

Mathematical Literacy Skills of Fifth Grade Elementary School Students: A Case Study in Pekanbaru

M. J. Adi Putra^{1*}, Tri Agmadya¹, Syahrilfuddin¹

¹Department of Primary School Teacher Education, Faculty of Teacher Training and Education, University of Riau, Pekanbaru, Indonesia

*jaya.adiputra@lecturer.unri.ac.id

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Abstract

This study aims to identify and describe the mathematical literacy skills of fifth grade elementary school students. This study was conducted in one of the primary school in Pekanbaru from January to March 2020. The type of research used was a case study. The subject of this research was 37 fifth grade elementary school students. The instrument was arranged referring to the questions issued by PISA. After the instrument were validated by two experts and tested on students, the next step was used to retrieve data. The data collected is then grouped and categorized according to the device that has been created. The results of the data processing showed that most of the subjects had not been able to answer the questions at level 4 or above, while for the answered level it was broken down as follows; the mathematical literacy achievement of fifth grade elementary school students that reached level 1 were 38%, in level 2 there were 54%, and in level 3 there were 8%. From these data results, it appears that in general the fifth-grade elementary school students have a very low level in mathematical literacy skills, meaning that the learning technique they have gained so far has not been able to build mathematical literacy skills.

Keywords: *case study, fifth-grade students; literacy; mathematical literacy skills; PISA.*

1. INTRODUCTION

At this time, education is a part of people need and has a very important role in the community. Through education, people would become good quality human resources. Education has the responsibility to enhance, expand, and develop people's knowledge and interest, so it can help them to be able to

respond a great new challenge and ideas in the future.

Rapid technology developments cause changes in various aspect of life. And of course, it also has a great impact in education world. In fact, the process in education world has to be synergy with current technology developments. Technology makes it easy for the community to access a variety of

knowledge and information quickly, easily, and accurately from various sources. In fact, mathematics knowledge plays important role in the development of technology and science.

Mathematics is a universal science that underlies the development of modern technology, has an important role in various disciplines and develops human knowledge. To master and create a technology for the future, it needs a strong understanding skill in math from an early age.

But in reality, only few people like math. Mathematics is one of the subjects that is considered difficult by most of the students (Setyaningrum, 2012; Syafitri, Putra, & Noviana, 2020). This is caused by the lack of student's interest and understanding towards math. In an effort to improve the lack of student's understanding ability, The Ministry of Education and Culture has launched the School Literacy Movement program. The Ministry of Education and Culture has developed the School Literacy Movement program to improve the quality of human resources through education. The School Literacy Movement is a way to develop student's character and reading habits which outline in the Regulation of the Minister of Education and Culture (Permendikbud 2015 No.35). The School Literacy Movement program in primary school is carried out through three stages, namely the habituation stage, the development stage, and the learning stage (Faizah, 2016). Those three stages are carried out continuously through the years. To support the success of the

School Literacy Movement program in order to improve student's literacy skills, especially in math, it is necessary to develop the mathematical literacy learning.

According to Ojose (2011: 89), mathematical literacy skill is an ability to learn and apply the basic of mathematics knowledge in real life. Mathematical literacy skill is not only about calculus, differential equations, topology, linear algebra, abstract algebra, or complex and sophisticated mathematical formula, but also a broad understanding of mathematical knowledge that can be achieved.

The result of Programme for International Student Assessment (PISA) that carried out by the Organization for Economic Cooperation and Development (OECD) from 2000 until now has showed that the mathematical literacy skill of Indonesia's students have the lowest average scores. According to PISA 2018 result, Indonesia is in the lowest 10th ranked from 79 countries that also taking the literacy ability test. The reading literacy skill score is 371 with a position of 72 out of 77 countries, the mathematical literacy skill score is 379 with a position of 72 out of 78 countries, and the science literacy skill score is 396 with a position of 70 out of 79 countries.

The literacy skill that becomes the PISA assessment includes language literacy or reading literacy skill, mathematical literacy skill, and science literacy skill. But in reality, the literacy skill often seen as a narrow scope only for reading literacy skill. And according to

the observation test result in primary school, literacy building program is directed at the habituation ability and only focusing in language scope. Other fact, on PISA 2018 assessment, the mathematical literacy skill was downgrading from PISA 2015 assessment, which was 386 to 379 (Kemendikbud, 2018). This shows that the education program, especially in primary school program, has not been able to optimized the school and teacher's role to develop student's mathematical literacy skill.

The mathematical literacy skill has certain levels, from level 1 (lowest) to level 6 (highest) (Table 1). Each level shows the student's ability in mathematical literacy. Indonesia's students are in the lowest level which shown in one of the researches by Zainiyah and Marsigit (2018), and according to the research it clears that

the fifth and sixth grade elementary school students were only reached level 3 in mathematical literacy skill.

According to these backgrounds of the problem that has been described, the researcher analyzes the student's ability in mathematical literacy with a research title "Content Analysis of Mathematical Literacy Skills of Fifth Grade Elementary School Students"

2. METHOD

This research is a case study, conducted in one of the primary schools in Pekanbaru. The subjects of this study were 37 grade V students.

The instrument used in this study was an assessment test which included several questions from the PISA mathematics literacy assessment test, from level 1 to level 6, and was supported by interviews with certain students.

Table 1. Instrument part of the mathematical literacy assessment test

The Mathematical Literacy Skill Level	Question Number	Content	Question's Objective
Level 1	1	Quantity	Calculation of an average number of climbers per day for given period of time
	9	Change and Relationships	Calculating the time differences with clear information given
Level 2	3	Quantity	Measuring the height of the stairs with certain information
	6	Change and Relationships	Proving a statement with the information of a formula given
Level 3	2	Change and Relationships	Calculating the longest duration for climber to get back on period of time given
	8	Quantity	Measuring the numbers of car toys that could be made
Level 4	5	Shape and Space	Comparing between two pizzas which

			more profitable in sales
	11	Shape and Space	Measuring the size of multiple shape
Level 5	10	Change and Relationships	Calculating the pace-length
	12	Change and Relationships	Measuring the maximum speed of wind power electricity
Level 6	4	Uncertainty and Data	Measuring the right steps and amounts of weighting
	7	Uncertainty and Data	Measuring the height of Krakatau Mountain

3. RESULTS AND DISCUSSION

1. Mathematical Literacy Skills at Each Level

After given a certain test in the form of questions and interviews, to strengthen the answer of the test, to

determine the level of mathematical literacy skills of the students, as for the results of mathematical literacy achievements of the students at each level can be seen from the graph in the following figure:

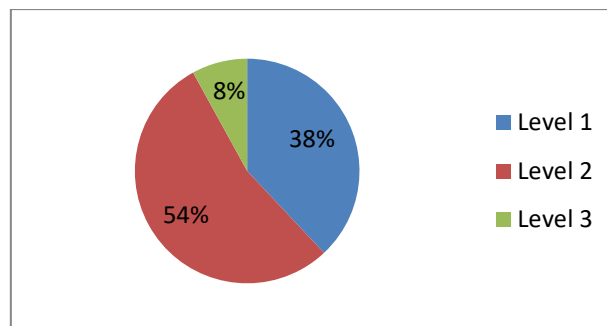


Figure 1. Percentage of Mathematical Literacy Achievements

2. Mathematical Literacy Skills in Each Question

The test about mathematical literacy skills that were given to the students contains the level of mathematical literacy skills, from level 1 to level 6. There were 2 questions given at each level. The results of the student's

achievement on each question can be seen from the graph in figure 2.

Based on figure. 2, it is clear that no students could answer higher level correctly. The students could only get to answer certain question from level 1 to level 3.

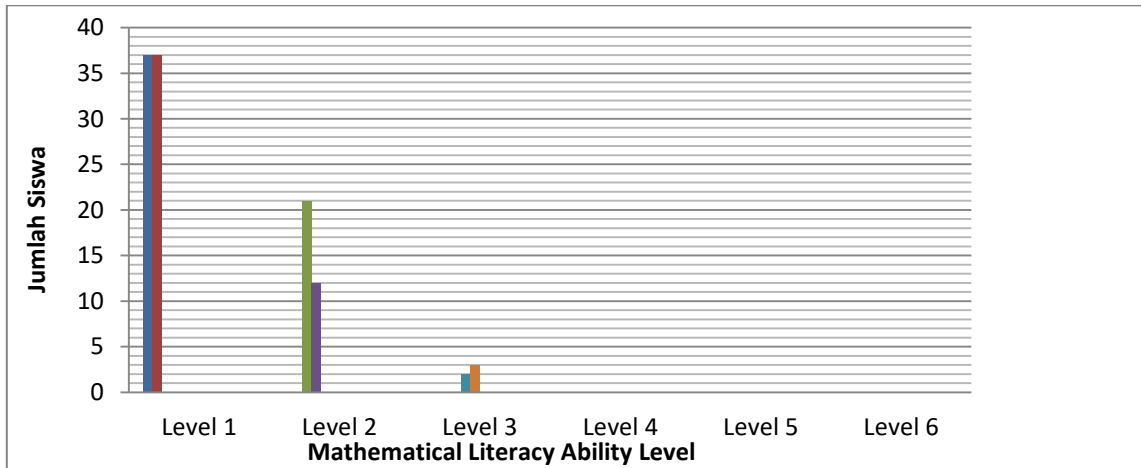


Figure 2. Student's Achievement in Each Question

a. Level 1

The students that could only get to level 1 means that the students could only answered the questions for level 1 and couldn't solve other questions on higher levels (fig.1). According to OECD (2014), for level 1 student activities carried out the ability to identify information in general context which consist of relevant information and the questions have been clearly provided so they can complete the routine procedures by taking actions easily in accordance with the stimulus that have been given.

At level 1, the questions given are about calculating the division number and measuring the world time differences. The students are asked to be able to find the results of the distribution of the average volcano climbers in each year by using the information that has been given such as the number of people who climb and the number of days that can be climbed each year. And also the students are asked to be able to

determine that time in Berlin by using the information about the time differences in the questions.

Based on Figure 1, there were only 14 students that could get into level 1 with a percentage of 38%. After the researcher analyzed each student's answer sheets, the students couldn't solve the questions for level 2 to level 6 correctly. At this level, there were 2 questions given, question number 1 and number 9. Based from their answer sheet, the 14 students could solve those questions correctly using mathematical procedures based on the information provided in the questions. The students have been able to process the answers by operating the division of numbers and calculating the world time differences correctly.

b. Level 2

According to OECD (2014), for level 2 student's activities carried out the ability to interpret and recognize a situation in the context that require to draw a

conclusion and the reason directly by using the basic algorithm or basic rules.

At level 2, the questions given are about calculating the division numbers and calculating the exponential numbers. The students are asked to be able to measure the height of each stairs by dividing the total of heights within the numbers of the stairs. However, the questions also provide the information of the total depth of the stairs, so that, it requires a good interpretation of the problem; it also could lead into the wrong answers. This is the reason why the students are still found an error to the answer.

The students are also asked to be able to prove a statement about the ideal body category by dividing the height and the weight. All the information about the formula and the category are given in the questions. The students are expected to be able to prove a statement by using a formula based on the division between the weight in kilogram and the height in centimeters quadrate. And the students are also expected to write down the reasons obtained from the formula.

At this level, there were 2 questions given, which were number 3 and number 6. For number 3, there were 21 students and only 12 students for number 6 that could get the right answers. So, to find the level attainment among these students, the researcher conducted interviews and retesting the students who had not been able to solve the questions. Then based on the test results and the interviews, there were 20 students with a percentage of 54% that

could answer the questions correctly on level 2 with a correct interpretation and also been able to use a correct procedure from the available information given. After the researcher analyzed the answer sheets, the 20 students were able to answer the level 1 and level 2 questions, so these students could be said to have reached level 2 in mathematical literacy skills.

These level 2 students are able to answer the questions correctly with a known context as well as the information that is available in the questions; able to interpret the information, so they can determine which information to be used, such as dividing the total of the height with the numbers of the stairs. These students are also able to prove the formula given by adding the numbers available in the question to the formula, and divide the weight with the height in centimeters quadrate, so they get the correct answer and are able to write down the reason with the proof.

c. Level 3

According to OECD (2014), level 3 student's activities carried out the ability to choose and implement the problem solving after interpret the information, so that, they can carry out the procedures properly, including the procedures that required decisions in sequence.

At level 3, the questions given are about the material determining the time with the speed information and the distance information that has been provided and calculating the division numbers. The students are asked to be

able to determine the right strategy to answer the questions correctly, because the questions are not provided with a formula for answering the questions correctly. So, the students had to determine a right formula to find the duration needed for climbing the mountain. After getting information about the duration, the students are asked to determine the longest time to start climbing so the climber could get back in time. And also, in this level, the students are asked to find the total of car toys that can be made by calculating the division of numbers.

Based on Figure 1, there were only 3 students that reached level 3 with a percentage of 8%. The researcher analyzed each answer sheets; these 3 students could solve the entire question on level 1 to level 3 correctly. So that can be said that these students have reached level 3 on mathematical literacy skills. At this level, there were 2 questions given which were number 2 and number 8. For number 2 there were 2 students and for number 8 there were 3 students that could answer the questions correctly. So, to determine the achievements level of these students, the researcher conducted interviews and retesting the students who had not been able to solve the questions. Then based on the test results and the interview, all the 3 students were able to draw conclusion directly from sorting out information, determining the right formula to find the time by dividing the distance with the speed, to be included in the conclusion and also being able to give the right reasons and

answers precisely from the results of the settlement. And also the students could choose the right strategy by dividing each of the available car manufacturing materials with the materials needed, so that, the correct answer to the questions was 7 cars total.

d. Level 4

According to OECD (2014), level 4 student's activities carried out the ability to work effectively with models implicit in concrete situations so the students can choose and combine the different representations and then relating it to a real situation.

At level 4, the questions given are the material of flat building. The students are asked to be able to find the formula of circle area (in this case exemplified as pizza) then compare it between two pizzas, which pizzas are more profitable in sales. And also, on the next questions, the students are asked to be able to determine the size of multiple material of flat building which are combine into one (in this case exemplified as a tower).

Based on Figure 1, there were no students that could reach level 4. After the researcher analyzed each of the answer sheets, there were no students could answer the questions correctly. At this level, there were 2 questions given which were question number 5 and 11.

To strengthen this study results about why nobody could solve the question in level 4, so the researcher conducted interviews with 2 students randomly. The following conversations were excerpts

from the interviews results with students S15 and S22:

R : "Why don't you solve the questions number 5 and 11?"

S15: "I couldn't understand the questions Miss, it's very difficult and I don't know the right formula, Miss"

S22: "It's because I am not good at answering this type of questions and I couldn't understand about the questions, Miss."

After hearing their answers, there was no chance to retesting the students because they totally didn't understand about the question in general. So, in conclusion, no student was able to reach and do activities at level 4 of mathematical literacy skills.

e. Level 5

According to OECD (2014), level 5 student's activities carried out the ability to develop and work with models in complex situations, identify the obstacles and clarify the guesses and accurately link the mathematical knowledge and skills with complex situations faced.

At level 5, the questions given are the type of rare questions which are determine the distance between two consecutive backside footprints (pace-length). In these questions, the students are asked to be able to determine the maximum speed of a wind power plant. So, the students on level 5 could use a broader reasoning in identifying the information given and solve the problems.

Based on Figure 1, there were no students that could reach level 5. After the researcher analyzed each of the answer sheets, there were no students could answer the questions correctly. At this level, there were 2 questions given which were question number 10 and 12.

To strengthen this study results about why nobody could solve the question in level 4, so the researcher conducted interviews with 2 students randomly. The following conversations were excerpts from the interviews results with students S13 and S31:

R : "Why don't you solve the questions number 10 and 12?"

S13 : "I never find this type of questions before, so I don't know how to solve the problems, Miss."

S31 : "I couldn't understand the questions, it's very difficult for me, Miss"

After hearing their answers, there was no chance to retesting the students because they totally didn't understand about the question in general. So, in conclusion, no student was able to reach and do activities at level 5 of mathematical literacy skills.

f. Level 6

According to OECD (2014), level 6 student's activities carried out the ability to conceptualize, generalize, and use the information based on findings, interpretations, opinions, and accuracy of thinking and reasoning in mathematics, so that, they can apply their

understanding in depth accompanied by mastering the mathematical operation techniques, developing strategies and communicate appropriately.

At level 6, the questions given require good generalization and conceptualization from the students. The students are asked to be able to find the steps and the right amount of weighting in ways and reasons that are logical and appropriate. And in the next questions, the students are asked to be able to determine the right strategy to measures the height of Krakatau Mountain. The questions in level 6 require extensive reasoning and understanding in determining formulas and processing ways to solve the answers. All the questions given are rarely to be found by the students.

Based on Figure 1, there were no students that could reach level 5. After the researcher analyzed each of the answer sheets, there were no students could answer the questions correctly. At this level, there were 2 questions given which were question number 4 and 7.

To strengthen this study results about why nobody could solve the question in level 6, so the researcher conducted interviews with 2 students randomly. The following conversations were excerpts from the interviews results with students S4 and S25:

- R : "Why don't you solve the questions number 4 and 7?"
S13 : "The questions are too long and I couldn't understand it, Miss"
S31 : "It's because I couldn't

understand these two questions, and it so difficult, Miss"

After hearing their answers, there was no chance to retesting the students because they totally didn't understand about the question in general. So, in conclusion, no student was able to reach and do activities at level 6 of mathematical literacy skills.

4. DISCUSSION

Based on the results above, we find that the mathematics literacy skills of fifth-grade elementary school students in Pekanbaru at the highest level only reached level 3. level 3 in math literacy skills. And this research is also reinforced by Baswedan (Nabilah, 2018) who said that no Indonesian students at PISA have yet reached level 6. Indonesian students at PISA who did not reach level 2 were 76%, the minimum level is outside the low category. achievement and the number of students who reach the highest level of 5 is only 0.3%.

The results of this study are not different from the research conducted by the Department of Basic Education (DoBE, 2011) and Lely, Putra, and Syahrilfuddin (2020) which states that the level of problem solving for elementary school students in grades IV to VI is still at the level of solving problems that are not visible and not routine but not always difficult, understanding and processes are higher levels are often involved, and may

require problem-solving skills to part of the solving process.

In line with this research by Mulyati (2016) which states that the characteristics of elementary school students who are still at the concrete operational stage, namely learning that integrates knowledge, skills, and creative thinking and emphasizes more on experience and active student involvement in problem solving.

The difficulty experienced by almost all students is the ability to understand and reason about the information given in the questions. This is because students rarely encounter problems based on mathematical literacy. Students think that the questions given are very difficult, making it difficult for them to focus and not being careful in completing answers. Students are accustomed to solving questions where the information is clearly given in the questions and using basic formulas. So, it can be said that students still have difficulty analyzing and understanding the questions given.

On the other hand, teacher competence also affects students' mathematical literacy. The opportunity is given by teachers to students to build their own knowledge and link mathematics with problems in everyday life because understanding and the ability to use concepts in life is part of mathematical literacy competencies (Nugroho, 2017). This means that to improve students' mathematical literacy, the teacher needs to provide reinforcement in the form of practicing

math literacy questions so that students' mathematical literacy at high levels of PISA, namely levels 4, 5 and 6 can be achieved.

5. CONCLUSION AND RECOMMENDATION

The results of the data processing showed that most of the subjects had not been able to answer the questions at level IV or above, while for the answered level it was broken down as follows; the mathematical literacy achievement of fifth grade elementary school students that reached level 1 were 38%, in level 2 there were 54%, and in level 3 there were 8%. From these data results, it appears that in general the fifth-grade elementary school students have a very low level in mathematical literacy skills, meaning that the learning technique they have gained so far has not been able to build mathematical literacy skills.

According to this study, the authors recommend that all the students have to change their perspectives about considering mathematics is a difficult subject and should be more pro-active in learning and understanding mathematics in order to improve their mathematical literacy skills. Some sort of learning instructions need to be developed such as learning based on realistic mathematics education (Lestari, Syahrilfuddin, Putra, & Hermita, 2019), or using media in learning mathematics (Winanda, Putra, & Zufriady, 2020).

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