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Mathematical Literacy of Junior High School Students with Sociocultural Context In terms of Student's Learning Style

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ABSTRACT

The mathematical literacy of Indonesian school children is comparatively low. The capacity to comprehend, reason, create, recognize, and compute to solve any mathematical problem about real-life problems is known as mathematical literacy. Students' learning styles also influence their achievement of mathematical literacy. Learning style is each individual's method of receiving and understanding all the information they get. One aspect that influences students' mathematical literacy is the learning style aspect. This research goal is to find out how junior high school students' mathematical literacy relates to the sociocultural context in terms of learning styles. This research uses a qualitative method with a descriptive approach. This research involved three students in 8th grade at SMP Negeri 1 Perak with different learning styles and equal mathematical abilities as subjects. The results of this research indicate that student's learning styles influence students' mathematical literacy processes. The mathematical literacy of students with an auditory learning style is better than that of students with a visual and kinesthetic learning style. Students' mathematical literacy has not been achieved using existing indicators.

Keywords: Learning style, Literacy, Mathematical, Sociocultural

INTRODUCTION

The mathematical literacy of Indonesian school children is comparatively low. The performance of Indonesian students from 2000 to 2022 was less than satisfactory based on PISA survey data (Zulkardi & Putri, 2020). The PISA 2003 test yielded the lowest average score for Indonesian students, 360; the PISA 2006 test yielded the highest average score for Indonesian students, 391; and the PISA 2018 exam yielded the lowest average score for Indonesian students, 379 (OECD, 2019a). Indonesia could only rank 42nd out of 79 countries that took the 2018 PISA test and 33rd out of 37 OECD countries. The mathematics PISA results 2018 indicate that Indonesian students' average scores fluctuate. The results of Indonesian students taking the PISA 2022 test mean that Indonesia's mathematical literacy has increased by five positions compared to PISA 2018 (OECD, 2022). Even though Indonesia's ranking has increased, Indonesia's PISA score has decreased. Indonesia was categorized as low compared to the decline that occurred in other countries (OECD, 2022).

To be proficient in reading, writing, and speaking about mathematics, pupils must

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possess mathematical literacy (Nurwahid & Ashar, 2022). Because literacy can influence a person's thinking in making decisions, responding to the environment, and fostering a critical culture that gives birth to an intelligent and competitive society, having strong literacy skills has a significant impact on learning a variety of information related to competence in living (Masfufah & Afriansyah, 2021). Individual skills to interpret, use, and formulate mathematical problems are mathematical literacy (Tarim & Tarku, 2022). Mathematical literacy is an individual's ability to interpret, apply, and formulate mathematical problems that contain the context of everyday life (Kusuma et al., 2021). Mathematical literacy contains mathematical concepts, mathematical procedures, mathematical reasoning, and mathematical facts used to predict and explain related phenomena that emphasize process, content, and context competencies (Retnawati & Wulandari, 2019). From these definitions, mathematical literacy is the capacity to comprehend, reason, create, recognize, and compute to solve more than just mathematical problems, known as real-life problems.

In achieving good mathematical literacy, many things are needed in learning, such as the content and context of problems, assignments, and tests. Students' mathematical literacy in the context of change and relationships, uncertainty, and data is higher than in the content of quantity, space, and shape, both based on class and school level, which is caused by many factors (Retnawati & Wulandari, 2019). Mathematical content is an object's properties, position, and visual information represented by the actual shape of an object (OECD, 2022). Research shows that the mathematical literacy of junior high school students who are given tests with PISA-equivalent questions containing space and shape content are less able to solve mathematical problems with real contexts (Pereira et al., 2022). Test instruments with questions containing space and shape are needed to see the extent of students' mathematical literacy. Apart from content, context is needed to develop mathematical literacy skills to help students solve mathematical problems. Emphasis on context issues, especially sociocultural context, is very closely related to facilitating students' literacy skills in learning, which is essential to be linked to the questions in math tests (Susanta et al., 2022). Everything humans create and do with all their thoughts and conscience in social life through their social ways is called social culture (Yanuarita & Haryati, 2021). From this definition, social culture is everything in social life that is reciprocal and characteristic of that society. In this research, the sociocultural context was chosen so that students could learn more or less about Indonesian culture amidst the increasing number of foreign cultures entering Indonesia. Contextualizing test items with elements from the student's surroundings, culture, history, and familiar material can influence student competency (Susanta et al., 2023).

Students' learning styles also influence mathematical literacy. This is because if students have not mastered the concept, students will have difficulty understanding the questions due to various factors (Vebrian et al., 2021). Learning style can be one of these factors because the way students learn does not match their learning style when studying concepts. Learning style is a characteristic of choosing appropriate learning methods, techniques, and strategies (Cimermanová, 2018). Learning style is the method used to receive, absorb, process, and respond to incoming information (Bire et al., 2014). Learning styles can minimize student failure in learning. Learning styles consist of three types, namely auditory learning style, kinesthetic learning style, and visual learning style. If the student's learning style is known, the teacher can direct the student to learn in a way that suits their learning style. In this way, it is easier for students to learn and increases students' mathematical literacy.

The mathematical literacy duty of number patterns in the Bengkulu context for junior

high school students has been the subject of prior study; however, the use of context in this task is limited to the Bengkulu context and is concentrated on creating questions to supplement instructional materials (Susanta et al., 2023). Research is needed in various mathematical literacy contexts so students can become accustomed to solving many problems (Retnawati & Wulandari, 2019). This research aims to describe the mathematical literacy of junior high school students in the sociocultural context regarding students' learning styles. This research was also conducted to produce descriptions and findings associated with mathematical literacy.

METHOD

The research design is qualitative descriptive research that describes students' mathematical literacy based on the sociocultural context in terms of their learning styles. Research data was obtained according to the results of a mathematical literacy test given to grade 8 junior high school students. This research involved three students as research subjects who had different learning styles with equal mathematical abilities. The three subjects were chosen based on the results of a questionnaire regarding students' learning styles. This research uses a mathematical literacy test containing space, shape content, and sociocultural context. The expert assessment validates the mathematical literacy test instrument. Experts must validate three mathematical literacy questions and a questionnaire related to learning styles. The question of mathematical literacy are

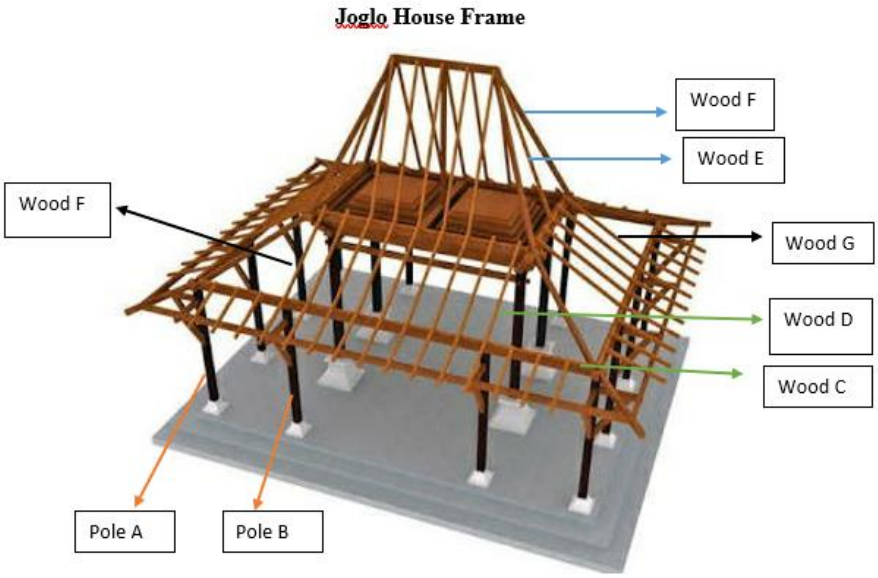


Figure 1. The Information from One Number to the Third Number

The information is that Joglo is a traditional house of the East Javanese people. This building was built with teak wood as the primary material. The Joglo house has four main pillars, known as "saka guru," with a height of around 300-350 cm. Joglo has 12 other supporting poles with a height ranging from 200-250 cm. The Joglo traditional house consists of several rooms. Generally, it consists of a pavilion as a place to receive guests, a *paringgitan* which is a link between the pavilion in front of the main house, an *omah* which is used as a residence, *dalem agung*, a *senthong* which is used to store valuables, a *gandhok* which is used as a place to cook and also a bathroom.

From that information, please answer this question

Question number 1

Mr. Somat is the craftsman trusted to build Mr. Mamat's Joglo house. Mr Somat thinks that the location of the wood and the poles he installed are in the table below. Determine whether Mr Somat's opinion is right or wrong by ticking √ in the appropriate column!

Statement	Answer		Reason
	True	False	
The pole A and the pole B are parallel.			
Wood C and Wood D intersect with each other.			
The wood E and the wood F are located next to each other.			
The wood G and the wood H are positioned opposite each other.			

Question number 2

Mr Mamat wants to build a house with two grand palaces. If the land available for the palace is only 6m × 4m, Mr. Mamat wants to make one grand palace bigger than the second grand palace with a ratio of only 2:3. What is the smallest area of Dalem Agung?

Question number 3

The size of the Joglos built by the people of East Java varies greatly. Mr Mamat will build a Joglo house. To make Joglo poles, what is the minimum length of wood that Mr Mamat needs?

Research subjects were given a questionnaire regarding student learning styles, and then students were given a mathematical literacy test containing space and shape content as well as sociocultural context. From the test results, an analysis was carried out on how junior high school students' mathematical literacy was viewed from their learning styles based on indicators of achieving mathematical literacy competency. This research aims to analyze the mathematics literacy process of junior high school students in the sociocultural context in terms of students' learning styles.

Table 1. Indicators of Mathematical Ability (OECD, 2019b)

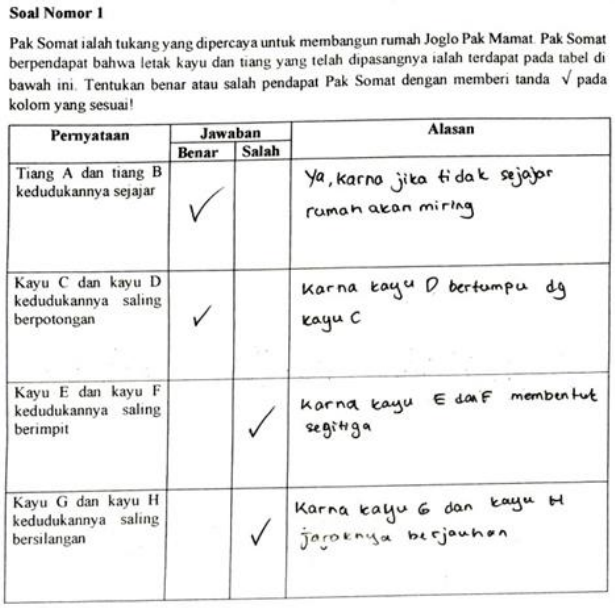
Competency of Mathematical Literacy	Achievement Indicators
Interpretation	Represents problems, communicates, provides mathematical arguments, uses language, corrects mathematical symbolic operations, and devises strategies for problem-solving.
Formulating	Mathematizing the problem
Applying	Calculating problems to find solutions by applying strategy and reasoning

RESULT AND DISCUSSION

Result

Subject 1 with An Auditory Learning Style In Interpreting Mathematical Problems

Mathematical problems are interpreted using questions that show a table related to the position of two lines. The problem is that the subject must choose whether each statement is true or false, accompanied by reasons. The work process by Subject 1 is shown in Figure 2.



Soal Nomor 1

Pak Somat ialah tukang yang dipercaya untuk membangun rumah Joglo Pak Mamat. Pak Somat berpendapat bahwa letak kayu dan tiang yang telah dipasangnya ialah terdapat pada tabel di bawah ini. Tentukan benar atau salah pendapat Pak Somat dengan memberi tanda √ pada kolom yang sesuai!

Pernyataan	Jawaban		Alasan
	Benar	Salah	
Tiang A dan tiang B kedudukannya sejajar	✓		Ya, karna jika tidak sejajar rumah akan miring
Kayu C dan kayu D kedudukannya saling berpotongan	✓		karna kayu D bertumpu dg kayu C
Kayu E dan kayu F kedudukannya saling berimpit		✓	karna kayu E dan F membentuk segitiga
Kayu G dan kayu H kedudukannya saling bersilangan		✓	karna kayu G dan kayu H jaraknya berjauhan

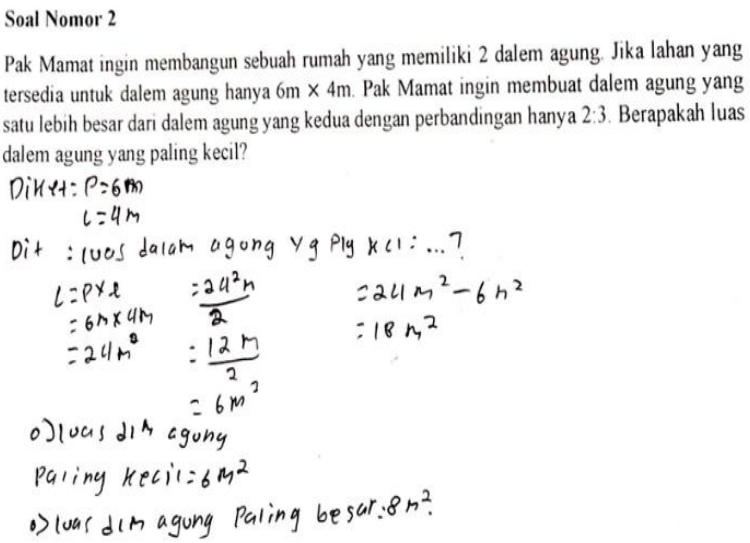
Figure 2. Process of Working on Question Number 1 by Subject 1

The question of one number is whether Mr. Somat is the craftsman who is trusted to build Mr. Mamat's Joglo house. Mr Somat thinks that the location of the wood and the poles he installed are in the table below. Determine whether Mr Somat's opinion is right or wrong by ticking √ in the appropriate column. The statement in the first line reads, "Pole A and pillar B are parallel," the student answers that this statement is correct because if they were not parallel, the house would tilt. The statement in the second line reads, "The wood C and the wood D intersect each other," the student answers that this statement is incorrect because the wood D rests on the wood C. The statement in the third line reads, "The wood E and the wood F are adjacent to each other," students answered that this statement was wrong because the wood E formed a triangle. The statement in the fourth line reads, " The wood G and the wood H are opposite each other," the student answers that this statement is wrong because the wood G and the wood H are far apart.

The results of Subject 1 show that the arguments are not based on the reasons for the position of two lines in mathematics. The subject answered correctly, but the subject stated the wrong reason. The reasons given do not show mathematical argumentation and language. Overall, the argumentation, communication, language, and symbolic indicators in the interpretation carried out by Subject 1, who has an auditory learning style in question 1, still have difficulty interpreting the problem.

Subject 1 with An Auditory Learning Style In Mathematizing Problems

Usage indicators are measured using problems related to the ratio of the area of Dalem Agung. Figure 3 shows the process of working on Subject 1 and the process of working on question number 2.



Soal Nomor 2

Pak Mamat ingin membangun sebuah rumah yang memiliki 2 dalem agung. Jika lahan yang tersedia untuk dalem agung hanya 6m × 4m. Pak Mamat ingin membuat dalem agung yang satu lebih besar dari dalem agung yang kedua dengan perbandingan hanya 2:3. Berapakah luas dalem agung yang paling kecil?

Dikt: P=6m
l=4m
Dit: luas dalam agung yg Plg kcl: ...?
L=P×l
=6m×4m
=24m²
=24m²/2
=12m²/2
=6m²
=24m²−6m²
=18m²
a) luas dlm agung paling kecil=6m²
b) luas dlm agung paling besar=8m²

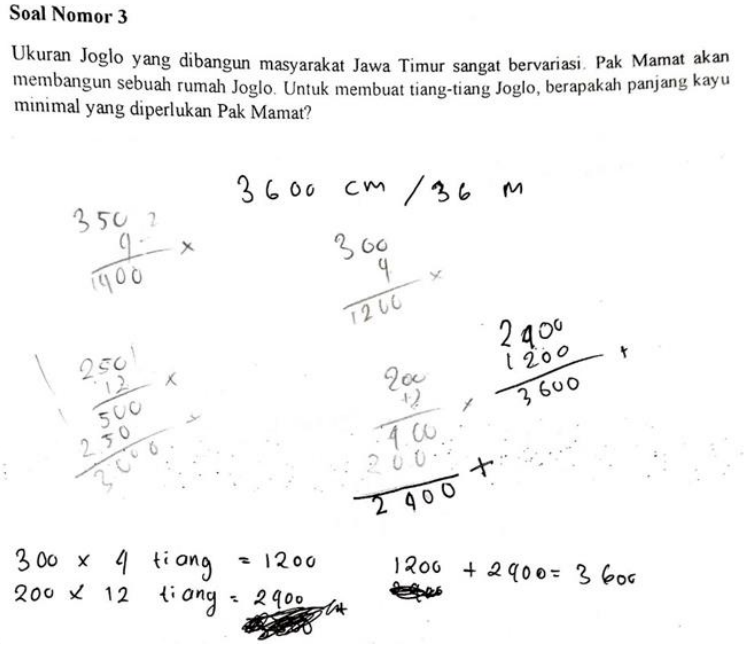
Figure 3. Process of Working on Question Number 2 by Subject 1

The question of the second number is whether Mr Mamat wants to build a house with two grand palaces. If the land available for the palace is only 6m × 4m, Mr. Mamat wants to make one grand palace bigger than the second grand palace with a ratio of only 2:3. What is the smallest area of Dalem Agung?

Based on the work results, it can be seen that the first step in answering the question taken by subject 1 was correct, namely calculating the total area of the inner palace. Subject 1 understands the meaning of the problem, but the strategy designed is inappropriate, so the results of solving the problem are wrong. Therefore, Subject 1 shows that subject 1 mathematizes the problem quite well, reasons, and is lacking in problem-solving strategies.

Subject 1 Formulates The Problem Situation Mathematically

Formulating the problem situation mathematically is measured using problems related to the minimum length of wood for Joglo house poles. The work process by Subject 1 is shown in Figure 4.



Soal Nomor 3

Ukuran Joglo yang dibangun masyarakat Jawa Timur sangat bervariasi. Pak Mamat akan membangun sebuah rumah Joglo. Untuk membuat tiang-tiang Joglo, berapakah panjang kayu minimal yang diperlukan Pak Mamat?

3600 cm / 36 m
300 × 4 tiang = 1200
200 × 12 tiang = 2400
1200 + 2400 = 3600

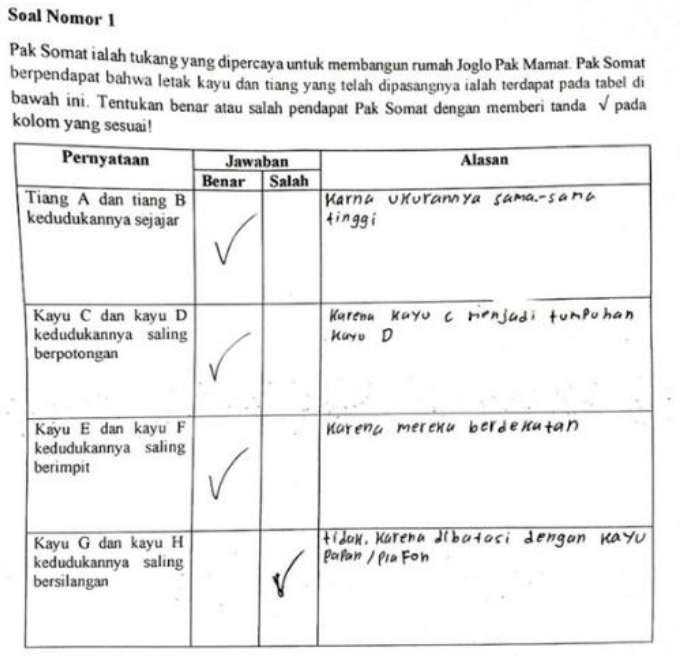
Figure 4. Process of Working on Question Number 3 by Subject 1

The question of the third number is the size of the Joglos built by the people of East Java varies greatly. Mr Mamat will build a Joglo house. To make Joglo poles, what is the minimum length of wood that Mr Mamat needs?

Subject 1's work on question number 3 on the indicator of mathematizing the problem shows that he understands the problem quite well. Subject 1 could answer questions correctly even without proper work procedures, such as writing down his first knowledge. Subject 1's reasoning shows that he has the correct mindset in the process he is carrying out.

Subject 2 with A Kinesthetic Learning Style In Interpreting Mathematical Problems

Mathematical problems are interpreted using questions that show a table related to the position of two lines. The problem is that the subject must choose whether each statement is true or false, accompanied by reasons. The work process by Subject 1 is shown in Figure 5.



Soal Nomor 1

Pak Somat ialah tukang yang dipercaya untuk membangun rumah Joglo Pak Mamat. Pak Somat berpendapat bahwa letak kayu dan tiang yang telah dipasangnya ialah terdapat pada tabel di bawah ini. Tentukan benar atau salah pendapat Pak Somat dengan memberi tanda √ pada kolom yang sesuai!

Pernyataan	Jawaban		Alasan
	Benar	Salah	
Tiang A dan tiang B kedudukannya sejajar	√		Karna ukurannya sama-sama tinggi
Kayu C dan kayu D kedudukannya saling berpotongan	√		Karena kayu C menjadi tumpuhan kayu D
Kayu E dan kayu F kedudukannya saling berimpit	√		Karena mereka berdekatan
Kayu G dan kayu H kedudukannya saling bersilangan		√	tidak, karena dibatasi dengan kayu Papan / Plafon

Figure 5. Process of Working on Question Number 1 by Subject 2

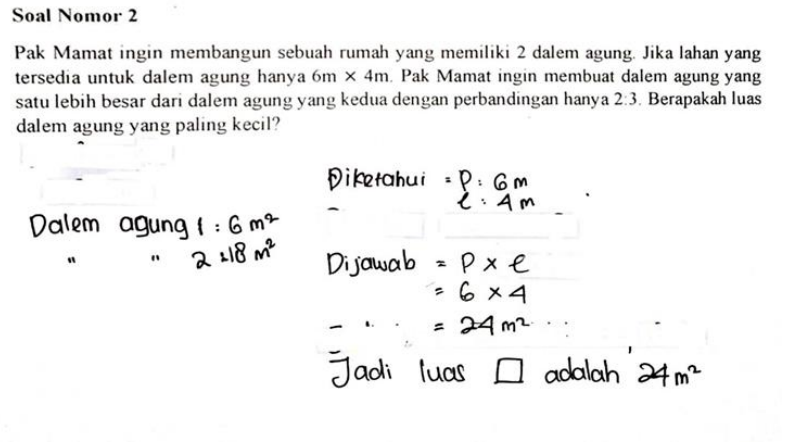
The question of one number is whether Mr. Somat is the craftsman who is trusted to build Mr. Mamat's Joglo house. Mr Somat thinks that the location of the wood and the poles he installed are in the table below. Determine whether Mr Somat's opinion is right or wrong by ticking √ in the appropriate column. The statement in the first line reads, "Pole A and pillar B are parallel," the student answers that this statement is correct because they are both tall in size. The statement in the second line reads, "The wood C and the wood D intersect each other." The student answers that this statement is correct because wood C becomes a support for wood D. The statement in the third line reads, "The wood E and the wood F are adjacent to each other." Students answer that this statement is correct because they are close together. The statement in the fourth line reads, " The wood G and the wood H are opposite each other," the student answers that this statement is wrong because it is not limited to wooden planks/ceilings.

The results of Subject 2 show that the arguments do not follow the reasons for the position of two lines in mathematics. The subject stated the wrong reason. The reasons given do not show mathematical reasons. The subject's answer was wrong regarding the coinciding position of the two lines. Overall, the argumentation, communication, language, and symbolic

indicators in the interpretation carried out by subject 2 with the kinesthetic learning style in question 1 have not been appropriately fulfilled.

Subject 2 with A Kinesthetic Learning Style In Mathematizing Problems

Usage indicators are measured using problems related to the ratio of the area of Dalem Agung. The process of working on Subject 2 is shown in the process of working on question number 2 in Figure 6.


Soal Nomor 2

Pak Mamat ingin membangun sebuah rumah yang memiliki 2 dalem agung. Jika lahan yang tersedia untuk dalem agung hanya 6m × 4m. Pak Mamat ingin membuat dalem agung yang satu lebih besar dari dalem agung yang kedua dengan perbandingan hanya 2:3. Berapakah luas dalem agung yang paling kecil?

Dalem agung 1 : 6 m²
" " 2 : 18 m²

Diketahui = p : 6 m
l : 4 m

Dijawab = p × l
= 6 × 4
= 24 m²

Jadi luas □ adalah 24 m²

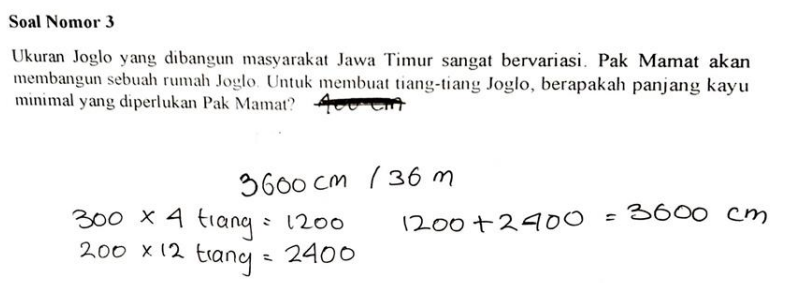
Figure 6. Process of Working on Question Number 2 by Subject 2

The question of the second number is whether Mr Mamat wants to build a house with two grand palaces. If the land available for the palace is only 6m × 4m, Mr. Mamat wants to make one grand palace bigger than the second grand palace with a ratio of only 2:3. What is the smallest area of Dalem Agung?

It can be seen that the first step in answering the question taken by subject 2 was correct, namely calculating the entire area of the grand interior. However, Subject 2 could not calculate the area of the most miniature grand interior. Subject 2 does not show how to obtain great principles 1 and 2. Therefore, Subject 2 has been unable to mathematize problems, reason, and solve problems.

Subject 2 Formulates The Situation Mathematically

Formulating the situation mathematically is measured using problems related to the minimum length of wood for Joglo house poles. The process of formulating Subject 2 is shown in answering question 3 in Figure 7.


Soal Nomor 3

Ukuran Joglo yang dibangun masyarakat Jawa Timur sangat bervariasi. Pak Mamat akan membangun sebuah rumah Joglo. Untuk membuat tiang-tiang Joglo, berapakah panjang kayu minimal yang diperlukan Pak Mamat? ~~400 cm~~

3600 cm / 36 m

300 × 4 tiang = 1200
200 × 12 tiang = 2400

1200 + 2400 = 3600 cm

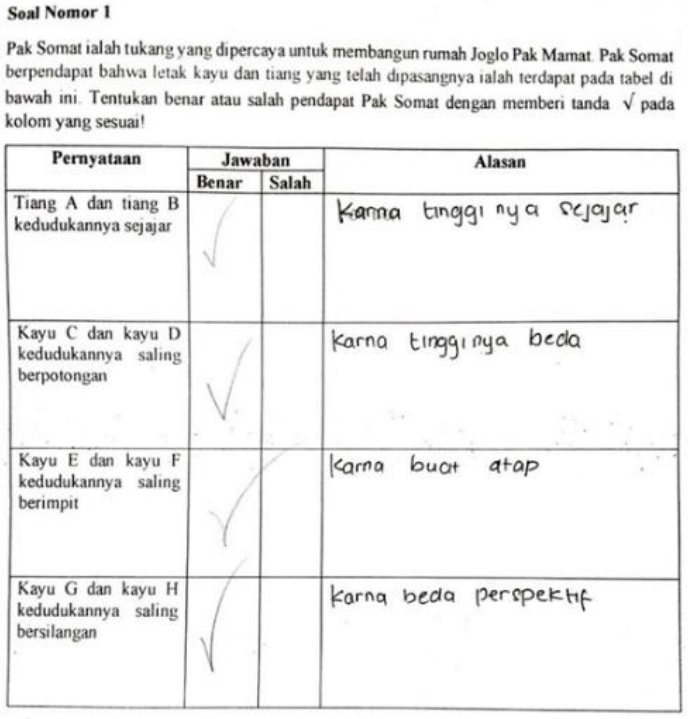
Figure 7. Process of Working on Question Number 3 by Subject 2

The question of the third number is the size of the Joglos built by the people of East Java varies greatly. Mr Mamat will build a Joglo house. To make Joglo poles, what is the minimum length of wood that Mr Mamat needs?

Subject 2's work on question number 3 on the indicator of mathematizing the problem shows a pretty good understanding of the problem. Subject 1 could answer questions correctly even without proper work procedures, such as writing down his first knowledge. Subject 2 was able to change units from cm to m. Subject 2's reasoning shows that he has the correct mindset in the process he is carrying out.

Subject 3 with A Visual Learning Style In Interpreting Mathematical Problems

Mathematical problems are interpreted using questions that show a table related to the position of two lines. The problem is that the subject must choose whether each statement is true or false, accompanied by reasons. The work process by Subject 3 is shown in Figure 8.



Soal Nomor 1

Pak Somat ialah tukang yang dipercaya untuk membangun rumah Joglo Pak Mamat. Pak Somat berpendapat bahwa letak kayu dan tiang yang telah dipasangnya ialah terdapat pada tabel di bawah ini. Tentukan benar atau salah pendapat Pak Somat dengan memberi tanda √ pada kolom yang sesuai!

Pernyataan	Jawaban		Alasan
	Benar	Salah	
Tiang A dan tiang B kedudukannya sejajar	√		Karna tinggi nya sejajar
Kayu C dan kayu D kedudukannya saling berpotongan	√		karna tinggi nya beda
Kayu E dan kayu F kedudukannya saling berimpit	√		karna buat atap
Kayu G dan kayu H kedudukannya saling bersilangan	√		karna beda perspektif

Figure 8. Process of Working on Question Number 1 by Subject 3

The question of one number is whether Mr. Somat is the craftsman who is trusted to build Mr. Mamat's Joglo house. Mr Somat thinks that the location of the wood and the poles he installed are in the table below. Determine whether Mr Somat's opinion is right or wrong by ticking √ in the appropriate column. The statement in the first line reads, "Pole A and pillar B are parallel," the student answers that this statement is correct because the height is parallel. The statement in the second line reads, "The wood C and the wood D intersect each other," the student answers that this statement is correct because the height is different. The statement in the third line reads, "The wood E and the wood F are adjacent to each other," students answered that this statement was correct because it was for the roof. The statement in the fourth line reads, " The wood G and the wood H are opposite each other," the student answers that this statement is correct because of different perspectives.

Subject 3 shows that the argument is not based on the reasons for the position of two lines in mathematics. The subject stated the wrong reason. The reasons given do not show mathematical reasons. There were two incorrect subject answers regarding the position of two lines that coincided and crossed each other. Overall, subject 2's kinesthetic learning style in question 1's interpretation of the indicators of reasoning, communication, language, and symbols shows that they still have trouble with mathematical literacy-related tests.

Subject 3 with A Visual Learning Style In Mathematizing Problems

Usage indicators are measured using problems related to the ratio of the area of Dalem Agung. The process of working on Subject 3 is shown in the process of working on question number 2 in Figure 9.

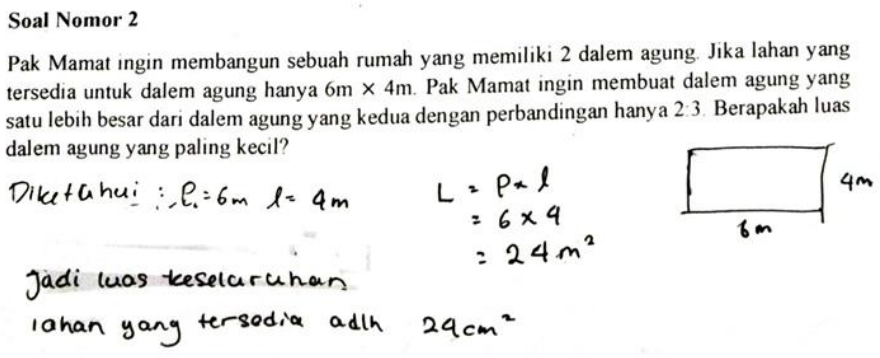


Figure 9. Process of Working on Question Number 2 by Subject 3

The question of the second number is whether Mr Mamat wants to build a house with two grand palaces. If the land available for the palace is only 6m × 4m, Mr. Mamat wants to make one grand palace bigger than the second grand palace with a ratio of only 2:3. What is the smallest area of Dalem Agung?

Based on the results of the work, it can be seen that subject 2 represents what is known in the form of images. Subject 3 was able to write down what he knew correctly. However, Subject 3 did not understand the meaning of question number 2. It could be seen that only the total area was calculated. What is asked about is the smallest area of the inner palace. This shows an inappropriate problem-solving strategy. If the problem-solving strategy is inappropriate, it will affect the process of formulating and implementing the problem.

Subject 3 Formulates The Situation Mathematically

Formulating the situation mathematically is measured using problems related to the minimum length of wood for Joglo house poles. The process of formulating Subject 3 is shown in answering question 3 in Figure 10.

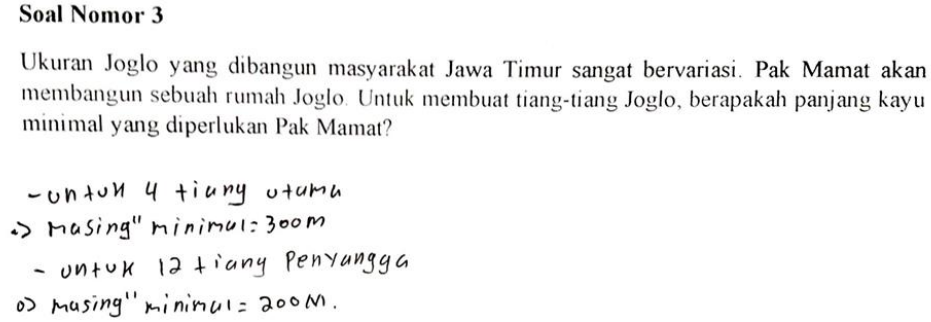


Figure 10. Process of Working on Question Number 3 by Subject 3

The question of the third number is the size of the Joglos built by the people of East Java varies greatly. Mr Mamat will build a Joglo house. To make Joglo poles, what is the minimum length of wood that Mr Mamat needs?

Subject 3's work on question number 3 on the indicator of mathematizing the problem shows a pretty good understanding of the problem. Subject 3 answered the question correctly, but not completely until the solution. The subject's reasoning shows that subject 3 has the

correct mindset in the process he is carrying out. Table 2 compares mathematical literacy based on the subject.

Table 2. Comparison of Mathematical Literacy Given Learning

Competency of Mathematical Literacy	Achievement Indicators		
	Subject 1	**Subject 2**	**Subject 3**
Interpretation	Subject 1's interpretation is not yet representative of a problem with good. Question number 1 was answered all right, but the argument given and the language used to answer question number 1 are not mathematical. The solution strategy problem for number 2 is incorrect, whereas for number 3, it is correct.	Subject 2 does not represent the problem well. There is one wrong answer to question number 1, and all the arguments given are not mathematical. The problem-solving strategy for number 2 is inappropriate, and the mathematics process for questions 2 and 3 is quite good. This means that subject 3's interpretation is no better than that of subject 1's.	Subject 3 does not represent the problem well. There are two wrong answers to question number 1, and all the arguments given are not mathematical. The problem-solving strategy for number 2 is incorrect, and the process of mathematizing the answer to question number 3 is good. This means that Subject 2's interpretation is no better than that of Subject 1 and Subject 2.
Formulating	Mathematization problems in questions 1 and 2 are unfulfilled, while number 3 has been fulfilled well.	Mathematization The problem has not been appropriately fulfilled in numbers 1 and 2, while it has been fulfilled well in number 3.	Mathematization The problems in questions 1, 2, and 3 have not been met.
Applying	The strategy for working on question number 2 lacks precision, and the subject shows deep workmanship in the process reason, whereas the strategy for number 3 is correct.	The strategy for working on question 2 is less precise and shows little of the reasoning process, while the strategy for working on question 3 is correct.	The strategy for working on questions 2 and 3 was inappropriate, and the subject did not show a deep reasoning process or workmanship.

Discussion

Errors in representing indicators and designing strategies affect other indicators, such as mathematizing the problem, executing the strategy, providing arguments, language, and symbolic operations, and calculating the problem. The three subjects have not shown they can reason about questions in a sociocultural context. If the subject understands the reasoning indicators, then the subject can easily design problem-solving strategies (Kusuma et al., 2021). The main components of mathematical literacy are understanding and mathematical problems. Fundamental difficulties in mathematical literacy are shown in the process of understanding problems. Therefore, if individuals do not understand the problem correctly, the solution steps in mathematization are incorrect n, and the interpretation and formulating of the problem will also cause errors in using strategies to solve problems, specifically misinterpretations, errors in procedure, flaws in technology, and errors in writing (Musafir & Susiswo, 2021).

Considering the outcomes of the mathematical literacy test, different learning styles show different mathematical literacy processes. Students with an auditory learning style can correctly answer problems in questions 1 and 3, but the arguments used in answering question 1 are not mathematical. Meanwhile, students could only work on questions in number 2 up to the initial steps. Students could not solve the problems correctly but showed a reasoning process when answering questions. Students with a kinesthetic learning style only answered question number 3 correctly.

Meanwhile, there were wrong answers accompanied by non-mathematical arguments in question number 1 and question number 2, which were answered incorrectly. In visual learning style, students cannot answer all the questions correctly. However, there is a correct answer to question number 1, but the argument is not mathematical. Considering the mathematical literacy test outcomes, it appears that students with an auditory style are better at solving mathematical literacy questions in a sociocultural context. When learning mathematics, students with an auditory learning style perform better than those with a visual or kinesthetic learning style (Hanggara & Suhardi, 2016). Students with an auditory learning style are more mathematically literate than those with a kinesthetic or visual learning style (Syawahid & Putrawangsa, 2017).

Differences in learning styles will be a characteristic of every mathematical literacy process carried out by students; the mathematical literacy process starts from understanding the problem, designing a solution strategy, mathematizing the problem, and formulating the problem, to the process of checking the answers obtained (Sulisawati et al., 2019). Students' skills in solving mathematical problems that contain context depend on the students' learning styles (Aljaberi, 2015). The way students learn shows the best methods students use in processing and analyzing the information they receive (Kusumawarti et al., 2020)—auditory learning style students like learning using the lecture learning method (Tyas & Safitri, 2017). Students with an auditory learning style will try to understand contextual mathematical problems and make plans by connecting them with the basic concepts they have previously (Sulisawati et al., 2019). This makes students with an auditory learning style more able to answer and solve mathematical literacy questions using reasoning, even though they are not optimal, compared to those with a kinesthetic and visual learning style. Students with a visual learning style tend to have problems storing verbal information in their memory, and the way students answer questions is brief (Sulistiana et al., 2013). Visual learning style, students tend not to recheck the answers they have obtained. This could be one of the reasons why students with a visual learning style cannot answer all the questions correctly on the mathematical literacy test.

Students with a kinesthetic learning style prefer learning that involves conducting experiments while learning takes place (Leopold, 2012). In kinesthetic learning, students tend to read while moving their limbs, playing with their fingers or nails, and wanting to immediately solve the problem because they cannot stand sitting for long (Sulisawati et al., 2019). This could be a factor in students with a kinesthetic learning style only answering question number 3 correctly, question number 1 not answering correctly, and the arguments not being mathematical.

This research shows that students' learning styles influence their mathematical literacy process. Students who learn best visually or kinesthetically are less inclined to solve difficulties than those who learn best auditorily. All subjects in this study could not perfectly solve problems in questions 1 and 2. However, the work processes of the three subjects were different. This shows that when using mathematical literacy to solve issues, the PISA indicators have not been met.

CONCLUSION

The discussion that has taken place shows that learning style has an impact on students' mathematical literacy. Mathematical literacy has three mathematical literacy processes with indicators of mathematical literacy achievement. Mathematical literacy indicators influence each other in problem-solving. Visual learning style students have not yet achieved all indicators of mathematical literacy. The argument given is not mathematical. Students with a kinesthetic learning style have not achieved good mathematical literacy indicators, but the students did problem number 3 correctly. In the auditory learning style, students can mathematize problems even though they have shortcomings in that the arguments given in answer to question number 1 are not mathematical. Auditory learning style students show a reasoning process when working on questions in number 2; only the strategy used is wrong. The mathematical literacy of students with an auditory learning style is better than that of students with a kinesthetic and visual learning style.

Suggestions for further research are to expand the problem context in the mathematical literacy test instrument. Apart from that, it would be better if indicators of mathematical literacy were supplemented with critical thinking. This is because the mathematical literacy process requires additional indicators to improve mathematical literacy, such as critical thinking, which is the basis for achieving the leading indicators. Researchers are aware of the limitations of this research, which focuses on sociocultural contexts, whereas in mathematical literacy, there are four contexts. For researchers who want to conduct similar research, they can add variations in context to the instrument problem.

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