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STUDENTS' MATHEMATICAL LITERACY PROCESSES ON PISA-LIKE PROBLEMS WITH THE DOMAIN OF SPACE AND SHAPE

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Abstract

Mathematical literacy is defined as the ability possessed by an individual in formulating, employing, and interpreting mathematics in a variety of contexts. This research aims to describe the mathematical literacy processes of Junior High School students in solving PISA-like problems on space and shape content. The method in this research used qualitative descriptive. The research subject was students of the ninth grade in SMP Negeri 2 Krembung on Sidoarjo, which consisted of twenty-nine students. The instruments used were test and interview. The results showed that the students' mathematical literacy was classified as less for the process of formulating. Some students still find many difficulties, such as difficulty in determining the strategy used in solving the problem as well as errors in calculation and drawing conclusion. The students' mathematical literacy was classified as quite good for the process of employing. Students understand the intent of the problem and know what strategy used, although there were some minor errors in calculation or drawing a conclusion. The students' mathematical literacy was classified as very lacking in the process of interpreting. Students only guess because students were still unable to understand the meaning of the questions and what strategies were used to solve the given problems to answer questions.
Keywords: mathematical literacy, formulating, employing, interpreting, space and shape content

INTRODUCTION

Mathematical literacy is very important in helping to solve everyday problems using mathematical concepts. According to Sari (2015) mathematical literacy is interpreted as the ability to use mathematical knowledge and understanding effectively in facing the challenges of daily life. Meanwhile, according to Stacey & Turner (2015) mathematical literacy is a person's ability to use mathematical thinking in daily problems to be better prepared to face life's challenges. This opinion is in line with the definition of mathematical literacy released by OECD (2019b) that mathematical literacy is an ability possessed by an individual in formulating, employing, and interpreting mathematics in various contexts. This includes mathematical reasoning and using mathematical concepts, procedures, facts and tools to describe, explain and predict the phenomena that occur.

One of the international assessments can be used as a measure to find out educational achievement in Indonesia is the results of PISA studies. PISA (Program for International Student Assessment) is the study of international student assessment programs organized by the Organization for Economic Cooperation and Development (OECD). PISA aims to take into account whether students aged 15 years have understood meaningful knowledge and skill to be able to participate as a public society or a constructive and responsible member of society (Wardhani & Rumiati, 2011). PISA takes into account reading literacy, mathematical literacy, and science literacy.

Wardhani & Rumiati (2011) states that "there are three basic components that can be identified in PISA studies in mathematical literacy namely process, context and content". Content components according to the OECD (2019b), include shape and space, change and relationship, uncertainty and data, and quantity. The process components include formulating, employing, and interpreting. The context component focuses on personal, occupational, societal, and scientific contexts.

Indonesia participates in PISA activities since it was first held under the OECD in 2000, which illustrates the results of achievements obtained as shown in the following Table 1 (OECD, 2019a). Table 1 shows that

Indonesia's achievements in mathematics literacy are lower compared to other countries.

Table 1. Indonesia's Position in PISA Studies

Year of Studies	Indonesia Average	International Average	Indonesia Rankings
2000	367	500	39 of 41
2003	360	500	38 of 40
2006	391	498	50 of 56
2009	371	496	61 of 65
2012	375	494	64 of 65
2015	386	490	63 of 69
2018	379	489	73 of 79

Based on PISA 2018 analysis, the achievement of Indonesian students is still relatively low, with only 28% of students can reach level 2 and above. This is quite far when compared to the OECD average of 76%. Furthermore, the report of the results of the National Examination (UN) junior high school level in 2019 showed that the national exam average for math subjects was only 46.56, the lowest when compared to the other three subjects. Then, when viewed the percentage of students who answered correctly on geometric and measurement material is still relatively low, which is 42.27% (Puspendik, 2019). There is also research conducted by Rahmawati & Mahdiansyah (2014) which shows that the average mathematical literacy in space and shape content was 25.8 which is the lowest average compared to the average mathematical literacy in other content. This is in line with research conducted by Nurutami & Setyawan (2019) where based on content, the domain that achieved the highest score was the change and relationship domain with an average of 47.92, while the space and shape domain was 22.08.

In addition to paying attention to the average acquisition of literacy scores achieved by students, it is also necessary to pay attention to how the process is carried out by students in solving PISA-like math problems. So far there have not been many studies that have examined it, one of which is research conducted by Wijaya et al (2014) which examines the difficulties and location of errors experienced by students in solving context-based PISA math problems. The results of research conducted by Wijaya et al (2014) showed that misapprehension and transformation are the most dominant mistakes made by students in which students make fewer errors in mathematical processing and interpretation of mathematical situations about real-world situations. There is also research conducted by Hasnawati (2016) on students' mathematical literacy skills based on contents, contexts, materials, and processes. The results of research conducted by Hasnawati (2016) show that based on the process, students' mathematical literacy skills in the process of formulating get the highest results with an average score of 43.4. While the ability of mathematical literacy students in the interpretive process got the lowest results with an average score of 19.

Realizing this fact, researcher study to find out how students process solving PISA-like math problems. The focus of this research is on the process component of space and shape content. The researchers choose to focus on these fields because the three process components released by PISA have an important role in achieving the purposes of mathematics learning. Moreover, so far there have not been many studies that have examined mathematical literacy based on the process. For the selection of space and shape content as content to be studied because there are still many Indonesian students who have difficulty working on geometry and measurement material questions where if classified the material is included in the space and shape content. The purpose of this study is to find out more clearly the process of student mathematical literacy in the domain of space and shape.

METHOD

This research was qualitative descriptive research that intend to describe students' mathematical literacy processes in solving PISA-like mathematical problems with domain of space and shape. This research was carried out on students of SMP Negeri 2 Krembung grade IX. The reason for choosing grade IX as research subject was because the PISA studies assessed children aged 15 years old where most Indonesian children sat in grade IX. The selected research subjects were twenty-nine students from grade IX-E. Of the twenty-nine students, two students with the highest test scores were selected to interview. The researchers assume that the students who get the highest score were the students who can solve the problems best compared to other students. In addition, the selection of these two students were also seen from the student's communication skills based on short pre-interviews and recommendations from partner teachers.

In this study, the main instrument were researchers and the supporting instruments used were mathematical literacy skills tests and interview guidelines. The mathematical literacy test used consist of 5 questions developed by researchers by looking at various sources, such as previous year's PISA questions, AKM question collection books, and other relevant sources. After that, this question will be validated by the supervisor and partner teacher before being distributed to the students. Here is an example of a question that will be given to students:

Irrigation

Indonesia is an agrarian country that knows only two seasons, namely the rainy season and the dry season. Indonesia is referred to as an agrarian country because most of its population has jobs in agriculture. For income in agriculture to increase, good irrigation is needed in irrigating rice fields when planting rice or palawija.

In supporting the irrigation sector, the government built a reservoir that holds water so that it can be used when water shortages. The source of irrigation in the community comes from reservoirs, rivers, or wells that are pumped using water suction machines. The strength of the water suction affects the debit of the water emitted. If the water suction machine brand "A" is written debit of 120 liters/minute, it means that in 1 minute the engine can drain water as much as 120 liters.

Pak Budi will irrigate a rice field covering an area of 0.5 hectares. Pak Budi needs 30 liters of water to irrigate the rice fields every 1 square meter. Put a sign (✓) on the box in front of the statement for the correct answers.

☐ The time needed to irrigate Pak Budi's rice fields with machine "A" is 8 hours.

☐ The time needed to irrigate Pak Budi's rice fields with a "B" engine that has a debit of 500 liters/minute is 5 hours.

☐ Machine A takes 10 hours to irrigate 2,400 m^2 of rice fields.

☐ On machine "B" it says a debit of 500 liters/minute is equivalent to a debit of 10 liters/second.

Information: 1 hectare = 10000 m^2

Figure 1. Example of Question That Given to Students

The question could represent the PISA model problem because it not only measures standard technical abilities related to memory and calculations but measures the ability to reason, problem-solving, and argument. In solving this problem, an understanding of the concept of debit is needed. In mathematics learning, this debit concept is included in geometry and measurement materials, where if classified in the content proposed by PISA, it is included in the content of space and shape.

The results of this test will be used to determine the two subjects to be interviewed. Interview are conducted to get more complete information about students' mathematical literacy based on the process. Data collection techniques used in this research were test and interview methods. Data analysis in this research includes data on test and interview results. The test results are corrected using predetermined assessment guidelines. From the test result scores for each student, two students were selected to be interviewed further on how the process students carried out in completing the test was based on the three components of the PISA process. Test and interview results are analyzed in three stages, namely data reduction, data presentation, and drawing conclusions. There are many indicators for each component of the PISA process that students must fulfill. Of the many indicators proposed by the OECD (2019b), researchers selected several indicators that were in accordance with the questions developed and looked at references from several exiting research. The following are indicators of mathematical literacy used in data analysis.

Table 2. Process Component Indicators and Their Indicator Codes

Process Component	Indicator	Indicator Code
Formulate	Identify mathematical aspects of contextual problems and identify variables that matter.	F1
	Represent mathematical situations using the same variables, symbols, and models.	F2
	Recognize mathematical structures (relationships) in contextual problems.	F3
Employ	Think about and implement strategies to find mathematical solutions.	E1
	Apply facts, rules, algorithms, and mathematical structures to find solutions.	E2
	Displays simple calculations.	E3
	Use mathematical equipment, including technology, to help find the right solution.	E4
	Make a simple conclusion.	E5
Interpret	Evaluate mathematical results in a context.	I1
	Interpret mathematical results back into real-world contexts.	I2

RESULTS AND DISCUSSIONS

This research was conducted to find out students' mathematical literacy processes in solving PISA-like math problems in grade IX-E of SMP Negeri 2 Krembung. The results of students' mathematical literacy test scores in solving PISA-like math problems were used to determine which students will be interviewed further. From 29 students of grade IX-E of a public secondary school, two students were selected with the highest scores based on the results of the student's writing test in completing PISA-like math problems. Furthermore, two students were

interviewed to confirm the student way of thinking in formulating, employing mathematical concepts and procedures, and interpreting PISA-like math problems that support the data obtained on the results of the writing test. The two students selected by the researcher to be interviewed were student-S24 and student-S25. The following are presented answers to student-S24 and student-S25 as well as interviews between the researcher with student-S24 and student-S25.

a. Question Number 1

Student-S24

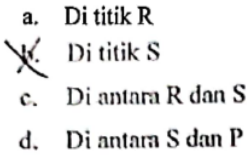


Figure 2. The Answer of S24 to Question Number 1

Answer Translation:

a. At point R
b. At point S
c. Between R and S
d. Between S and P

The following are the results of an interview conducted between the researchers and student-S24 for question number 1.

P : "Try to write down the way or strategy you use to solve the problem!"

S : "Time is taken by the Ferris wheel for one full rotation = 15 minutes. Because in one Ferris wheel there are four points, then the time it takes from one point to another $= \frac{15}{4} = 3{,}75$ minutes. So that after 10 minutes the Ferris wheel rises to the point S."

P : "Did you use a tool such as a calculator or others in solving this problem?"

S : "At first, I did the calculation manually, then when I found the answer, I checked again with a calculator."

Question number 1 was included in the process of employing. Student-S24 was wrong in answering question number 1. From the results of the test and interview presented earlier, it could be seen that student-S24 was able to think about and implement strategies to find mathematical solutions, that is using concept of division. Student-S24 was able to mention facts or things that are known on the question, such as the time takes to make one full rotation and the number of points on Ferris wheel. The next step taken by student-S24 was also correct, dividing 15 by 4, because the Ferris wheel was divided into four points, namely points P, Q, R, and S, and she could answer the results correctly. However, student-S24 errors in concluding calculations that have been made. This error might occur because the student was not careful in doing calculations. In doing questions, student-S24 used technology tools, namely calculators to check the answer. From the analysis, it could be concluded that student-S24 was able to fulfill the E1, E2, E3, and E4 indicators and was not able to fulfill the E5 indicator.

Student-S25

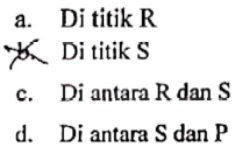


Figure 3. The Answer of S25 to Question Number 1

Answer Translation:

a. At point R
b. **At point S**
c. Between R and S
d. Between S and P

The following are the results of an interview conducted between researchers and student-S25 for question number 1.

P : "Try to write down the way or strategy you use to solve the problem!"

S : "1 full rotation = 40 minutes. Because what is asked for the position after ½ hour and ½ = 30 minutes, then $\frac{30}{40} \times 1$ lap = ¾ lap." The Ferris wheel rotates clockwise, so Raisa's last position is at Point S."

P : "Did you use a tool such as a calculator or others in solving this problem?"

S : "Yes, to check the answer."

Student-S25 was wrong in answering question number 1. From the results of test and interview presented earlier, it could be seen that student-S25 was able to think about and implement strategies to find mathematical solutions, that is using concept of division, but student-S25 was not able to mention facts or things that are known on the problem correctly, resulting in miscalculation and conclusions. This might occur because student-S25 misunderstood the problem and facts that are known in the problem so that the next step of completion will be wrong too. In doing questions, student-S25 used technology tools, namely calculators. From the

analysis, it could be concluded that student-S25 was able to fulfill the E1, E3, and E4 indicators and was not able to fulfill the E2 and E5 indicators.

b. Question Number 2

Student-S24

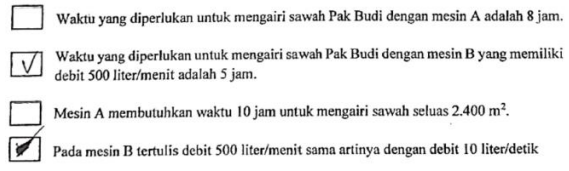


Figure 4. The Answer of S24 to Question Number 2

Answer Translation:

1. The time takes to irrigate Mr. Budi's rice field with machine A is 8 hours
2. **The time needed to irrigate Mr. Budi's rice field with machine B which has a flow rate of 500 liters/minute is 5 hours**
3. Machine A takes 10 hours to irrigate an area of 2400 m^2
4. On machine B it is written that the debit of 500 liters/minute is the same as the debit of 10 liters/second

The following are the results of an interview conducted between the researchers and student-S24 for question number 2.

P : "Try to write down the way or strategy you use to solve the problem!"
S : "I just guessed the answer."
P : "What is your reason for choosing that answer?"
S : "Because I think that answer is the most reasonable."
P : "Which part makes sense to you?"
S : "If you look at the area of the rice fields, it's 5000 m^2 so it takes 150000 liters of water to irrigate the entire rice fields, it is known that the debit is 500 liters/minute so I try to calculate using a calculator the possible result is 5 hours."
P : "What about the other statements, isn't anything true anymore?"
S : "In my opinion, only the second statement is correct."
P : "Why do you say that?"
S : "Because I found that the second statement is true so I'm not looking for the truth of the next statement. I assume that in one question there must be only one correct answer."
P : "Did you use a tool such as a calculator or others in solving this problem?"
S : "Yes"

Question number 2 was included in the process of employing. On question number 2, student-S24 only mention one true statement. From the results of the test and interview presented earlier, it could be seen that student-S24 was able to think about and implement strategies to find mathematical solutions for the second statement, that is using water debit formula. Student-S24 was able to mention facts or things that are known on the question, such as area of the rice fields, debit from machine B, and the time takes to irrigate the rice fields, but she was not able to display simple calculations because there is a possibility of student directly calculating using a calculator. For the third statement, student-S24 could not answer correctly because the student felt that she has found the right answer so she did not try whether there is another correct answer or not, even though in this case there were two correct answers. This is because student-S24 was not used to encountering multiple-choice questions that have more than one correct answer (complex multiple-choice questions). From the analysis, it could be concluded that student-S24 was able to fulfill the E1, E2, E4, and E5 indicators and was not able to fulfill the E3 indicator.

Student-S25

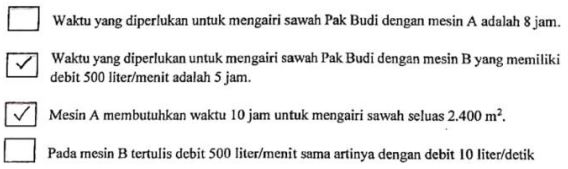


Figure 5. The Answer of S25 to Question Number 2

Answer Translation:

1. The time takes to irrigate Mr. Budi's rice field with machine A is 8 hours
2. **The time needed to irrigate Mr. Budi's rice field with machine B which has a flow rate of 500 liters/minute is 5 hours**
3. **Machine A takes 10 hours to irrigate an area of 2400 m^2**
4. On machine B it is written that the debit of 500 liters/minute is the same as the debit of 10 liters/second

The following are the results of an interview conducted between the researchers and student-S25 for question number 2.

P : "Try to write down the way or strategy you use to solve the problem!"
S : "For question number 2, I just guessed the

answer."

P : "What is your reason for choosing that answer?"

S : "Because when I try to calculate using the debit formula with the help of a calculator the closest answer to the result, I get is the answer to the second and third statements."

P : "Did you use a tool such as a calculator or others in solving this problem?"

S : "Yes, in doing calculations using a calculator."

On question number 2, student-S25 could mention all the true statements. From the results of the test and interview presented earlier, it could be seen that student-S25 was able to think about and implement strategies to find mathematical solutions and mention the ways used to find solutions, that is using debit formula, so that the conclusion drawn was also correct. This correct conclusion consists of two conclusions, namely the second statement and the third statement. However, students could not display simple calculations in finding the answer, because she immediately calculates with a calculator. From the analysis, it could be concluded that student-S25 was able to fulfill the E1, E2, E4, and E5 indicators and was not able to fulfill the E3 indicator.

c. Question Number 3

Student-S24

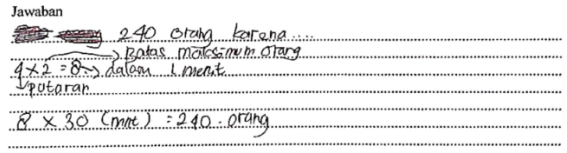


Figure 6. The Answer of S24 to Question Number 3

Answer Translation:
240 people because:
4 (round) × 2 (limitation of maximum person) = 8 person → in 1 minute
8 × 30 minutes = 240 people

The following are the results of an interview conducted between the researchers and student-S24 for question number 3.

P : "Try to mention what important information is known about the problem!"

S : "The door rotates 4 times in 1 minute. 1 turn accommodates a maximum of 2 people."

P : "What way or formula do you think is used to solve the problem?"

S : "Use multiplication."

P : "Why do you use this way or formula?"

S : "Because if we look at the problem, the method used must use multiplication as I have written on the answer sheet."

Question number 3 was included in the formulating process. Student-S24 was wrong in answering question number 3. From the results of previous test, it could be seen that student-S24 was able to present mathematical situations using appropriate variables, symbols, and models and recognize mathematical structures (relationships) in contextual problems. However, student-S24 was not able to identify mathematical aspects of contextual problems and identify important variables because there are few errors in understanding the information contained the problem, causing errors in calculations. This is because the possibility of student-S24 being wrong in absorbing information on the question where she wrote the maximum person who could enter the door was 2, even though that is maximum person on 1 wing of the door and the door has 3 wings. From the analysis, it could be concluded that student-S24 was able to fulfill F2 and F3 indicators and was not able to fulfill F1 indicator.

Student-S25

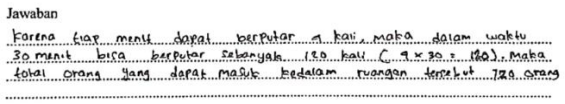


Figure 7. The Answer of S25 to Question Number 3

Answer Translation:
Because every minute it can rotate 4 times, then in 30 minutes it can rotate 120 times ($4 \times 30 = 120$), so the total people who can enter are 720 people.

The following are the results of an interview conducted between the researchers and student-S25 for question number 3.

P : "Try to mention what important information is known about the problem!"

S : "The door rotates 4 times in 1 minute. In one turn each door wing can accommodate a maximum of 2 people."

P : "What way or formula do you think is used to solve the problem?"

S : "Use multiplication."

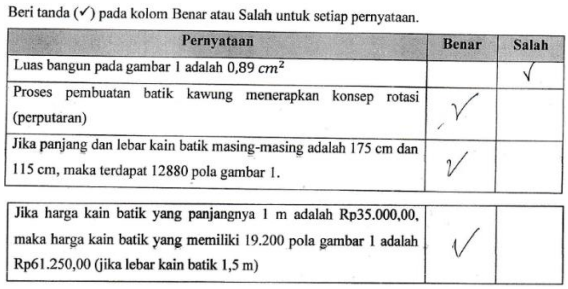
P : "Why do you use this way or formula?"

S : "Because based on what is known and asked in the question, then this method is the most appropriate method used to solve problem number 3."

Student-S25 was correct in answering question number 3. From the test results, it could be seen that student-S25 was able to identify mathematical aspects of contextual problems and identify important variables. Student-S25 was able to present mathematical situations using appropriate variables, symbols, and models and could recognize mathematical structures (relationships) in contextual problems. This is possible because student-S25 could understand the question given and could short out important information from the question. In addition, it is possible that student-S25 were very careful in answering question number 3 so that there are no errors in calculations. From the analysis, it could be concluded that student-S25 was able to fulfill F1, F2, and F3 indicators.

d. Question Number 4

Student-S24



Beri tanda (✓) pada kolom Benar atau Salah untuk setiap pernyataan.

Pernyataan	Benar	Salah
Luas bangun pada gambar 1 adalah 0,89 cm^2		✓
Proses pembuatan batik kawung menerapkan konsep rotasi (perputaran)	✓	
Jika panjang dan lebar kain batik masing-masing adalah 175 cm dan 115 cm, maka terdapat 12880 pola gambar 1.	✓	
Jika harga kain batik yang panjangnya 1 m adalah Rp35.000,00, maka harga kain batik yang memiliki 19.200 pola gambar 1 adalah Rp61.250,00 (jika lebar kain batik 1,5 m)	✓	

Figure 8. The Answer of S24 to Question Number 4

Answer Translation:

1. The area of the shape in figure 1 is 0.89 cm^2. **(FALSE)**
2. The process of making Batik Kawung applies the concept of rotation. **(TRUE)**
3. If the length and width of the Batik cloth are 175 cm and 115 cm, then there are 12880 images of figure 1. **(TRUE)**
4. If the price of Batik cloth with a length of 1 m is Rp35.000,00, then the price of Batik cloth which has 19200 images of figure 1 is Rp61.250,00 (if the width of Batik cloth is 1.5 m). **(TRUE)**

The following are the results of an interview conducted between the researchers and student-S24 for question number 4.

P : "Why do you say that the first statement is false? How do you conclude that the statement is false?"

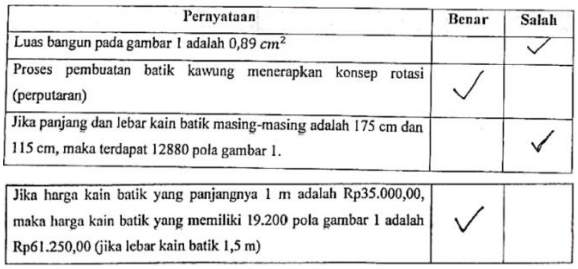
S : "For the first statement, the formula is 2 × the area of the potsherd, then when I calculate the answer is not 0.89 cm^2, so the first statement is wrong."

P : "Why do you say that the second statement is true? How do you conclude that the statement is true?"

S : "The second, third, and fourth statements are just guessing because I find it difficult to do it. Most importantly the answer is not empty."

Question number 4 was included in the interpreting process. On question number 4, student-S24 could answer one statement correctly, that is the third statement. From the test and interview results presented earlier, it could be seen that student-S24 was not able to evaluate mathematical results in a context and interpret mathematical results back into the world context. Indeed, students could explain the way or strategy they used to work out the first statement correctly, namely using the broad concept of a circle even though the results obtained were wrong, overall students were still unable to fulfill the two indicators mentioned earlier. This is because in answering questions, student-S24 only guess according to their instincts. From the analysis, it could be concluded that student-S24 was not able to fulfill the I1 and I2 indicators.

Student-S25



Pernyataan	Benar	Salah
Luas bangun pada gambar 1 adalah 0,89 cm^2		✓
Proses pembuatan batik kawung menerapkan konsep rotasi (perputaran)	✓	
Jika panjang dan lebar kain batik masing-masing adalah 175 cm dan 115 cm, maka terdapat 12880 pola gambar 1.		✓
Jika harga kain batik yang panjangnya 1 m adalah Rp35.000,00, maka harga kain batik yang memiliki 19.200 pola gambar 1 adalah Rp61.250,00 (jika lebar kain batik 1,5 m)	✓	

Figure 9. The Answer of S25 to Question Number 4

Answer Translation:

1. The area of the shape in figure 1 is 0.89 cm^2. **(FALSE)**
2. The process of making Batik Kawung applies the concept of rotation. **(TRUE)**
3. If the length and width of the Batik cloth are 175 cm and 115 cm, then there are 12880 images of figure 1. **(FALSE)**
4. If the price of Batik cloth with a length of 1 m is Rp35.000,00, then the price of Batik cloth which has 19200 images of figure 1 is Rp61.250,00 (if the width of Batik cloth is 1.5 m). **(TRUE)**

The following are the results of an interview conducted between the researchers and student-S25 for question number 4.

P : "Why do you say that the first statement is false? How do you conclude that the statement is false?"
S : "From the first to the fourth statement, I'm just guessing."
P : "What is your reason for choosing that answer?"
S : "There is no special reason, because I have difficulty working on the question, so instead of being empty, I just answer it."

On question number 4, student-S25 could not answer all statements correctly. From the test and interview results presented earlier, it could be seen that student-S25 was not able to evaluate mathematical results in a context and interpret mathematical results back into the world context. This is because in answering questions, student-S25 only guesses. From the analysis, it could be concluded that student-S25 was not able to fulfill the I1 and I2 indicators.

e. Question Number 5

Student-S24

No answer

The following are the results of an interview conducted between the researchers and student-S24 for question number 5.

P : "Why don't you answer the question?"
S : "I'm confused about what method should I do."
P : "Where do you feel confused?"
S : "I have a hard time understanding the question because there are a lot of readings."

Question number 5 was included in the process of formulating. On question number 5, student-S24 could not answer questions or explain the ways or strategies she used in doing the problem. This probably because student-S24 could not understand the question given. In addition, it is possible that student-S24 also run out time so she did not have time to answer question number 5. From the analysis, it could be concluded that student-S24 was not able to fulfill F1, F2, and F3 indicators.

Student-S25

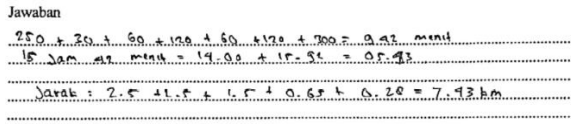

Jawaban

Figure 10. The Answer of S25 to Question Number 5

Answer Translation:

$250 + 30 + 60 + 120 + 60 + 120 + 300 = 942$ minutes $= 15$ hours 42 minutes

15 hours 42 minutes $=$ 14.00 WIB $+$ 15 hours 42 minutes $=$ 05.42 WIB

Distance $= 2.5 + 2.5 + 1.5 + 0.65 + 0.28 = 7.43$ km

The following are the results of an interview conducted between researchers and student-S25 for question number 5.

P : "Try to mention what important information is known about the problem!"
S : "Travel time and climbing speed from one post to another."
P : "What way or formula do you think is used to solve the problem?"
S : "Just add what is already known in the question."
P : "Why do you use this way or formula?"
S : "Because the travel time is already known in the question, for the first question I added up all the travel times."
P : "How about the second question?"
S : "For the second question, I am confused about finding the distance if we know the climbing speed, what formula do we use, so I use the same method as the first question, which is to add up all the climbing speeds."

On question number 5, student-25 could answer both questions even if there are still wrong answers. For the first question, the student's answer was almost correct because the approach or way that student used to find a solution was correct, but there is one piece of information from the problem that missed so this affects the answers obtained by student. From the test and interview results presented earlier, it could be seen that student-S25 was able to identify mathematical aspects of contextual problems and identify important variables. However, student-S25 was not able to present mathematical situations using appropriate variables, symbols, and models and unable to recognize mathematical structures (relationships) in contextual problems. This could be seen from the way student answer the second question, which only adds all known numbers, even though the numbers were a value at speed not distance, so it should be necessary to find the distance of each post first and then add the distance of each post that has been found. This is probably because

student-S25 was not able to sort out important information on the question properly. In addition, student-S25 was also less careful in working on question, possibly because she run out of time. From the analysis, it could be concluded that student-S25 was able to fulfill F1 indicator and was not able to fulfill F2 and F3 indicators.

From the results of test and interview that have been presented before, data was obtained from the results of students' way of thinking in formulating, employing mathematical concepts and procedures, and interpreting PISA-like math problems for each indicator on the questions presented in the following table.

Table 3. Student Way of Thinking Results for Each PISA Process Indicator

Subject Code	Question Number	Indicator Code									
		F 1	**F 2**	**F 3**	**E 1**	**E 2**	**E 3**	**E 4**	**E 5**	**I 1**	**I 2**
S24	1				✓	✓	✓	✓	×		
	2				✓	✓	×	✓	✓		
	3	×	✓	✓							
	4									×	×
	5	×	×	×							
S25	1				✓	×	✓	✓	×		
	2				✓	✓	×	✓	✓		
	3	✓	✓	✓							
	4									×	×
	5	✓	×	×							

Based on table 3 above obtained data on the results of students' way of thinking on each component of the PISA process, namely formulating, employing, and interpreting. From these results could be concluded about the ability of mathematical literacy for each student as follows.

Table 4. Description of Student Mathematical Literacy

Subject Code	Description of Student Math Literacy Skills
S24	Student can employ
S25	Student can formulate and employ

This could be seen from the results of tests and interviews of two subjects, one subject was able in the process of formulating and employing and the other subject was only able in the process of employing. No single subject is capable in the process of interpreting.

The results of the analysis conducted upon the results of the mathematical literacy test in solving PISA-like questions and interview at number 1 and number 2 show that students' mathematical literacy in the process of employing could be categorized quite good because students was able to fulfill most of the existing indicators. There were five indicators in the process of employing among others: (1) think about and implement strategies to find mathematical solutions; (2) apply facts, rules, algorithms, and mathematical structures to find solutions; (3) display simple calculations; (4) use mathematical equipment, including technology, to help find the right solution; and (5) make simple conclusions. In question number 1, student-S24 could fulfill four out of five indicators, which are indicators one to four. While student-S25 could fulfill three of the five indicators, which are indicators one, three, and four. In question number 2, both student-S24 and student-S25 could fulfill four out of the five indicators, which are indicators one, two, four, and five. These results were in line with research conducted by Rusmining (2019) which shows that problems related to the process of employing are the easiest problems and get the highest score when compared to other process-related problems.

The results of the analysis conducted upon the results of the mathematical literacy test in solving PISA-like questions and interview at number 3 and number 5 showed that the students' mathematical literacy in the process of formulating could be categorized as less, because students could only fulfill three of the existing indicators. There were three indicators in the process of formulating among others: (1) identify mathematical aspects of contextual problems and identify important variables; (2) represent mathematical situations using appropriate variables, symbols, and models; and (3) recognize mathematical structures (relationships) in contextual problems. In question number 3, student-S24 could fulfill two of the three indicators, which are indicators one and three, while student-S25 could fulfill all three indicators. In question number 5, student-S24 was not able to fulfill the three indicators, while student-S25 was only able to fulfill one of the three indicators. These results were in line with research conducted by Hendroanto *et al* (2018) which showed that problems related to the formulating process are problems that are difficult for students to understand and solve. In addition, research conducted by Hayati & Kamid (2019) also showed that students have difficulty in the process of formulating real problems into mathematical models.

The results of the analysis conducted upon the results of the mathematical literacy test in solving PISA-like questions and interview at number 4 showed that the students' mathematics literacy in the process of interpreting could be categorized as very lacking because students could not fulfill the existing indicators. There were two indicators in the process of interpreting, among others: (1) evaluate mathematical results in a context; and (2) interpret mathematical results back into real-world contexts. In question number 4, both student-S24 and

student-S25 were not able to fulfill both existing indicators. This result was supported by research conducted by Hasnawati (2016) which showed that mathematical literacy in the interpreting process gets an average score of 19 which is relatively low. In addition, research conducted by Hayati & Kamid (2019) also showed that students have difficulty evaluating the truth of mathematical solutions in real-world contexts.

From the analysis of the five questions, it could be concluded that the mathematical literacy processes of students in grade IX-E of SMP Negeri 2 Krembung could be said as low. The results obtained were in line with PISA Indonesia's results in 2018 where the average math literacy score obtained by Indonesian students was still far below the average international mathematics literacy score. This results were also supported by research conducted by Utami *et al* (2020) also showed that of the thirty students taken for the sample, sixteen students could not fulfill the three components of the PISA process, namely formulating, employing, and interpreting.

Low mathematical literacy is influenced by many factors, including the lack of familiarity of students in facing problems in everyday life that require mathematics as a solution (Rahmilah, 2016). In addition, students were also not used to doing questions such as questions number two and number four, where question number two include to a complex multiple-choice question type that has more than one correct answer and question number four include to a type of completely false question that require students to evaluate each statement or answer option given to find out the truth of the statement or answer option.

CLOSING

Conclusions

Based on the results of previous research and discussions students' mathematical literacy in solving PISA-like math problems in grade IX-E of SMP Negeri 2 Krembung in the process of formulating is less. This can be seen from the results of test and interview analysis on students' mathematical literacy in the process of formulating, in which students can understand the meaning of the problem and what strategy is used to solve problem number 3, although in the calculation still found errors that cause errors in the conclusion. However, this does not apply to question number 5, where students are still unable to understand the meaning of the question and what strategies are used in solving the problem. This can be seen in one of the students who did not answer the question and another student whose answer is still not correct. From the two students interviewed, only one student was able to fulfill the process of formulating.

Students' mathematical literacy in solving PISA-like math problems in grade IX-E of SMP Negeri 2 Krembung in the process of employing is quite good. This can be seen from the results of test and interview analysis on students' mathematical literacy in the process of employing, in which students have been able to understand the meaning of what questions and strategies are used to solve the given problems, it's just that there are mistakes in doing the problem, such as mistakes in writing known information, miscalculations, or errors in drawing conclusion. From the two students interviewed, both were able to fulfill the process of employing.

Students' mathematical literacy in solving PISA-like math problems in grade IX-E of SMP Negeri 2 Krembung in the process of interpreting is very lacking. This can be seen from the results of test and interview analysis on students' mathematical literacy in the interpreting process, in which students are still unable to understand the meaning of the questions and what strategies are used to solve the given problems so that in answering questions, they just guess. From the two students interviewed, neither was able to fulfill the interpreting process.

Suggestions

Researchers hope that teachers will provide and train students in doing PISA-like math problems so that students' mathematical literacy increase. This ability needs to be possessed and improved for students to be able to apply the mathematics they have mastered to solve all problems that occur in their lives and help build a smart and responsive society. For other researchers, it can be used as suggestion to develop or design other PISA-like mathematical problems.

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