges. So it can be concluded that there are 7 cars that can be made from these three materials.*

Based on the results of the analysis of test answers and the results of the doctoral interview, the doctoral degree can fulfill the four indicators of mathematical literacy, namely formulating real problems in problem-solving, using mathematics in problem solving, interpreting solutions in problem solving, and evaluating solutions in problem solving. When interviewed, S3 was able to explain in detail the process and steps in solving the questions given.

Figure 7. Student work results in the high category (S3) in question number 2

From Figure 7 the work results of students in the medium category (S3) on question number 2, S3 are able to fulfill three of the four indicators of mathematical literacy, namely formulating real problems in problem solving, using mathematics in problem solving, and evaluating solutions in solving problems understanding the problems given and able to find the right solution. However, S3 has not been able to interpret the solution in solving the given problem. When interviewed, S3 admitted that the time allotted had run out, so S3 was unable to provide the solutions given. The following is an excerpt of an interview with students in the high category on question 2.

Researcher	:	*How is the process for solving it?*
S3	:	*From this picture (while showing a picture of the tower in the question given) it consists of 3 towers with different heights. The first tower has 6 planes, 3 hexagons and 3 squares with a height of 21 cm. The 2nd tower has 5 planes, 3 hexagons and 2 squares with a height of 19 cm. And the 3rd tower has 2 hexagons and 1 square with unknown height. After that I exemplify the hexagonal shape with (x) and the square (y). Then I solved the problem using mixed methods.*
Researcher	:	*Why didn't the examples and final results be written down in the settlement process? (while pointing to the results of student answers)*
S3	:	***Miss, you don't have enough time,*** *besides you know exactly what I mean (smiles).*

Based on the results of the analysis of the test answers and the results of the doctoral interview, the doctoral students were able to solve the questions appropriately given and the doctoral students were also able to explain in detail the process of solving them. From this

description it can be concluded that the S3 mathematical literacy process is good, but still needs to be improved regarding the use of time. So that when faced with other questions S3 is able to make better use of time. Further descriptions of the mathematical literacy process based on ability levels can be seen in Table 2.

Table 2. Description of Mathematical Literacy Based on Ability Level

No.	Level of Ability	Description of Mathematical Literacy in completing STVLE
1	Low	S1 has not been able to correctly write down the steps used in solving problem numbers 1 and 2. Unlike the case when being interviewed, S1 was only able to explain question number 1, it's just that S1 was not thorough in solving it.
2	Medium	S2 is able to write and explain well the steps in solving problem numbers 1 and 2, but in question number 2 S2 is not thorough or has not evaluated the results of his answers again, so S2 cannot provide a solution to the problem.
3	High	S3 is able to write and explain the steps for solving problems number 1 and 2 well. However, in question number 2, S3 was unable to conclude the results of the solution and when interviewed, S3 was unable to use the time properly.

Table 3 show that of the three subjects only students in the high category (S3) have very good mathematical literacy because of the 2 questions given S3 is able to explain it well, while for subjects in the medium category (S2) and subjects in the low category (S1) is only able to explain 1 question, namely question number 1. So it can be concluded that S2 is only able to fulfill two indicators, namely being able to formulate real problems in problem solving and using mathematics in problem solving, while S1 has very low mathematical literacy, this can be seen from the test results and interviews conducted by S1 that S1 was only able to fulfill one indicator of mathematical literacy, namely being able to formulate real problems in problem solving.

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CONCLUSION

From the results of the study it can be seen that the S1 Subjects had a very low mathematical literacy process because of the four indicators of mathematical literacy there was only one indicator that was fulfilled, namely being able to use mathematics in solving a given problem. Whereas Masters in the mathematical literacy process is quite good because of the four indicators there are two indicators that are not fulfilled, namely Masters has not been able to interpret solutions in solving problems and Masters has also not been able to evaluate solutions in solving problems. At the same time, S3 is able to fulfill all indicators of its mathematical literacy process. The recommendation for further research is to analyze students' mathematical literacy processes based on other variables, for example based on thinking dispositions. This will contribute to the development of mathematical literacy from various reviews.

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