

Analysis of Students' Mathematical Literacy on Contextual Problem Viewed from Gender

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Abstrak. The mathematical literacy ability is crucial for the students to have in the mathematical study. The purpose of this study is to find out how a student's mathematical literacy ability is reviewed from gender. It falls into a sort of descriptive qualitative research. Subject is chosen using an impressive sampling technique. The data collection techniques used in this research are tests and interviews. To obtain validity data on research used triangulated techniques. The data analysis techniques used in this study are data reduction, data presentation, and deduction drawing. The results of this study show that students' mathematical literacy ability in solving contextual problems between men and women has almost the same characteristics. Male and female students can only achieve indicators of formulating problems and using mathematics to solve problems. This is also the basis for why literacy in Indonesia is low. Lack of motivation and monotonous learning models can also be the cause of low mathematical literacy.

Key words: Mathematical Literacy, Contextual Problem, Gender

How to Cite: Prihandika, Y.A., Waluya, S.B., Dewi, N.R. (2022). Analysis of Students' Mathematical Literacy on Contextual Problem Viewed from Gender. *ISSET: International Conference on Science, Education and Technology* (2022), 867-873.

INTRODUCTION

Education is one of the foundations for the progress of a nation and is a great capital in facing global competition (Nurani et al., 2020). Although it is the foundation but the education system in Indonesia still has many problems. A frequent problem is the difficulty of students in accepting concepts in each subject taught. One of the subjects that must be studied at school is mathematics.

Mathematics has been taught at all levels of education, ranging from lowest to the highest (Setiawan et al., 2019). Mathematics is also a universal science that underlies the development of modern technology, has an important role in various other disciplines and develops human thinking power (Mahiuddin et al., 2019). Mathematics is a part of human life because various problems faced in everyday life can be solved. The mindset of students can be trained during the learning process because that is what makes mathematics so important to learn. To make it easier for students to understand mathematics, an ability called mathematical literacy is needed.

Mathematical literacy is closely related to the concept of literacy (Coskun, 2019). In addition, mathematical literacy is also needed in order to fully understand the knowledge that exists

around modern society (Expert Panel on Student Success in Ontario, 2004). Mathematical literacy is the ability of individuals, who think, create, and are critical beings, to understand and recognize the role that mathematics plays in the world around by using mathematical thinking and decision-making processes in solving potential problems today and in the future (OECD, 2009). The need for careful reflection on the right way to develop mathematical literacy in schools and suitable ways to integrate contextual problems into the teaching of mathematics (Kolar & Hodnik, 2021) Although it is considered important but it turns out that literacy skills in Indonesia are still very low. This is based on the results of the PISA (Programme for International Student Assessment) held by the OECD every three years where Indonesia is always ranked at the bottom. Indonesia started participating in PISA in 2000. But until now, it has never had satisfactory results. PISA is considered a mecca for the quality of education around the world, therefore if Indonesia's PISA score is low, it indicates that the quality of education in Indonesia is also still lacking. The following is indonesia's participation score from 2000 to 2018 presented in Table 1.

Table 1. PISA Mathematics Indonesia Results

Years	Indonesia average	International average	Indonesia's Ranking of the Number of Participating Countries
2000	367	500	39 of 41
2003	360	500	38 of 40
2006	391	498	50 of 57
2009	371	496	61 of 65
2012	375	494	65 of 65
2015	386	500	63 of 72
2018	379	489	73 of 79

From Table 1, it can be seen that the problem of the quality of education in Indonesia seems to never end. This situation is very ironic with the position and role of mathematics for the development of science and knowledge, considering that mathematics is the parent of science and it turns out that mathematics until now has not been a favorite lesson. Facts in the field show that mathematics is considered an abstract and difficult subject to understand (Mena, 2016). This condition causes many students to not be able to understand mathematical concepts well so that they tend to obtain less than optimal mathematics learning results. To overcome students' difficulties in understanding mathematical concepts well, students need to be trained with contextual problems that are directly related to everyday life.

Contextual problems are problem designs that are made based on students' experiences in the real world (Ayunani et al., 2020). The mathematical problems that will be discovered by students are not only around numbers and the

components of mathematics itself which are usually referred to as routine problems, but also related to things that students face in their daily live (Naryaningsih et al., 2022). Mathematical literacy problems are very good when using contextual problems that are close to the life of students (Vebrian et al., 2021). There are factors that affect students' mathematical literacy ability, one of which is gender. Gender differences certainly cause physiological differences and affect psychological differences in learning (Karmila, 2018). Students' mathematical literacy ability when viewed from gender has differences where female students meet the indicators better than students of the male gender (Lanya et al., 2021). Therefore, the main focus in this study is students' mathematical literacy skills on contextual problems in terms of gender. The levels used in mathematical literacy are six (Asmara, A. S., Waluya, 2017). This study uses indicators regarding the stages in the student's mathematical literacy process. The following indicators of mathematical literacy ability are presented in Table 2.

Table 2. Mathematical Literacy Indicators

Stages of Mathematical Literacy	Description
Formulating the problem	Students can write down information from a given contextual problem.
Create a model	Students can create a model from the information that has been obtained.
Use mathematical models	Students can use mathematical models to solve problems.
Interpreting the results	Students made a conclusion from solving the problem.
Evaluate	Students are able to evaluate the results of solving contextual problems.

METHODS

The type of research used in this study is descriptive with a qualitative approach. Qualitative research is an approach used to obtain in-depth data from a phenomenon where

the form of data is in the form of words (Sugiyono, 2017). The location of this study was at NU Panunggalan High School with class XI subjects. In this study, the subjects presented were 4 students, namely 2 male students and 2 female students. The subject selection technique

used is purposive sampling where the subject is selected so that the researcher gets information in accordance with the research objectives. The data collection techniques used are tests and interviews. The data analysis techniques used are data reduction, data presentation, and drawing conclusions. The research began by distributing test instruments to class XI students. Then the subjects were selected based on the results of mathematical literacy ability tests taking into account sex differences and information that was in accordance with the objectives of the study. Next, the researcher will conduct an interview with the selected subject. To obtain the validity of the data, triangulation is carried out by matching test results and interviews. Next, the researcher will reduce the data so that it is not too broad from the research focus. The data that has been reduced will be presented in the form of images as well as interview excerpts from the research subjects. The description carried out in this study includes the achievement of indicators at each level of mathematical literacy given. The

test instruments are presented in Table 3.

Table 3. Mathematical literacy test

A farmer grows corn and cassava with the required land of no more than 50 plots. The farmer needs 30 kg of fertilizer per plot to fertilize corn and 60 kg per plot to fertilize cassava. The amount of fertilizer available is 2.400 kg. If the profit generated is Rp. 4.000.000 per plot for corn and Rp. 6.000.000 per plot for cassava. Determine the maximum profit obtained.

RESULTS AND DISCUSSION

This study presented 4 subjects with the provision of 2 men and 2 women. The first male subject is symbolized by M-1 and the second male is symbolized by M-2. The first female subject is symbolized by W-1 and the second female subject is symbolized by W-2. The researcher is symbolized by R. The test results of each subject will be presented as follows.

Subjek M-1

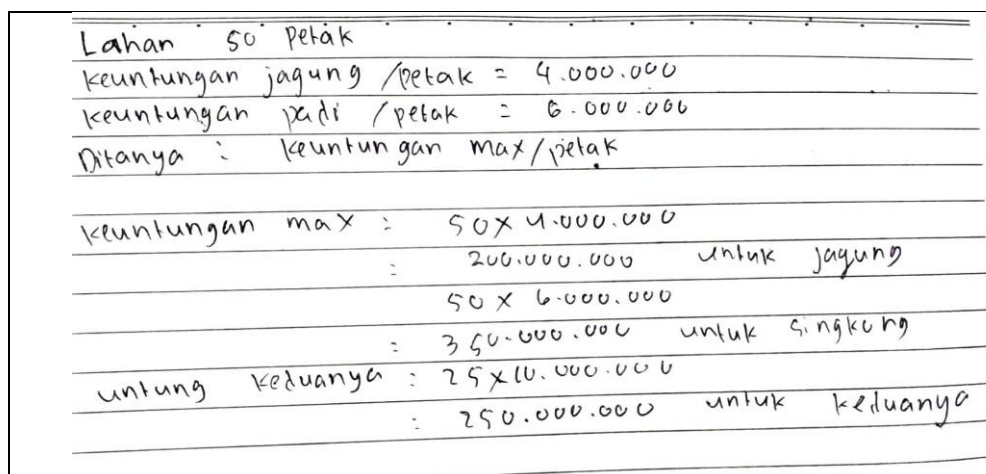


Figure 1. Subject answer sheet M-1

Based on Figure 1, it can be seen that the subject of M-1 wrote down the information that is known on the question but it is indeed incomplete. Researchers try to dig into more in-depth information by conducting interviews. When interviewing, the subject M-1 provides information related to what is known. The following is an excerpt of an interview conducted by the researcher to the subject of M-1.

R What is known in that matter?
M Corn land 50 plots, corn profit
-1 Rp. 4,000,000 and Rice Rp.
6,000,000

R Is it just that? Let's take a closer look. Do you think there is more information contained in the question or not?

M Farmers need 30 kgb fertilizer for corn and 60 kg for cassava. The amount of fertilizer available is 2,400 kg

R Why don't you write down the information to your answer sheet?

M Yesterday was not focused, sir.

-1 From the excerpt of the interview, it can be seen that in fact the subject of M-1 can explain

information related to the question but because it is not focused, the information is not written on the answer sheet. Furthermore, the researcher tried to analyze regarding mathematical models. On the answer sheet, the subject of M-1 does not appear to use a mathematical model. When asked about how the mathematical model was in the problem, the subject M-1 could not answer so indeed the subject of M-1 could not create a mathematical model to solve the problem. What looks more striking on the M-1 subject answer sheet is the problem-solving process carried out. In the answer sheet, the M-1 subject did carry out a calculation process, but when reanalyzed by the researcher, the calculations carried out by the M-1 subject were not quite right. Researchers are trying to further explore why it could have happened. The following is an excerpt of the researcher's interview to the subject of M-1.

R Is this your calculation correct

or not?

M I don't know, sir.

-1

R I think this calculation of yours is still not quite right. If you are at home, you often repeat the questions given by the teacher or not.

M No sir.

-1

From the excerpts of interviews conducted by researchers to M-1 subjects, it can be seen that they cannot solve the problem in the right way. When asked about the cause, the subject of M-1 gave the reason that when at home, he did not relearn the questions that had been given by the teacher. This is what makes the subject of M-1 forget about what is learned so that when given a question of the same form it will result in not being ready to answer.

Subjek M-2

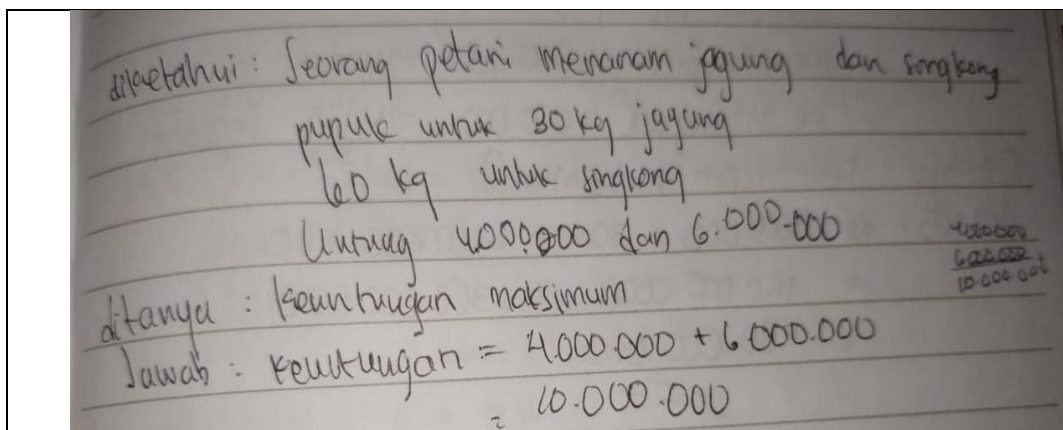


Figure 2. Subject answer sheet M-2.

Based on Figure 2, it can be seen that the subject of M-2 is able to write down what is known regarding the information on the question. The subject of M-2 is also capable of formulating what problems are asked. However, the formulation of the information in the question is still unclear. For this reason, the researcher tries to ask for information related to the problem. The following is an excerpt of an interview conducted by researchers on the subject of M-2.

R What information do you know about that?

M A farmer grows corn and cassava. Corn needs fertilizer 30 Kg. Cassava needs 60 Kg of fertilizer. The profit is 4 Million

and 6 Million.

R Is that all there is to it?

M Yes, sir.

-2

From the excerpts of interviews conducted on the subject of M-2, it can be seen that indeed in formulating problems and understanding information is still very minimal. Next, the researcher tries to analyze the process of creating a mathematical model. From Figure 2 it can be seen that the subject of the M-2 does not make mathematical models. Researchers tried to explore the reasons why the subject of the M-2 did not create a mathematical model. The following is an excerpt of the interview on subject M-2.

R Why don't you make a

- mathematical model?
- M I can't sir.
- 2 R Why can't it? Has this been taught?
- M I forgot the method sir.
- 2

Based on the excerpts of the interview, it can be seen that the subject of M-2 cannot write down mathematical models on the grounds of

forgetting by means of making mathematical models that were once taught. This can happen because the M-2 subject does not train himself to rework the questions given by the teacher. It is possible that it occurs because of the lack of learning motivation in the student. Then related to the settlement is also still not appropriate because students only add profits to the sale of corn and rice.

Subjek W-1

diketahui: keuntungan jagung per Petak 4.000.000
 ————— Singkong per Petak 6.000.000
 Sedangkan lahan 50 Petak, ditanami 2 tanaman (jagung, singkong) 50 Petak : 2 = 25 Per tanaman
 Jawab: =
 — Keuntungan jagung Per Petak x 25 Petak
 = 4.000.000 x 25
 = 100.000.000
 — Keuntungan Singkong Per Petak x 25 Petak
 = 6.000.000 x 25
 = 150.000.000
 } keuntungan jagung dan singkong
 = 100.000.000 + 150.000.000
 = 250.000.000
 jumlah? = keuntungan maksimum

Figure 3. Subject answer sheet W-1.

Based on Figure 3, it can be seen that the subject of W-1 is able to write down information on the question but is still unclear. The subject of the W-1 gives a description of what is known and asked. To further explore the writing of the subject of W-1, the pinsher tried to conduct an interview. The following is an excerpt of an interview conducted by the researcher to the subject of the W-1.

- R What is known in the matter?
- W It is known that the profit of
- 1 corn is 4 million and then cassava is 6 million, while the land is only 50 plots.
- R What was it about being told to look for?
- W Seek maximum profit.
- 1

From the statement of the subject of W-1 when interviewed, it can be seen that there is still a lack of understanding of the problem. The subject of the W-1 also seems to have not understood the steps to solve the problem. The

subject of the W-1 also did not write down the mathematical model that should exist. Likewise, in the process of solving it, it is still not right because you should have to make a graph and then look for the cut point. Researchers tried to explore the cause of the W-1 subject not solving it precisely.

- R Try to explain the steps to solve it.

W That I multiplied then added.

-1

- R Is it really like that?

W It seems so, sir.

-1

Based on the statement given, indeed the subject of the W-1 does not understand how to solve problems in linear programs. Analysis of the answers at the interview conducted also showed that there was doubt in the subject of the W-1. This should be improved so that in answering the questions there is no doubt in the students.

Subjek W-2

$$\text{Rp. } 4.000,000 + 6.000,000 = 1.000,000$$

Figure 4. Subject answer sheet W-2.

Based on Figure 4, it can be seen that the subject of the W-2 wrote very little information and even seemed to only give an answer even though it was still not quite right so that many things needed to be deepened again. For that reason, the researcher tries to explore it with interviews. The following is an excerpt of an interview that the researcher conducted to the subject of the W-2.

- R What is known in the matter?
W There are farmers growing corn
-2 and cassava.
R Is that all there is to it? Take a
 look again.
W Told to seek benefits.
-2

Based on the answer of the W-2 subject, it can be known that the W-2 subject has not fully understood the information on the question. The subject of the W-2 gives little information so that his understanding of the problem is still minimal. Then for the stage of making mathematical models, it has also not been done on the grounds that it cannot be done yet. At the stage of using mathematics to solve problems, it also still does not reach the given indicators because it is still not quite right. Actually, the W-2 sbujek knew the intention of the matter but because of his lack of understanding, he was unable to solve the problem properly.

From the data that has been presented, it can be seen that each subject has almost similar characteristics of mathematical literacy ability. Each subject no one makes a mathematical model. They solved the problem with the stages after writing down what was known and asked then went straight to the calculation stage. Students tend to make mistakes in calculations (Anditiasari, 2020). The step that needs to be done first, recognizing the information need indicated by the tendency of the student to include irrelevant information in his calculations. Secondly, it searches for and evaluates the quality of information indicated by the incompetence of students: selecting relevant information, linking information from different sources, and estimating missing

information(Wijaya, 2016). This study shows that students' mathematical literacy ability is seen from almost the same gender. This is contrary to the opinion (Nurani et al., 2020) which states that there are differences in the achievement of indicators in each male and female subject. From some of the interview excerpts presented, students felt less confident in answering the questions. Therefore, self-efficacy is very necessary in learning, especially mathematics.

CONCLUSION

Based on the results that have been presented, it can be seen that each student of each gender has a slight difference in characteristics. That being said, overall, the students' answers are essentially the same. The first male student can formulate the problem quite well. However, at the stage of making a mathematical model the first male student could not make it. Furthermore, at the stage of solving the question, the first male student can write down, but the results of the completion are not in accordance with the question question. So it can be concluded that gender does not affect a person's mathematical literacy ability. There may be other aspects that influence why mathematical literacy skills in Indonesia are low. The results of the interview also showed that self-efficacy is indispensable in learning mathematics because students feel less confident in their answers. For further research, researchers will try to conduct research on mathematical literacy skills with a review of self-efficacy and associated with the learning process in a particular model.

ACKNOWLEDGEMENT

The researcher would like to thank all parties who have been willing to become informants in this study and those who have supported the researcher so far.

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