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MATHEMATICAL LITERACY ABILITY OF JUNIOR HIGH SCHOOL STUDENTS BASED ON INTRAPERSONAL INTELLIGENCE

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Abstract

Mathematical literacy is an individual's ability to use mathematical knowledge to solve everyday problems. This study aims to describe the mathematical literacy ability of junior high school students viewed from intrapersonal intelligence. This research is a qualitative descriptive study with the subject of SMP Negeri 2 Jatinegara students. The purposive sampling technique was employed in the sampling process. Intrapersonal intelligence questionnaires, mathematical literacy tests, and interviews were used to collect data. The questionnaire was used to classify high, medium, and low intrapersonal intelligence students. Tests and interviews were used to describe mathematical literacy skills. The results showed that students with high intrapersonal intelligence had mastered 4 indicators of mathematical literacy: identifying aspects of the problem, turning the problem into an appropriate mathematical image, applying mathematical models to find solutions to problems, and interpreting mathematical solutions/results. Students with medium intrapersonal intelligence had mastered 3 indicators of mathematical literacy: identifying aspects of the problem, turning the problem into an appropriate mathematical image, and interpreting the solution/mathematical result. Students with low intrapersonal intelligence had mastered one indicator of mathematical literacy ability: identifying aspects of the problem.

Keywords*: Mathematical Literacy Ability, Intrapersonal Intelligence*

INTRODUCTION

Literacy is often defined as the ability to read and write. However, nowadays, literacy has a comprehensive meaning and contains various meanings. One type of literacy that is no less important and closely related to the ability to solve everyday problems is mathematical literacy. Mathematical literacy is the ability of individuals to use their mathematical knowledge to solve everyday problems (Anwar, 2018: 369). According to the OECD (2019: 75) mathematical literacy is the ability of individuals to formulate, apply and interpret mathematics in different contexts. The formulating process shows students' understanding in recognizing mathematical aspects in the problem and choosing the stage to solve the problem in mathematics. The application process demonstrates the student's ability to calculate and use general concepts and facts to discover solutions. The interpreting process demonstrates students' ability to reflect on solutions in real-world contexts and make reasonable conclusions. Mathematical literacy skills include mathematical reasoning skills and mathematical concepts, procedures, facts and tools to describe, explain, and solve problems in everyday life. This helps individuals recognize mathematics's role in life, make judgments, and make appropriate decisions in various phenomena that occur constructively and reflectively.

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Before PISA introduced mathematical literacy, this term had been coined first by NCTM in the Curriculum and *Evaluation Standards for School Mathematics* in 1989 where mathematical literacy had 4 main components in problem-solving including exploring, connecting, reasoning and using mathematical methods. This component makes solving problems and developing mathematical skills easier (Sari, 2015: 714).

Every individual must have mathematical literacy skills. Because this ability includes other mathematical abilities such as reasoning, communication, problem-solving, connection, and representation skills. This is in line with the opinion of Zahroh et al. (2020: 165) who define mathematical literacy as the ability of individuals who can effectively and efficiently formulate, interpret, reason, interpret, communicate and explain problem-solving in everyday life.

Ojose (2011: 90) defines mathematical literacy as personal knowledge about applying mathematics in everyday life. This means that individuals with good mathematical literacy skills and understanding will have mathematical concepts to solve the problems. Furthermore, Steecey &; Tur ner (Asmara &; Waluya, 2017: 137) literacy in mathematics is the power to use mathematical thinking in solving everyday problems to be better prepared to face life's challenges.

Indicators of mathematical literacy ability used in this study include: a) Identifying mathematical aspects in the problem. b) Convert the problem into an appropriate mathematical form. c) Apply the design of mathematical models to find solutions to problems. d) Interpret the mathematical solutions/results obtained. e) Evaluate mathematical solutions in a real-world context. f) Generalize and communicate the conformity of the results to the problem being solved.

Based on the explanation above, intrapersonal intelligence plays a role in improving students' mathematical literacy skills in current conditions. With good intrapersonal intelligence, students can develop independent abilities and attitudes to find their ways of learning (Maratusyolihat et al, 2021: 236).

METHOD

This research was conducted at SMP Negeri 2 Jatinegara and is qualitative descriptive. The subjects of this study were grade VIII B students with subjects taken using *purposive sampling techniques.* The research object consisted of 6 students with 2 students from high intrapersonal intelligence, 2 from medium intrapersonal intelligence, and 2 from low

intrapersonal intelligence. The sampling considered intrapersonal intelligence questionnaire scores, math literacy ability test results and information from mathematics subject teachers. Data collection techniques used intrapersonal intelligence questionnaires, math literacy ability tests and interviews. Data analysis techniques use Miles and Humberman model analysis techniques, which include data reduction, data presentation and conclusions. This study used a data validity test in the form of a triangulation test. The triangulation test used in this study is a triangulation technique.

RESULTS AND DISCUSSION

Collection of intrapersonal intelligence data through questionnaires, obtained the following results:

Table 1 Intrapersonal Intelligence Categories

Category	Number of Students	Information
High Intrapersonal Intelligence	3	Taken 2 students as research subjects
Moderate intrapersonal intelligence	13	Taken 2 students as research subjects
Low intrapersonal intelligence	4	Taken 2 students as research subjects

In this study, data collection on mathematical literacy skills was carried out with a test consisting of three questions. Each question contains a question that measures an indicator of students' mathematical literacy ability. The following are samples of math literacy ability test results and student interviews.

Question:

Pak Awi plans to create 12 fish ponds for catfish farming. The pool is in the form of blocks made of adobe covered with a tarp with a length of 3.5 m, a width 2.8 m with a depth of 1 m. Then the pools will be filled with water from the reservoir. Each pool must be filled with as much water as $\frac{1}{2}$ part. How much area does Pak Awi need to coat each pond and much water is used entirely? Write down:

a. Things that are known and asked from the above problems.
b. Sketch the fish pond according to the above provisions.

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c. Solve the problem with the right formula.
d. Describe the result obtained from point c.
e. If the reservoir is only able to hold 60,000 liters of water. Can the water in the reservoir meet all the water needs of the pool? Explain.
f. Two pools leaked and the water in them each decreased from the initial $\frac{2}{7}$ part so that the remaining water was 56 m^3 of the total. Is that true? Give the reason

The question contains 6 questions that represent each indicator of mathematical literacy ability. Here are the answers to the questions and interview results from each subject in each category:

High Intrapersonal Intelligence Students

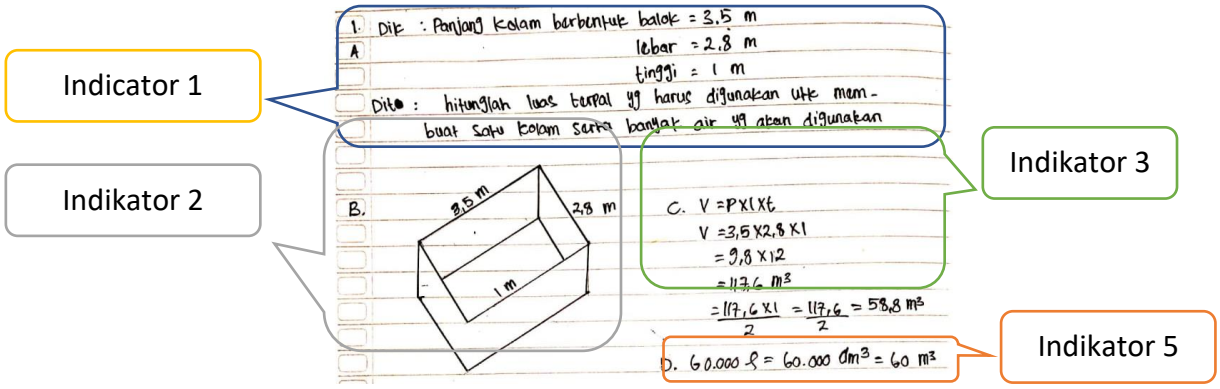

Figure 1. Answer Of Subject with High Intrapersonal Intelligence

Based on the figure above, it is known that in indicator 1: identifying aspects of the problem, the subject has written down the things that are known and asked in the problem. However, the answer is still incomplete because it does not include the part filled with water and the many pools that will be created. In indicator 2, converting the problem into an appropriate mathematical drawing, the subjects sketched a block-shaped fish pond. However, the shape of the beam depicted is not quite right. In indicator 3, the object has written down the concept of beam volume and solved the problem of much water correctly but did not write down the concept of the surface area of the beam without a lid to find the area of the tarpaulin. This suggests that subjects are less able to achieve indicator 3: apply appropriate mathematical models to find solutions to problems. The object does not write down the conclusions of mathematical results obtained from the solution. Shows \that Subject has not mastered indicator 4: interpreting the mathematical solutions/results obtained. In indicator 5: evaluating problem-solving strategies, the object writes down the answer but has not yet completed it. The object

only performs calculations but is not accompanied by an explanation and has not mastered indicator 6: generalize and communicate the suitability of the results with the problem being solved because the subject cannot solve question number 1f.

The interview results also showed that the object could identify aspects of the problem's mathematical problem. The object can name what is known and asked from the problems and can transform the problem into the form of a mathematical image that is appropriate to say the correct form of space. The subject can also apply appropriate mathematical models to find solutions to problems because it can name the formulas used and the steps to solve them. However, there is still a mistake in stating the formula used. The interview showed that the subject could not interpret the solution/results obtained because they did not describe them. The subjects were able to evaluate problem-solving strategies. The subjects also mistakenly answered the questions, and answered question 1e but wrote them 1d and were unable to generalize and communicate the suitability of the results to the problem being solved because they could not explain how to work on questions 1e and 1f.

Moderate Intrapersonal Intelligence Students

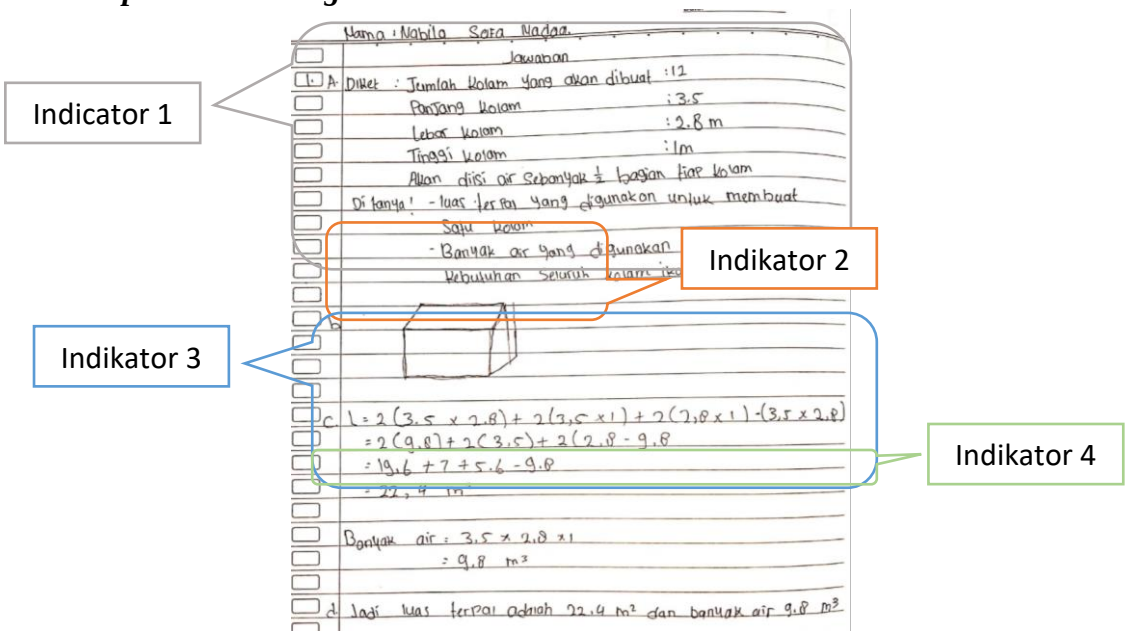

Figure 2. Answer Of Subject of Moderate Intrapersonal Intelligence

Based on Figure 2, the subject was able to master indicator 1: identify mathematical aspects in the problem because they had written down the known and asked questions contained in the problem correctly. The object can master indicator 2: convert the problem into the appropriate mathematical form, it appears that the subject has described it in the form of a block space correctly, but not accompanied by a description of its size. In indicator 3: applying mathematical models to find solutions to problems, subjects lack mastery because they do not

write down mathematical concepts to calculate the area of tarp and much water, but immediately calculate it and the answer is correct. The subject did not master indicator 5: interpreting the mathematical solution/result obtained, it was seen that the subject did not answer question 1e. Likewise, for indicator 6: evaluating problem-solving strategies and indicators generalizing and communicating the suitability of the results to the problem being solved, subjects could not solve problem number 1f.

From the results of the interview it was also proved that the subject were able to identify aspects of mathematical problems in the problem by mentioning things that were known and asked and were able to change the problem into the form of mathematical images that correspond to mentioning and describing the shape of the space formed, namely blocks. Suobject can apply mathematical models to find solutions to problems, confidently name the formulas used to solve problems and can interpret mathematical solutions/results obtained by explaining the results obtained correctly.

Subject with Low Intelligence Intrapersonal

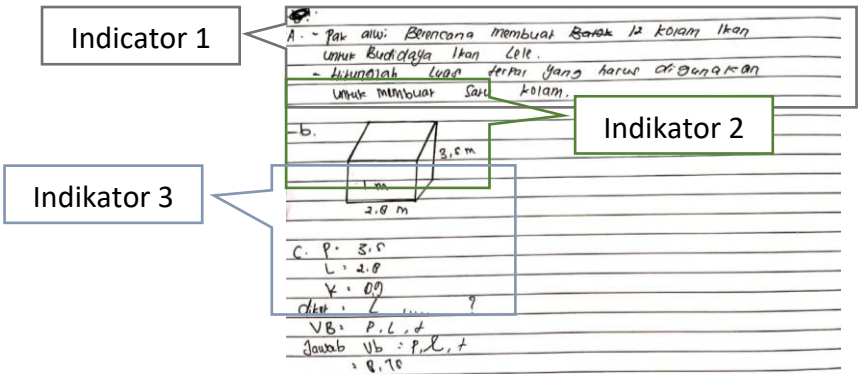

Figure 3. Answer of subject with low interpersonal intelligence

Figure 3 shows that subject lacks mastery of indicator 1: identifying aspects of the mathematical problem. It seems that the subject has written what is known but not complete, they should write down the pool sizes such as length, width, depth and many parts of the water , and the amount of water asked. The object also has not mastered indicator 2: turning the problem into the form of an appropriate mathematical drawing, namely by sketching a fish pond, but not precisely because The scale is not appropriate so that it looks the block-shaped pool. Subject also has not mastered indicator 3: apply appropriate mathematical models to find solutions to problems because he has not created and written the right mathematical concepts write the answer. Subject did not answer questions 1d, 1e and 1f. In other words, subject do not master indicators 3, 4 and 5, namely interpreting the results / mathematical

solutions obtained, evaluating problem-solving strategies, and generalizing and communicating the results' suitability to the problem being solved.

The results show that the subject can identify aspects of mathematical problems and explain what is known and asked but is still incomplete. The object has not been able to transform the problem into the form of a suitable mathematical image as evidenced by answering the shape of the space whose shape is not correct. Subject mentioned building cube space and has not been able to apply appropriate mathematical models to find solutions to problems, and can not explain the mathematical concepts used and the steps to solve it.

Based on the test results and interviews of all research subjects, it was produced:

1. Subjects with High Intrapersonal Intelligence

Subjects with high intrapersonal intelligence mastered 4 indicators of mathematical literacy ability. In indicator 1, subjects can correctly identify aspects of the problem . This shows how the subject solves a problem starting with finding information from the problem. Marfiah & Heni (2020) state that students with high intrapersonal intelligence prefer to interpret understanding by understanding, managing, and controlling themselves. In indicator 2, the subject was able to convert the problem into the form of a mathematical image that fits correctly. The subject can interpret the problem by associating the information obtained with the solved problem. Marfiah & Heni (2020) state that students with high intrapersonal intelligence prefer to interpret understanding by understanding, managing, and controlling themselves. In indicator 3, subjects can apply mathematical models to find solutions to problems. Subjects can use mathematical concepts and solving steps. This shows that students can form an accurate model and use it effectively. According to Rokhima & Harina (2017), subjects with high intrapersonal intelligence can solve problems using their knowledge. In indicator 4 students can interpret the mathematical solutions / results obtained by the results of the work. In this case, subjects with high intrapersonal intelligence tend to involve more thinking and reasoning process skills in concluding. In line with the opinion of Wijayanti &; Huri (2017) who states that the subject's intrapersonal intelligence will increase when able to reason well when solving mathematical problems. Shiva has not mastered indicator 5, evaluating problem-solving strategies. In filling out questionnaires, students with high intrapersonal intelligence feel less initiative in solving new, more complicated problems. The subjects also did not master indicator 6: generalizing and communicating the conformity of the results to the correctly solved problem. This is because subjects with high intrapersonal intelligence have not been able to overcome the difficulties experienced but are always trying

to try new things. This is in accordance with Mahmud & Rezki (2017) that subjects with high intrapersonal intelligence in taking mathematical tests always feel confident and confident with the answers chosen without any more profound analysis of the answers' correctness.

Based on filling out the questionnaire, students with high intrapersonal intelligence like to learn mathematics. Marfiah & Heni (2020) state that students with high intrapersonal intelligence prefer to interpret understanding by understanding, managing, and controlling themselves.

2. Subjects with Moderate Intrapersonal Intelligence

Subjects with intrapersonal intelligence mastered 3 indicators of mathematical literacy ability. In indicator 1, the object can correctly identify aspects of the problem. The subject finds a way to understand the problem by writing down information from what is known and asking about the problem. This relates to the characteristics of intrapersonal intelligence students being able to express opinions regarding the initial information of the problem appropriately. In indicator 2, the object can convert the problem into a mathematical form. The subject can draw the shape of the space in question. It relates to intrapersonal intelligence where the object can interpret the problem by relating the information obtained with the problem being solved. This relates to the characteristics of intrapersonal intelligence objects being able to express and express opinions related to the initial information of the problem through the construction of the space formed. While there is an indicator of 3, the object cannot apply mathematical models to solve problems using appropriate mathematical concepts and correct work steps. This relates to the fact that intrapersonal intelligence is ineffective in understanding mathematical concepts to solve problems. This is to the results of research by Baiduri et al (2021) which states that subjects with intrapersonal intelligence show an ineffective understanding of geometry concepts . In indicator 4 s the object can interpret the mathematical solutions / results obtained from the work. In this case, it is related to students' intrapersonal intelligence which involves the ability of the thought process to conclude. In line with the opinion of Wijayanti & Huri (2017) which states that intrapersonal intelligence will increase when able to reason well when solving mathematical problems. In indicator 5 the object cannot evaluate mathematical solutions in a real-world context.

With regard to intrapersonal intelligence, the object feels less initiative in solving new, more complicated problems. In indicator 6, the object is still tricky in work so it cannot generalize and communicate the suitability of the results with the problem being solved. This

relates to the way the object has not been able to overcome the difficulties experienced and has not tried to try new things.

In filling out the questionnaire, subjects with low intrapersonal intelligence do not like learning mathematics. This is by Marfiah & Heni (2020), which state that students with moderate and low intrapersonal intelligence are intelligent in other types of intelligence and the factors that influence it.

3. *Subject* with Low Intrapersonal Intelligence

Subjects with low intrapersonal intelligence master 2 indicators of mathematical literacy ability. In indicator 1, the object has identified aspects of the problem. This relates to how the object understands the problem and begins by writing down the problem's information. Subjects with low intrapersonal intelligence can write down what is known and ask correctly. Subjects with low intrapersonal intelligence can integrate understanding in their way. This is related to the results of research by Sholikhati et al. (2018) which states that students with low intrapersonal intelligence can reach a level of understanding. In indicator 2, the object has not been able to convert the problem into the form of an appropriate mathematical image, students have not been able to draw the intended space correctly. This relates to the intrapersonal intelligence of the object in interpreting the problem by associating the information obtained with the problem being solved.

Subjects with low intrapersonal intelligence tend not to be able to master the changing stage. This is reinforced by the opinion of Sholikhati et al. (2018) which states that subjects with low intrapersonal intelligence can reach the level of understanding where students can only understand problems. In indicator 3, the object has not been able to apply mathematical models to find solutions to problems, namely has not used appropriate mathematical concepts. This relates to intrapersonal intelligence which has not been effective in understanding the mathematical formulas that must be used to solve problems. This is to the results of research by Baiduri et al. (2021) which states that students with low intrapersonal intelligence show an understanding of geometry concepts that are still under the word relevant. From this opinion it can be seen that objects with low intrapersonal intelligence have not been able to apply, only able to understand problems. In indicator 4, the object cannot interpret the mathematical solutions / results obtained from the work. This is related to intrapersonal intelligence that has not involved the ability of thought and reasoning processes to conclude has been ineffective. According to Wijayanti & Huri (2017), students' intrapersonal intelligence will increase when they can reason well when solving mathematical problems. Indeed, students with low

intrapersonal intelligence have not been able to describe what is obtained from the calculation results. In indicator 5, the subject has not been able to evaluate the problem-solving strategy. This is related to students' lack of initiative in solving new, more complicated problems. In indicator 6, the object has not been able to generalize and communicate the conformity of the results to the problem being solved. This relates to intrapersonal intelligence in overcoming difficulties experienced but has not tried to try new things.

In filling out the questionnaire, subjects with low intrapersonal intelligence do not like learning mathematics. This is by Marfiah & Heni (2020), which state that subjects with moderate and low intrapersonal intelligence are intelligent in other types of intelligence and the factors that influence it.

CONCLUSION

Based on the results of the study, the following conclusions were obtained: (1) subjects with high intrapersonal intelligence, have mastered 4 indicators of mathematical literacy ability, namely identifying aspects of the problem, transforming the problem into the form of appropriate mathematical images, applying mathematical models to find solutions to problems, and being able to interpret the mathematical solutions/results obtained. (2) Subjects with intrapersonal intelligence are mastering 3 indicators of mathematical literacy ability, namely identifying aspects of the problem, transforming the problem into appropriate mathematical images, and interpreting the mathematical solutions / results obtained. (3) Subjects with low intrapersonal intelligence master 1 indicator of mathematical literacy ability: identifying aspects of the problem.

Research on mathematical literacy skills based on intrapersonal intelligence can be followed up by developing teaching materials to facilitate mathematical literacy skills. The teaching materials developed can be focused according to students' level of interpersonal intelligence, by accommodating differentiated learning.

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