

The Analysis of Mathematical Literacy Skills Based on the Self-Efficacy of Junior High School Students

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Abstract: The purpose of this study is to explain student's mathematical literacy abilities based on their own self-efficacy. This study aims to examine and describe mathematical literacy abilities across three levels of self-efficacy: high, medium, and low. The study was conducted at PKBM Homeschooling HSPG Purwokerto, focusing on 9th-grade junior high school students. Purposive sampling was used to select participants, and data were collected through questionnaires, written tests, and interviews. The data analysis uses qualitative descriptive analysis to fully discuss the importance of mathematics ability generated from self-efficacy. According to the research findings, students with high self-efficacy have good mathematical literacy skills, as seen by their performance on systematic questions. Meanwhile, students with moderate self-efficacy have pretty strong mathematical ability; they are able to successfully complete several aspects of mathematical literacy, although some remain inadequate. Then, students with low self-efficacy have extremely weak mathematical literacy skills, as evidenced by poor performance on the criteria of the mathematical literacy evaluation. Based on the research findings, self-efficacy improves students' mathematical literacy abilities since it is crucial in establishing students' ability to solve mathematical questions.

Keywords: mathematics; mathematical literacy; self-efficacy

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A. Introduction

Determination curriculum independence in Elementary and Secondary Education units be one of effort in prepare participant educate become human being human beings who have quality tall and powerful competition high so that you can answer challenges in the future come. The learning process in the merdeka curriculum emphasizes independence and facilitates participant educate For can develop abilities and skills 21st century (Tuerah, 2023) Merdeka Curriculum offers freedom to the teacher for develop learningto be able to customized with abilities and needs participant educate in unit school.

Flexibility in learning expected give chance for development customized learning with need in the future front and the world. This is in accordance with runway (Tuerah, 2023)y sociological from implementation Independent curriculum (Noptario et al., 2024) which state that : (1) learning must designed in effort preparation Students as world citizens. (2) learning arranged with lift various topics and dynamics social, as well as lift global issues. (3) Students are honed sensitivity social on problems that occur in various other parts of the world,motivated

For Study diverse different cultures, and are encouraged For contribute for a better world life good. Referring from statement the can understood that learning No just focus on content material learning but also pay attention to the learning process as well as ability from participant educate for can develop its potential.

Structured learning as above is also applied to the learning process mathematics, which is one of the eye lessons to be learned supported by participants educate from Primary Education to with Secondary Education. Mathematics is a necessary part developed in the world of education. Mathematics own role important in breakdown problem life. Mathematics is eye lessons that have role important in effort solve various problem in life every day (Rahman Yulianto et al., 2020). While (Hendriana et al., 2014) is of the opinion that mathematics own role in former pattern think humans are needed in modern society, because can make manbecome more flexible mentally, open and easy adapt with various situation as well as condition in various problems. In addition, mathematics is underlying science field knowledgetheothers. Suyitno (Rahman Yulianto et al., 2020) said that *mathematics is a queen of sciences and mathematics is a servant of sciences*. That matter show that mathematics own role important in development knowledge knowledge. Mathematics is a science in which there is a collection of concepts in the form of operations, numbers, symbols and definite patterns (Najah, 2024).

Importance mathematics in development knowledge knowledge, so that need there is study deep for in development mathematics. One of them, in study mathematics that is development literacy mathematics. Literacy mathematics is one of necessary skills developed in understand mathematics. OECD through PISA said that literacy mathematics is ability design, use, interpret breakdown mathematics in life every day. People who have ability literacy good math can know role important mathematics in life every day. As opinion (Haara et al., 2021) Mathematical literate people are able to recognize the role of mathematics indecision making or problem solving. Apart from that, math in breakdown the problem need ability procedural. This is in accordance with ability literacy interrelated mathematics relate with procedural abilities (Nisa & Arliani, 2023). Referring to matter said, in the process of solving problem required ability literacy mathematics for participants educate can analyze problem until with the process of interpreting problem in settlement problem.

Ability literacy mathematics also has role important in development of education. Therefore that, literacy mathematics be one of indicator international education standards (Ghofur et al., 2022). In Indonesia, the focus of educational evaluation through a minimum competency assessment is mathematical literacy (Nizham et al., 2017). The Government of Indonesia has fixed the curriculum, learning achievement targets, and international-based evaluation (Nugraha, 2022). However, The development of student learning achievement in mathematics, especially in junior high schools (SMP) in Indonesia, still shows a low level of knowledge (Suherman, 2024) and in reality ability literacy mathematics participant educate Indonesia still in Category low. Based on PISA report in 2022 ability literacy mathematics participant educate occupy ranked 70th out of 81 countries (Nugraha, 2022). The results show still need attention special in development ability literacy mathematics. In addition, the conditions it is also necessary become runaway in development learning customized

mathematics with needs and skills century to 21 involving ability thinking, analyzing, and creativity.

Condition low literacy Mathematics is also explained in research previously. Participants educate experience difficulty in solve question connected mathematics with life every day. It is marked with participant educate Not yet can to describe problem until with analyze results from questions, participants educate doubt in answer question so that often produce different interpretations (Alqusyairi & Suherman, 2021). The doubts that cause different interpretations show absence belief participant educate in finish question mathematics. This is be one of existing internal factors in self participant less educated certain in settlement question mathematics. Some study literature explain that difficulty in finish problem mathematics is also due to participant educate Already own view that mathematics that eye difficult and many lessons count, thing this cause participant educate the more no certain in finish question mathematics. In ability belief participant educate in finish math period impact on the participant process educate finish problem. The term of inconsistency belief often known as *self-efficacy*.

Efficacy self, or often called *self-efficacy*, is level belief somebody to ability self Alone in finish problem or the tasks given to him (Indraswara & Kusmaharti, D., & Yustita, 2023). *Self-efficacy* own role important in settlement problem mathematics, because belief self from participant educate become one of the initial capital for can with easy understand literacy mathematics. This is reinforced with results study previously conducted by (Drajat, WR & Dasari, 2023) who stated that *self-efficacy* participant educate own connection significant with literacy mathematical, meaning how much big or small level *self-efficacy* participant educate will influence literacy mathematical participant educate. This is in line with opinion this is in line with (Nizham et al., 2017) PISA stated that *self-efficacy* own role important in Study because can influences the level of effort and persistence applied by participants educate in finish tasks and challenges.

Referring to the analysis and study above, in this research this done analysis for give description in terms of and description related with ability participant educate in literacy mathematics under review from ability *self-efficacy* from participant educate. In the discussion article this will describe ability literacy mathematics based on indicator from ability literacy mathematics that yourself, in order to provide clear picture related with ability participant education in mathematics literacy.

B. Methods

Types of research this is study descriptive qualitative purposeful for analyze understanding draft mathematics Junior High School students in grade IX towards data content. Subject study this is student class IX, which has get material in determining the subject, researcher use *purposive sampling* which is the sampling member sample based on consideration certain (Sugiyono, 2013). Election subject started with give questionnaire self-efficacy and test instruments literacy mathematically, then from results answer questionnaire student grouped become three category that is high, medium, and low. Test results literacy mathematical students who have not fulfil indicator literacy mathematical in a way maximum for further analyzed in the interview.

Collection techniques in research this use test written and interview. Written test correlated to the indicator literacy mathematical on data content as well interview correlated on test written information provided. The data validity technique used in study this is triangulation technique. Data analysis conducted in the study this through three stages that is data reduction, data presentation, and extraction conclusion (Sugiyono, 2013). After the data was obtained through test written and interview, then done data reduction data reduction is done with choose things main, focus things important, and throw away what is not need. Then the result data reduction the served so that there is a clear and possible picture for interesting conclusion.

As for the indicators literacy mathematics used is according to (OECD, 2019)oncognitive processes student is able to: 1) *formulating mathematical situations*, 2) *Employing mathematical concepts, facts, procedures and reasoning*, 3) *Interpreting, applying and evaluating mathematical outcomes*. In research this, indicator the will loaded in 9 grains questions given as instruments and already validated by expert education Mathematics, the indicators are as following:

Table 1. Cognitive Process Components and Indicators Mathematical Literacy Student

Cognitive Process Components	Indic ator
<i>Formulating mathematical situations</i>	Identifying aspect mathematics in the problem Representation mathematical from the given problem
<i>Employing mathematical concepts, facts, procedures, and reasoning</i>	Explain identified representation from the given problem Design and implement internal strategies finish problem Connecting and using various representation Reflecting on mathematical arguments , explaining and justifying results mathematical.
<i>Interpreting Applying and Evaluating mathematical outcomes</i>	Finding the mathematical model used Interpret results mathematical to real world context Use thinking mathematics and thinking computing For make prediction solution mathematical from contextualized problems

C. Results and Discussion

Analysis cognitive process problems literacy mathematics on three subject study done based on results answer write student in finish it. After that, is done interview with students forconfirm suspicion results analysis test mathematical literacy. The test instruments used and the results the analysis as following.

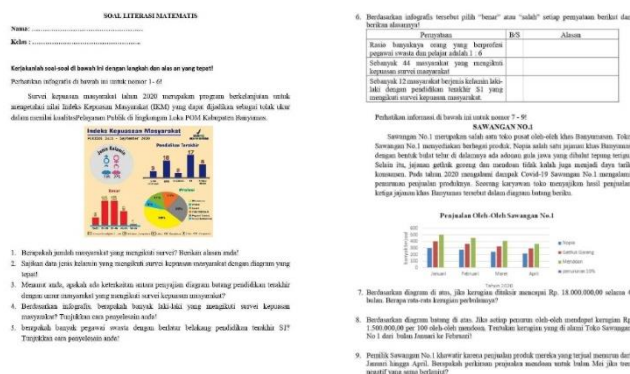


Figure 1. Instrument Test

1. Answer Written and Interview Subject Along With The Analysis

a. Analysis Answer Written and Interview First Subject (S1)

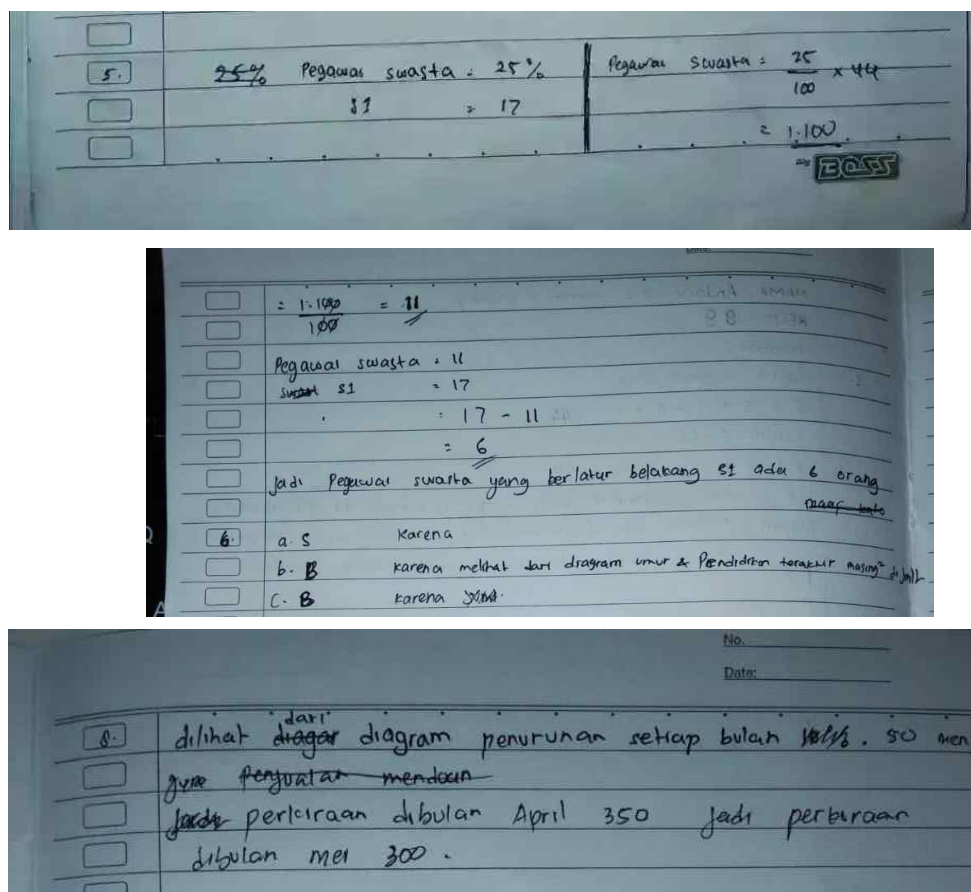


Figure 2. Results S1 Answer

Based on Figure 2, from (S1N5) suspected student experience difficulty in to mean questions asked that is the amount employee private with background behind S1 education. This is seen in the results settlement student where no can connect information public profession employee private as much as 25% with lots community with background behind S1 education as many as 17. From (S1N6a) and (S1N6c) it is suspected student not yet can explain reason why statement given is false or true. For (S1N9) it is suspected lack of information used from infographics provided so that No appropriate in predict decline sales in the month May.

On the question number 5 with indicator connect and use various representation. S1 can identify as much as 25% of employees private from pie charts and many public 17 people with bachelor's degrees, will but student No can connect second information the for determine lots employee private sector background S1 education. The following results interview researcher with first subject (S1):

- Q : Are you sure about your answer to number 5?
 S1 : I'm not really sure, because I don't know, that's all I know.
 Q : Why do you use the 25% x 44 strategy?
 S1 : because we are looking for lots of private employees.
 Q : Do you understand the question given?

S1 : *Yes, looking for the difference between the number of private employees and the number of members of the public Bachelor's degree*

Q : *Have you ever heard of the profession of private employee with a Bachelor's degree background?*

S1 : *Yes, because when working you have to include your last education*

Q : *When working, do you have difficulty connecting two pieces of information?*

S1 : *Yes,*

From the interview excerpt, it can be seen that the subject does not understand the relationship between the two pieces of information, namely private employees and their last education. This makes students misinterpret the questions given. Therefore, students cannot complete the large number of private employees with a bachelor's degree.

On the question number 6a and 6c with indicator reflect mathematical arguments, explain, and justify results mathematical. S1 can give assessment of each question given with right. However no write the reason. Here results interview researcher with first subject (S1):

Q : *Did you have any difficulty completing number 6?*

S1 : *no.*

Q : *Why don't you write down the reasons for each statement?*

S1 : *because I forgot to write it down.*

Q : *From the statement 6a given, what reason should you give?*

S1 : *the ratio of the number of people working as private employees to students is 1:5?*

Q : *Whereas in question 6c, what reason should you give?*

S1 : *I don't know, I forgot.*

From the interview excerpt, it can be seen that the subject only wrote the assessment correctly. However, it is difficult to argue and explain the assessment given. This happens because students do not fully understand the information they get. It can be seen when the researcher asks for the reason that should be given in number 6a. Students make a mistake in stating the ratio of many people who work as private employees and students.

On the question number 9 with indicator use thinking mathematics and thinking computing for make prediction solution mathematical from contextualized issues. Subject write a prediction decline sale mendoan with see from the bar chart the stem is presented. Here results interview researcher with first subject (S1):

Q : *Did you have any difficulty completing number 8?*

S1 : *No.*

Q : *Why do you predict a 50% decline in mendoan sales?*

S1 : Because I looked at the bar chart from January to February sales decrease by 50, so every month there is a decrease of 50

Q : Did you not find any other information from the diagram?

S1 : No,

Q : If I ask you to observe again, would you find anything other information?

S1 : Oh yeah, it says there's a 10% decrease.

From the interview excerpt, it can be seen that the subject was not careful in reading and understanding the information provided. The subject only read the data presentation in January and February experienced a decrease of 50, so the subject generalized that the Sawangan No. 1 shop experienced a decrease in mendoan sales of 50 each month. This resulted in the subject not using his mathematical thinking and computational thinking to predict a given problem.

b. Analysis Answer Written and Interview Second Subject (S2)

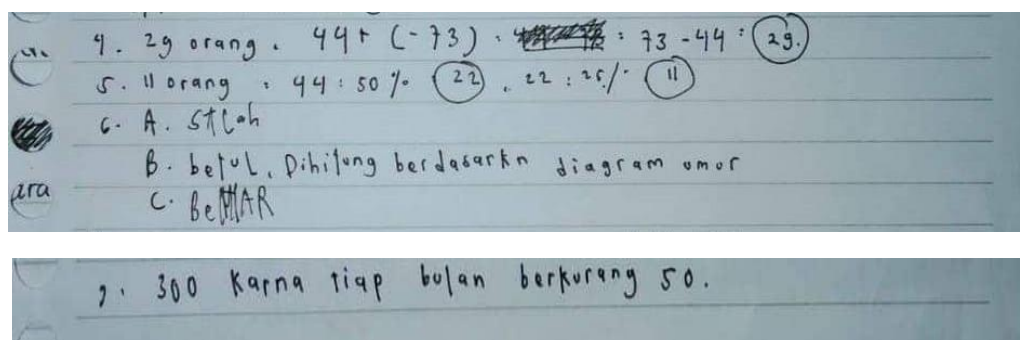


Figure 3. Results S2 Answer

Based on Figure 3. From (S2N4) it is suspected student experience difficulty in identify and design strategies from the information he obtained. This seen in the results settlement student where no can implement the right strategy. From (S2N5) it is suspected student experience difficulty in identify information must be obtained for finish problem. That thing seen in the results settlement student where no display identification information percentage employee private and many have a Bachelor's degree. From (S2N6a) and (S2N6c) it is suspected student not yet can explain reason why statement given is false or true. For (S2N9) it is suspected lack of information used from infographics provided so that No appropriate in predict decline sales in the month May.

On the question number 4 with indicator designing and implementing internal strategies finish problem. S2 does not show moreover formerly identification the necessary issues. However, the subject direct try for design and implement the strategy. Here's results interview researcher with second subject (S2):

Q : Are you sure about your answer to number 4?

S2 : Yes, I'm sure.

Q : Why did you write information 44?

S2 : *because of the number of people who took part in the survey.*

Q : *Why did you write information 73?*

S2 : *because the percentage of male gender*

Q : *In your opinion, is 73% of a society that follows survey?*

S2 : *eehmmm. yeah I think so*

Q : *If yes, what operation should be used to show the part?*

S2 : *don't know.*

From the interview excerpt, it can be seen that the subject designed a strategy from the two pieces of information obtained. This can be seen when the subject answered the researcher's question about what operation should be used to show 73% of a community that took the survey. However, the subject could not answer it. Therefore, the subject could not implement the strategy in finish problem with appropriate.

On the question number 5 with indicator connect and use various representation. S2 does not can identify information employee private from pie charts and many public Bachelor's degree from education diagram lastly. Next results interview researcher withsecond subject (S2):

Q : *Do you find it difficult to solve problem number 5?*

S2 : *Yes.*

Q : *Why did you write $44 \times 50\%$?*

S2 : *because we are looking for lots of private employees.*

Q : *Why did you write $22 \times 25\%$?*

S2 : *because we are looking for many people with a Bachelor's degree*

Q : *In your opinion, is there a relationship between private employees andlast education?*

S2 : *None, because I don't know who had the last education, S1, and became a private employees.*

Q : *When working, do you have difficulty connecting two pieces of information?*

S2 : *Yes,*

From the interview excerpt, it can be seen that the subject had difficultyidentifying the information that he/she had to obtain to solve the problem, and the subject also did not know the relationship between private employees and their last education. This caused students to make mistakes in using various representations. Therefore, students were unable to complete the large number of private employees with a bachelor's degree.

On the question number 6a and 6c with indicator reflect mathematical arguments, explain, and justify results mathematical. S2 can give assessment of each question given with right. However No write the reason. Here results interview researcher with second subject (S2):

Q : Did you have any difficulty completing number 6?

S2 : No.

Q : Why don't you write down the reasons for each statement?

S2 : because I don't know.

From the interview excerpt, it can be seen that the subject only wrote the assessment correctly. However, it was difficult to argue and explain the assessment given. This happened because the student did not fully understand the information obtained.

On the question number 9 with indicator use thinking mathematics and thinking computing for make prediction solution mathematical from contextualized issues. Subject write a prediction decline sale mendaon with see from the bar chart the stem is presented. Here results interview researcher with second subject (S2):

Q : Did you have any difficulty completing number 8?

S2 : No.

Q : Why did you write 300?

S2 : Because every month there is a decrease of 50 on the bar chart

Q : Did you not find any other information from the diagram?

S2 : No,

From the interview excerpt, it can be seen that the subject was not careful in reading and understanding the information provided. The subject only read the presentation of data in the bar chart which experienced a decrease of 50, so the subject generalized that the Sawangan No. 1 shop experienced a decrease in mendaon sales of 50 each month. This resulted in the subject not using his mathematical thinking and computational thinking to predict a given problem.

c. Analysis Answer Written and Interview Third Subject (S3)

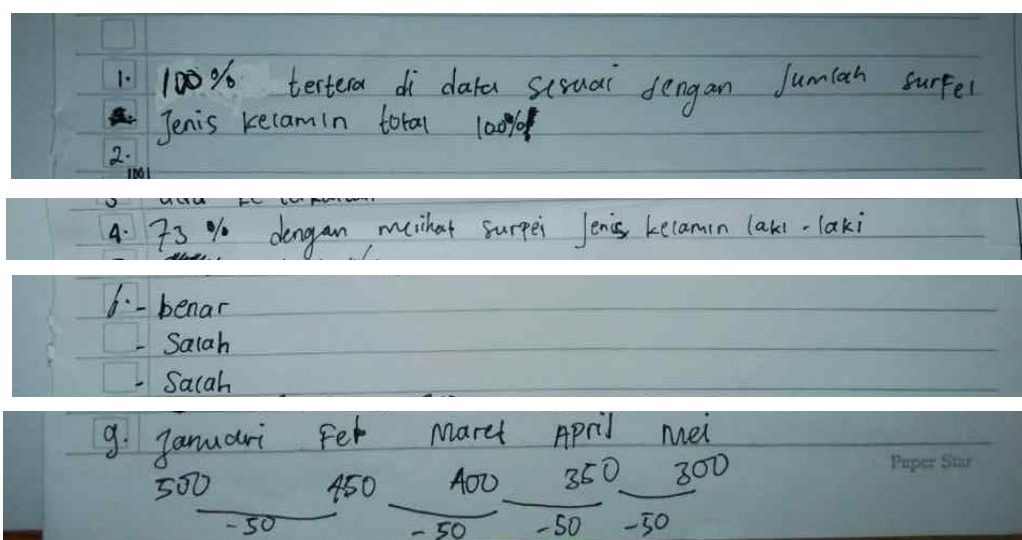


Figure 4. Results S3 Answer

Based on Figure 4, from (S3N1) suspected student experience difficulty in identify mathematical the amount the community that follows survey,. This is seen in the results settlement student where only write down 100% of what is obtained from the type diagram sex. From (S3N2) suspected student misconception aboutrepresentation a percentage data to in the shape of a pie chart. This is seen in the resultssettlement student Where represent in bar chart form. From (S3N4) it is estimated student difficulty identify infographics provided. This is seen in the results settlement student only write 73% with see survey type sex male. From (S3N6) suspected studentdifficulty in understand the statement given. This is seen results settlement student when give assessment of each statement given not yet appropriate all and nothing writethe reason. For (S3N9) allegedly lack of information used from infographics provided so that No appropriate in predict decline sales in the month May.

On the question number 1 with indicator identify aspect mathematics that is in the problem. Here results interview researcher with third subject (S3):

Q : *Are you sure about your answer to number 4?*

S3 : *Yes, I'm sure.*

Q : *Why did you write 100%?*

S3 : *because of the number of genders that participated in the survey.*

Q : *If I asked you to look at the infographic again, would you found other information?*

S3 : *No*

From the interview excerpt, it can be seen that the subject was less careful in reading the infographics provided. The difficulty in identifying infographics in a way mathematical so that No can give the right answer.

On the question number 2 with indicator representation mathematical from the given problem. The following results interview researcher with third subject (S3):

Q : *Are you sure about your answer to number 2?*

S3 : *yes.*

Q : *Why did you present it in a bar chart?*

S3 : *because it follows the presentation of other data.*

Q : *Why not choose a pie chart?*

S3 : *it's okay*

From the interview excerpt, it can be seen that the subject's lack of knowledge regarding the presentation of data in a diagram, the subject does not yet understand thatpercentage data should be presented with a pie chart. Lack of subject knowledge so thatNo can represent with appropriate.

On the question number 4 with indicator designing and implementing internal strategies finish problem. Here results interview researcher with third subject (S3):

Q : *Are you having difficulty solving problem number 4?*

S3 : *No*

Q : *Why did you write 73%?*

S3 : *Because it looks like a male gender.*

Q : *Do you understand the question given?*

S3 : *No*

From the interview excerpt, it can be seen that the subjects had difficulty in understanding the questions given. It can be seen from the subjects who only identified 73% of the male gender without writing down the number of people who took the survey. This resulted in students not designing and implementing a strategy to determine the number of male genders who took the survey.

On the question number 6 with indicator reflect mathematical arguments, explain, and justify results mathematically. Here results interview researcher with third subject (S3):

Q : *Are you sure about the assessment you gave?*

S3 : *yes*

Q : *Why did you write the assessment true, false, false?*

S3 : *ehhhmmm... because true, false, false.*

From the interview excerpt, it can be seen that the subject had difficulty in understanding the statements given. The subject only gave an assessment according to his opinion. It can be seen when the researcher asked for the reason, the subject could not explain each assessment in the statement given.

On the question number 8 with indicator interpret results mathematical to real world context. Here results interview researcher with third subject (S3):

Q : *Did you have any difficulty completing number 8?*

S3 : *No.*

Q : *Why did you write $1,500,000 = 1,425,000$?*

S3 : *Because I just answered randomly*

Q : *Do you understand the questions in the given problem?*

S3 : *just keep quiet*

From the interview excerpt, it is seen that the subject did not fully understand the questions given, so the subject just answered haphazardly. This resulted in the subject being unable to interpret the mathematical results of the decline in mendoan sales from January to February.

On the question number 9 with indicator use thinking mathematics and thinking computing for make prediction solution mathematical from contextualized issues. Subject

write a prediction decline sale mendoan with see from the bar chart the stem is presented. Here results interview researcher with third subject (S3):

Q : *Did you have any difficulty completing number 9?*

S3 : *No.*

Q : *Why did you write 300?*

S3 : *Because I see the result of $500-450 = 50$, so I conclude that each the month is reduced by 50*

Q : *Did you not find any other information from the diagram?*

S3 : *No,*

From the interview excerpt, it can be seen that the subject was not careful in reading and understanding the information provided. The subject only relied on the result of $500 - 450 = 50$ so that the subject predicted that every month there would be a decrease of 50. The subject estimated a decrease in mendoan sales in May of 300.

Based on the results of the analysis and interviews with 3 subjects, it was found that the subjects still faced several difficulties in completing mathematical literacy. *First*, the subjects had difficulty identifying aspect mathematical problems in the problem, because of the low literacy and accuracy in extracting information from the infographics provided. *Second*, the subject had difficulty representing mathematical from a problem, because lack of knowledge student about data presentation. *Third*, explain identified representation from problem, because subject experience difficulty in explain the relationship obtained from two representations namely bar chart education final with age the community that follows survey satisfaction society. *Fourth*, the subject difficulty designing and implementing internal strategies finish problem, because subject No understand questions and identify on a problem. *Fifth*, the subject experience difficulty connect and use various representation, because not yet understand the relationship between two representations in a given infographic. *Sixth*, subjects have difficulty reflecting on mathematical arguments, explaining, and justifying results mathematically, because lack of accuracy read infographics and tend to only origin just in justify results statement given. *Seventh*, subject experience difficulty interpret results mathematical to real world context, because the difficulty interpret the average of a mark certain so that subject No can interpreting the average of a other values. *Eighth*, the subject experience difficulty use thinking mathematics and thinking computing For make prediction solution mathematical from contextualized problems, because no be careful in reading and understanding infographics so that you immediately generalize the information you get without looking at it again.

Of the 3 subjects who were analyzed for answers and interviews, each had difficulty in achieving the given indicators. The first subject was able to complete 6 indicators of mathematical literacy, namely 3 indicators in the cognitive process of *Formulating situations mathematics*, 1 indicator in the cognitive process *Employing mathematical concepts, facts, procedures, and reasoning*, and 2 indicators in cognitive processes *Interpreting Applying and Evaluating mathematical outcomes*. Subject second capable complete 5 indicators literacy mathematical namely 3 indicators in the cognitive process of *Formulating situations*

mathematics, and 2 indicators in the cognitive process *Interpreting Applying and Evaluating mathematical outcomes*. Besides that subject third capable complete 2 indicators literacy mathematical namely 1 indicator in the cognitive process *Employing mathematical concepts, facts, procedures, and reasoning*, and 1 indicator on cognitive processes *Interpreting Applying and Evaluating mathematical outcomes*.

D. Conclusion

Based on from results analysis and discussion can taken conclusion that subject that has self efficacy tall can finish literacy mathematical more Good compared to others . Self efficacy is level belief somebody to ability self Alone in finish problem or the tasks given to him . Subjects who have self efficacy tall can complete 6 indicators literacy mathematical with fulfill 3 cognitive processes that is Formulating mathematical situations, Employing mathematical concepts, facts, procedures, and reasoning, and Interpreting Applying and Evaluating mathematical outcomes. Subjects who have self efficacy currently can complete 5 indicators literacy mathematical with fulfill 2 cognitive processes that is Formulating mathematical situations, and Interpreting Applying and Evaluating mathematical outcomes. Besides that subject that has self efficacy low only can complete 2 indicators literacy mathematical with fulfil 2 cognitive processes that is Employing mathematical concepts, facts, procedures, and reasoning, and Interpreting Applying and Evaluating mathematical outcomes.

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