



## Students' Mathematical Literacy Ability in Solving PISA Questions at SMP Kabupaten Melawi

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### Abstract

*This study aims to describe students' mathematical literacy skills in solving Program For International Student Assessment (PISA) questions. This research uses a qualitative approach with a descriptive method. The research subjects were students of class VIII spread over several schools in Melawi Regency, totaling 46 students. The research instrument used was a mathematical literacy test with a PISA context of 6 questions and interviews. After doing the research, it was found that the mathematical literacy ability of the students was still in the low category with an average of 33.5. The mistakes that are often made are the lack of students' basic mathematical abilities, one of which is that students are less able to understand the problems in the form of stories and construct them into mathematical models and are less able to apply the concepts used to solve the problems given.*

**Keywords:** *mathematical literacy, pisa questions*

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## INTRODUCTION

PISA (Program for International Student Assessment) is an international study that aims to study all aspects of literacy skill achievement, including reading, math, and science. It is used to measure the extent to which basic education in a country prepares students to face the real world. Pakpahan (2016) states that PISA is not a benchmark to determine students' ability to master the curriculum at school, but to measure students' ability to solve problems in real life. One of the objects studied is the ability of mathematical literacy.

According to the PISA assessment framework, mathematical literacy is defined as a person's ability to formulate, apply, and explain mathematics in various contexts, including mathematical reasoning and the ability to use concepts, procedures, and facts to describe, explain, or predict phenomena/events (OECD, 2019). Mathematical literacy skills are based on seven basic skills, namely communication, representation, designing strategies in mathematical problem solving, reasoning and argumentation. Students with good literacy skills will find it easy to solve problems in everyday life (Setiawan, Dafik, & Lestari, 2014).

According to Puspitasari (2015) Indonesian students' mathematical literacy is still categorized as low. This can be seen from the results of the PISA study and the position of the mathematical literacy ability of Indonesian students from 2000 to 2018. Table 1 shows the position of the mathematical literacy ability of Indonesian students based on the PISA study.

**Table 1. The position of students' mathematical literacy skills in Indonesia Based on the PISA study**

Year	Indonesia Average Score	International average score	Indonesia Ranking	Number of Participating Countries
2000	367	500	39	41



2003	360	500	38	40
2006	391	500	50	57
2009	371	500	61	65
2012	375	494	64	65
2015	386	490	62	70
2018	379	489	74	79

Sumber: (Puspitasari, 2015:2)

The survey results above show that Indonesia is always included in the 10 countries with the lowest mathematical literacy abilities. PISA divides the achievement of students' mathematical literacy skills into six skill levels, from level 1 (lowest) to level 6 (highest) with different descriptions between study domains. These levels describe the level of reasoning in solving problems. In 2018, the majority of students' mathematical literacy skills in Indonesia were at 51.7% (level 2) and 0.6% (level 5 or 6). When viewed from the academic quality between countries, Indonesian students are ranked 7th from the bottom with a score of 379 out of an average score of 489 (OECD, 2019). This shows that the mathematical literacy ability of Indonesian students is still relatively low compared to other countries.

Similar research conducted by Efriani et al (2019), Firdaus (2017), and Hadi et al. (2018), found that students' mathematical literacy was still low even when the questions on the questions had been adapted to the Indonesian context. Students answer the questions given without providing calculation steps and provide explanations for the answers they wrote. This shows that students cannot provide an argument against the math problems tested in the math test. In line with research conducted by Sandrom, et.al (2013) it was concluded that students had difficulty solving mathematical literacy problems because they had difficulty giving reasons, even when solving problems related to story questions they felt restless and insecure. This is because it lowers students' ability to understand reading or math problems given.

This study aims to determine students' mathematical literacy skills in solving PISA questions. Based on the explanation above, the researcher intends to analyze the students' mathematical literacy skills with the title "Students' Mathematical Literacy Ability in Solving PISA Questions at SMP Kabupaten Melawi."

## RESEARCH METHODE

This research uses a qualitative approach with a descriptive type of research. The subjects in this study were students of class VIII at SMP Melawi Regency, totaling 46 students. The procedure carried out has three stages, namely the planning stage, the implementation stage and the data analysis stage. The data collection technique used is the provision of mathematical literacy test questions based on 6 levels with the PISA context, totaling 6 questions that have been translated from English into Indonesian and given interviews. The question instrument used was adopted from the data that had been collected and analyzed using three stages, namely data reduction, data presentation and drawing conclusions.

## RESULTS AND DISCUSSION

### Results

This study produces data on students' mathematical literacy test results based on the literacy level of PISA questions and interview results, which will be analyzed and described. The following is the percentage of data analysis results based on each level of PISA questions:



**Table 2. Percentage of Score for Each Question Level**

Question Number	Level	Skor (%)
1	1	64,67 %
2	2	1,86%
3	3	08 %
4	4	33 %
5	5	0,5 %
6	6	0,47 %

Based on table 2, it can be seen that there are no students who get perfect scores on each number of questions. This indicates that the higher the level of the question, the higher the difficulty and level of reasoning experienced by students in answering each item. The following will be presented for each level of PISA questions:

- a. Level 1 questions are contained in question number 1 which consists of parts a, b and c. In part a there are 19 students who are able to solve the problem correctly, then 13 students who can understand the problem but make an error in the calculation and there are 12 students who answer but are wrong and 2 students who do not answer at all. In part b there are no students who can answer correctly, but there are 12 students who have been able to process the information on the questions but make errors in calculations and most students make mistakes in choosing the completion steps. In part c, students are asked to provide conclusions for answers a and b. But most students have not been able to give conclusions correctly, only 2 students have answered correctly and gave reasons for the answers they wrote.
- b. Level 2 questions are contained in question number 2. Most of the students were able to answer correctly, but there were still 2 students who made errors in calculations, 10 students answered incorrectly and 10 students did not answer at all.
- c. Level 3 questions are contained in question number 3. At this level there are no students who can answer correctly according to what was instructed in the question. Students make many mistakes in calculations and have not been able to determine the procedure used.
- d. Level 4 questions, contained in question number 4 which consists of parts a, b and c. In part a, there are 33 students who have answered but have not answered correctly and 13 students who have not answered at all. Then in part b there are 5 students who have answered correctly, 12 students answered but wrongly and 29 students did not answer. Furthermore, in part c there are 11 students who have answered correctly, 6 students answered but wrongly and 29 students did not answer.
- e. Level 5 questions are contained in question number 5. At this level there are 21 students who answer but make errors in calculations and 25 students who do not write answers to the questions.
- f. Level 6 questions are contained in question number 6. At this level only 1 student has answered correctly, 19 students answered but was wrong and 26 students did not write answers on the question sheet.

### **Discussion**

This study aims to determine how the students' mathematical literacy skills in solving PISA questions at the junior high school level of class VIII in junior high schools in Melawi Regency, amounting to 46 students. In the implementation, several processes were carried out, namely giving a mathematical literacy test in the context of PISA and interviews. After being given the test, it was generally found that the students' mathematical literacy ability in solving PISA questions was still in the low category with

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a percentage of 33.5%. Then specifically for each level of PISA questions, level 1 is in the good category, level 4 is in the low category and levels 2, 3, 5 and level 6 are in the very poor category.

At level 1, students' mathematical literacy skills on average obtained 64.67% belonging to the good category. This score is the average ability that students have in answering question number 1. This question asks students to determine the currency exchange rate from SGD to ZAR and vice versa and conclude whether they will get a profit. However, there are some students who still make mistakes in choosing the work process. This is because students still cannot understand the language in the questions, so students are confused in choosing the procedure that will be used to solve the questions given. Based on the research of Simalango et al. (2018), it can be categorized into difficulty of change which means difficulty in using mathematical procedures that are relevant to the questions given. This can be seen from the inability of students to know what procedures should be used to solve the problems in the problem.

At level 2, the average student's mathematical literacy ability was 1.86%, which was classified in the poor category. This score is the average ability that students have in answering question number 2. This question asks students to determine the block size if the number of boxes available is known and describes the blocks. Errors made by students are difficulties in determining the steps of the process and cannot give reasons for the answers they are doing, because students still cannot recognize the information that has been given to the questions. This is in line with the findings of PISA (Mansur, 2018) which states that there are still 76% of Indonesian children who do not reach level 2.

At level 3, the students' mathematical literacy ability on average was 0.8% which was classified in the poor category. This score is the average ability that students have in answering question number 3. This question asks students to determine the width of a rectangular window. However, most students still make mistakes in choosing the work process. This is because students understand the information contained in the questions, so students find it difficult to determine strategies in solving the problems given. This is similar to the findings of Karimah & Fuad (2018) which explained that the most mistakes made by students were not being able to determine the strategy to be used in solving the problem.

At level 4, students' mathematical literacy skills on average obtained 33% belonging to the low category. This score is the average ability that students have in answering question number 4. This question asks students to determine what year the comet first appeared, reappeared and whether the discoverer will see the appearance of a second comet. Students make mistakes in doing the problem. This is because students are still confused about choosing and combining different representations in the questions and communicating the arguments they have.

At level 5, the students' mathematical literacy ability on average was 0.5% which was classified in the poor category. This score is the average ability that students have in answering question number 5. This question asks students to determine the number of apple tree rows along with how to get the answer. The mistake that many students make in answering is in choosing the steps of the process, and most students also do not fill in the answer sheet. This is because students still cannot develop the models contained in the questions, reason, analyze and communicate the reasons. In fact, this ability is needed in the literacy process. In accordance with the opinion of the US Department of Education (2014) which states that communication skills and analyzing ideas are needed to solve problems in real life.

At level 6, the average student's mathematical literacy ability was 0.47% which was classified in the poor category. This score is the average ability that students have in answering question number 6. This question asks students to give reasons for whether they will get an increase if they add more land and give them a reason. Give the reason. However, many students do not work on these questions, because students have not been able to connect and reason at a high level to answer these questions. Students have not



been able to think systematically to understand complex problems and have not been able to interpret their opinions with real situations to give reasons for the questions. PISA (Afriyanti et al, 2018) revealed that the most important thing in literacy is giving reasons, because in literacy one of them must involve Reasoning and Argument. This ability is based on the ability to think logically in analyzing information to produce reasonable conclusions. So that the conclusions drawn are based on logical reasons.

## CONCLUSION

Through the research that has been done, in general it can be concluded that the mathematical literacy ability of students in solving PISA questions is still relatively low. This can be seen from the average percentage score of the mathematical literacy test that has been given at 33.5%. The mistakes that are often made are the lack of students' basic mathematical abilities, one of which is that students are less able to understand the problems in the form of stories and construct them into mathematical models and are less able to apply the concepts used to solve the problems given.

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