AlphaMath
Journal of Mathematics Education, 11(2) November 2025
p-ISSN: 2477-409X, e-ISSN: 2549-9084
Available online: https://jurnalnasional.ump.ac.id/index.php/alphamath/

Mapping Students' Mathematical Literacy Skills in Basic Geometry: A Study Based on Stacey and Turner's Indicators

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http://dx.doi.org/10.30595/alphamath.v11i2.28590

ABSTRACT

Indonesia's mathematical literacy achievement remains below the global average, indicating a continued need to improve these skills. This study aims to map the mathematical literacy abilities of eighth-grade students in basic geometry, particularly two-dimensional shapes, based on Stacey and Turner's indicators: (1) formulating real-life situations mathematically; (2) using concepts, facts, procedures, and reasoning; and (3) interpreting, applying, and evaluating results. This research employs a descriptive qualitative approach, with data collected through mathematical literacy tests, analysis of student responses, and in-depth interviews across three ability categories (high, medium, low). The categorization of subjects facilitates a more structured and in-depth analysis process. The findings show that most students fall into the medium category, while fewer are in the high and low categories. Based on the indicators, the main weaknesses are in students' ability to formulate real-life situations mathematically and to evaluate results; these findings are consistent with PISA studies, which also highlight these two aspects as major weaknesses in Indonesian students' mathematical literacy. High-ability students demonstrate mastery of all indicators, while medium-ability students generally complete only part of the process and rarely reflect on their answers. Low-ability students have difficulties in formulating real-life situations, using concepts, and are unable to evaluate results. This study confirms that the primary weaknesses are in formulating problems and evaluating results, in line with PISA findings. The implications of this study highlight the need for contextual and reflective mathematics learning, as well as strengthened teacher training in developing mathematical literacy assessments.

Keywords: Basic geometry, mathematical literacy, plane figures, Stacey and Turner indicators

Received : October 31, 2025
Revised : November 15, 2025
Accepted : November 20, 2025

Introduction

Education in the era of globalization demands a generation that is adaptive, creative, and highly competitive in facing the dynamics of the 21st century. Mathematics plays a strategic role, not only as an instrument for mastering concepts but also as a vehicle for developing critical, analytical, and problem-solving skills. Mathematical literacy competence has now become a primary benchmark for the success of modern mathematics education, as recognized in various international studies such as the Programme for International Student Assessment (PISA), which emphasizes the importance of functional mathematics usage in everyday life (Rizki & Priatna, 2019; Umbara & Suryadi, 2019). This mathematical literacy paradigm encourages a shift in learning from mere memorization and procedural exercises to meaningful understanding and application of mathematics in real-life contexts, enabling students to actively participate in a complex and knowledge-based society.

The international definition of mathematical literacy continues to evolve, one of which is proposed by Stacey and Turner, who assert that mathematical literacy is the ability of individuals to formulate, use, and interpret mathematics in various contexts. According to PISA, mathematical literacy is the capacity of individuals to formulate, use, and interpret mathematics in a variety of life contexts, including the ability to reason mathematically and use mathematical concepts, procedures, facts, and tools to describe, explain, and predict phenomena. With mathematical literacy, one is able to understand the role of mathematics in everyday life and make well-founded decisions as a constructive, reflective, and responsible citizen (OECD, 2018; Stacey, 2015; Stacey & Turner, 2015). Stacey & Turner also place the process of mathematical modeling at the core of mathematical literacy, namely: (1) formulating real-world situations into mathematical models; (2) using mathematical knowledge and procedures to solve problems; and (3) interpreting and evaluating mathematical results in real contexts. These three processes have become the main cycle in PISA assessments and various contemporary studies (Stacey, 2015; Stacey & Turner, 2015).

Nevertheless, the achievement of mathematical literacy among Indonesian students remains a significant challenge. The results of PISA 2022 indicate that the mathematical literacy scores of Indonesian students are below the global average, with only 18% of students able to reach level 2 or above (Aisyah & Juandi, 2022; OECD, 2023). One of the root problems is the low ability to formulate contextual problems, the reflective use of concepts and procedures, as well as the interpretation of mathematical results in real life (Jailani et al., 2020; Malasari et al., 2017). Mastery of mathematical literacy is crucial for students, as it not only determines success in mathematics learning at school, but also plays a major role in equipping students to face real-life problems that require understanding, reasoning, decision-making, and problem-solving based on quantitative data and information. Mathematically literate students will be more prepared to face the challenges of a modern, complex society, be critical of information, and be able to contribute productively to the workforce and community life. Various studies show that obstacles to mathematical literacy are not only due to conceptual limitations but are also influenced by personal factors such as motivation, self-confidence, and mathematical anxiety, as well as external factors such as teaching patterns and the quality of assessment (Kusuma et al., 2025; Matope & Chiphambo, 2022; Roth et al., 2015).

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p-ISSN 2477-409X, e-ISSN: 2549-9084

From the instructional process perspective, teachers tend to rely on procedural exercises, lack integration of contextual problems, and have insufficient training in designing mathematical literacy assessments (Kappassova et al., 2025; Kusuma et al., 2025). Teachers are also often unfamiliar with international mathematical literacy frameworks such as PISA and are not trained in developing literacy-based mathematics problems that demand reasoning, communication, and reflection (Sonmez & Yilmaz, 2023; Umbara & Suryadi, 2019). School curricula also tend to focus on procedural national exam achievements rather than the application of mathematics in real life (Khaesarani & Ananda, 2022; Malasari et al., 2017). This exacerbates the gap between the demands of 21st-century mathematical literacy and the reality of implementation in schools.

Spatial literacy also becomes a crucial component in developing mathematical literacy, especially in two-dimensional geometry material. Recent studies indicate that Indonesian students' mastery of spatial literacy, particularly the aspect of spatial communication, remains low and is often overlooked in conventional geometry instruction (Mas'udah et al., 2021; Octaria et al., 2025). The main obstacles in basic geometry include the inability to identify relevant data, difficulty in reflecting on statements' meaning, and errors in interpreting spatial objects (Malasari et al., 2017). The geometry material taught to students in schools, such as two-dimensional shapes, not only trains understanding of the form, size, and properties of geometric objects, but also serves as an essential foundation for developing spatial geometry skills. Spatial geometry itself encompasses skills in visualizing, representing, and manipulating objects in both two and three dimensions, whether in real or imaginative space. Thus, good geometry instruction will strengthen students' spatial literacy, which is indispensable for deeper mathematical understanding, solving contextual problems, and adapting to technological advances and future workforce needs. Two-dimensional shapes, as part of the "Space and Shape" framework in PISA, require strong spatial representation, geometric reasoning, and mathematical modeling skills (Pertiwi & Setyaningsih, 2024).

Previous studies in Indonesia, both at the junior and senior high school levels, have been dominated by general descriptive studies and rarely conduct a categorical mapping (high, medium, low) of students' mathematical literacy abilities on two-dimensional geometry materials based on Stacey & Turner's indicators (Stacey, 2015; Stacey & Turner, 2015; Triyono et al., 2025). Kusuma et al. (2025) in vocational school students highlighted the low mathematical literacy across various ability categories and emphasized the need for detailed indicator mapping and analysis of factors inhibiting students' achievements. Meanwhile, Triyono et al. (2025) underscored the importance of mapping mathematical literacy achievement based on Stacey's indicators in high, medium, and low ability groups—linking the role of self-confidence and instructional strategies in improving outcomes.

Stacey & Turner's indicator theory contains three main indicators in mathematical literacy, namely the ability to (1) formulate real-world situations into mathematical models (formulate), (2) use concepts, facts, procedures, and mathematical reasoning in problem solving (employ), and (3) interpret, apply, and evaluate mathematical results into real-life contexts (interpret). These indicators not only serve as the main framework in PISA assessments, but also as international standards for comprehensively and systematically measuring mathematical literacy. The relationship with mathematical literacy ability is: the more complete and balanced these three indicators are mastered by students, the higher the level of mathematical literacy they possess. In other words, the Stacey & Turner indicators enable detailed mapping of the dimensions of students' mathematical literacy abilities, and can thus be used as the basis for developing learning strategies, assessments, and targeted interventions to improve the quality of mathematics education.

The novelty of this research lies in an integrative effort that has not previously been conducted in Indonesia: an in-depth mapping of the mathematical literacy abilities of eighth-grade students in two-dimensional geometry materials based on Stacey & Turner's indicators, while considering the distribution of ability categories and the influencing factors. Not only measuring numerically, this study also explores students' thinking processes and identifies obstacles and supporting factors for mathematical literacy achievement through a combination of tests, response analysis, and interviews across three ability categories (high, medium, low) (Kusuma et al., 2025; Triyono et al., 2025). Thus, this research expands the findings of Kusuma et al. (2025), which focused on vocational schools and probability material, and deepens Triyono et al.(2025), who emphasized the importance of Stacey & Turner's indicators for mapping mathematical literacy in linear material, by applying them to two-dimensional geometry.

This study also offers practical contributions in the form of recommendations for contextual learning strategies, process-based mathematical assessments, and teacher training oriented toward strengthening mathematical literacy, especially in spatial representation and geometry modeling (Kusuma et al., 2025; Triyono et al., 2025). Moreover, the integration of these empirical mapping results is expected to enrich the national literature and serve as a reference for the development of mathematics education policies relevant to Indonesia's 21st-century needs.

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Methods

Research Design

This study employed a descriptive qualitative approach to map the mathematical literacy abilities of eighth-grade students on basic geometry material, specifically two-dimensional shapes, using the indicators of mathematical literacy proposed by Stacey and Turner (Stacey, 2015; Stacey & Turner, 2015). The qualitative approach was chosen to provide an in-depth depiction of the characteristics, thought processes, and factors influencing students' mathematical literacy achievements in real classroom contexts (Sugiyono, 2018).

Participants or Data Sources

The research subjects consisted of 20 eighth-grade students from MTs Miftahul Huda, selected purposively to represent a range of ability levels based on their learning outcomes in plane geometry. The school and students at MTs Miftahul Huda were chosen as the research sample because the school had previously conducted the Minimum Competency Assessment (AKM) for mathematical literacy, ensuring that students' data and experiences related to mathematical literacy were well documented. Thus, selecting this school and its students was considered relevant for the purpose of in-depth and contextual mapping of mathematical literacy abilities. The sampling strategy was designed to ensure diversity in student abilities and perspectives.

Research Instruments

The main research instrument was a set of three contextual test items, each constructed to measure one specific indicator of mathematical literacy: (1) formulating real-life situations mathematically; (2) using mathematical concepts and procedures, and; (3) interpreting and evaluating mathematical results in real-world contexts (Stacey, 2015; Stacey & Turner, 2015). The instrument was validated by experts prior to its use.

Research Procedures

The research was conducted systematically in several stages. *First*, an observation of the teaching and learning process was conducted, along with an initial assessment to identify students' baseline mathematical literacy in basic geometry. *Second*, the test instrument was developed and validated. *Third*, the validated test was administered to all participants. *Fourth*, students' responses were scored using a pre-established rubric. The scores were then used to calculate the mean ($\bar{X}$) and standard deviation

(SD) in order to categorize students into three ability groups (Arikunto, 2021): high (score $\geq \bar{X} + SD$), medium ($\bar{X} - SD <$ score $< \bar{X} + SD$), and low (score $\leq \bar{X} - SD$). *Fifth*, one student from each ability group was purposively selected for in-depth interviews focusing on their thought processes, problem-solving strategies, and encountered difficulties. One selected student is assumed to represent the group of students in a category. This student can be interviewed with a more focused and in-depth approach.

Data Collection Techniques

Data were collected through (1) written test results from all participants and (2) in-depth interviews with selected students from each ability category. The selection of one student to be interviewed from each category was based on the recommendations of the mathematics teacher, with the criteria that the selected student had participated in the entire research process from start to finish and was able to understand and answer the researcher's questions fluently. This selection was intended to ensure that the data obtained from the interviews genuinely reflected the understanding and experiences of students in each ability category. The interviews aimed to explore students' reasoning, strategies, and obstacles faced during mathematical literacy tasks.

Data Analysis Techniques

The data were analyzed using the Miles and Huberman model (Miles, M. B,. Huberman, 1984), which consists of three main stages: (1) Data Reduction, selecting and grouping data according to the established indicators; (2) Data Display, presenting data in the form of narratives and matrices, and; (3) Conclusion Drawing and Verification, identifying patterns of achievement and the factors influencing students' mathematical literacy. A summary of the research flow is presented in Figure 1.

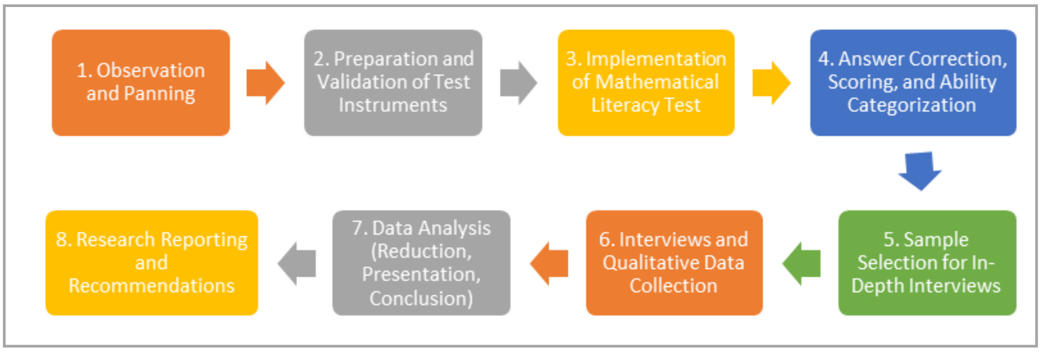

Figure 1. Research Stages (Adapted from (Rahmawati et al., 2024; Rosana et al., 2024; Triyono et al., 2025)

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The diagram in Figure 1 clarifies the research process from initial observation to reporting results and recommendations. All research procedures adhered to ethical standards, including providing information and obtaining consent from students and the school, maintaining the confidentiality of participants' identities, and ensuring that the data were used solely for academic purposes and for the advancement of mathematics education. With systematic stages, standardized instruments, and transparent analysis procedures, this study can be replicated in other populations or contexts and is expected to contribute to the mathematics education literature in Indonesia.

Result and Discussions

Result

Observation and Initial Assessment

The research began with classroom observations conducted during two sessions in grade VIII at MTs Miftahul Huda. The first session focused on the topic of calculating the perimeter and area of triangles, while the second session covered the perimeter and area of quadrilaterals. Throughout the learning process, the researcher directly observed student engagement and the implementation of instruction, aiming to obtain an initial overview of students' mathematical literacy abilities on the topic of two-dimensional shapes.

Table 1. Mathematical Literacy Ability Indicators
(adapted from contexts Stacey, 2015; Stacey & Turner, 2015)

Indicator (N)	Criteria Reflected in Student Answers
Formulating real situations mathematically (N1).	Students write down the known elements involving plane figures (triangles and quadrilaterals) and the mathematical model for the problem presented in the question.
Using concepts, facts, procedures, and reasoning (N2).	Students perform calculations of perimeter and area of plane figures in real-life contexts and state the properties of the shapes used to solve the problem.
Interpreting, applying, and evaluating results (N3).	Students explain the meaning of the calculation results in the context of the real-world problem and evaluate whether the solution obtained is relevant to the situation.

The indicators in Table 1 were then used as the basis for developing three test items, with each item designed to measure one specific indicator of mathematical literacy ability. In detail: item number 1 measures indicator N1; item number 2 measures indicator N2; and item number 3 measures indicator N3. The appearance of the developed test instrument is presented in Figure 2.

Mathematical Literacy & Understanding Test
Plane Concepts

1. A gardener has a rectangular garden measuring 12 meters long and 8 meters wide. The gardener wants to plant grass across the entire surface of the garden. Determine a mathematical model to calculate the area of the garden! And if the cost of planting grass is Rp. 25,000 per square meter, what is the total cost?
2. A swimming pool in the shape of an isosceles trapezoid has parallel sides measuring 20 meters and 12 meters, respectively, and a height of 8 meters. Calculate the surface area of the pool! And if the surface of the pool is to be tiled at a cost of Rp. 75,000 per square meter, how much will it cost to install the tiles?
3. A painter wants to create a kite-shaped design on a wall. The kite has diagonals measuring 10 cm and 8 cm, respectively. What is the area of the kite design? If the painter only has enough paint to cover an area of 40 cm2, will the paint be sufficient?

Figure 2. Mathematical Literacy Test Instrument

Figure 2 shows that the instrument consists of three context-based questions. Each question was validated by two mathematics education lecturers and one mathematics teacher to ensure its suitability with the indicators and the students' context.

Mathematical Literacy Test, Correction, Scoring, and Categorization of Students' Abilities

A total of 20 grade VIII students took the mathematical literacy test after the lessons. Each student completed all three items on the provided answer sheets. All student answer sheets were collected for correction and further analysis.

Students' answers were corrected and scored based on a predetermined rubric. The scoring results were processed to obtain the mean ($\bar{X}$) and standard deviation (SD), which were $\bar{X} = 66.25$ and SD = 7.75. The criteria for ability categories were set as follows: High (H): Score ≥ 74.00; Medium (M): 58.50 < Score < 74.00; and Low (L): Score ≤ 58.50. Based on these criteria limits, 4 students were found to be in the high ability category, 12 students in the middle category, and 4 students in the low category.

Selection of Samples and Conducting In-Depth Interviews

One student from each category was selected using purposive sampling for further analysis, namely A18-H (high), A4-M (medium), and A13-L (low). Interviews were conducted to confirm and deepen the understanding of the students' thought processes and problem-solving strategies in answering mathematical literacy questions. The following interview excerpts document the students' authentic responses.

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High Category Student (A18-H)

The analysis of achievement for the first mathematical literacy indicator N1, namely the ability to formulate real situations mathematically, was conducted using the answer to test item 1 written by sample A18-H. This answer is shown in Figure 3.

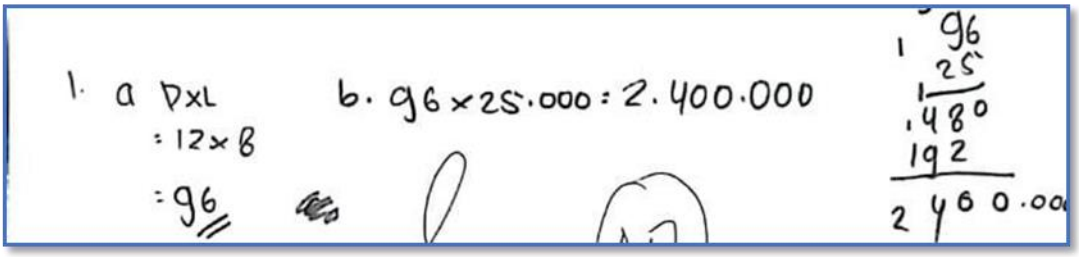

Figure 3. Answer to Test Item 1 by A18-H

In Figure 3, A18-H was able to write down the known information, use the formula for the area of a rectangle, and carry out the calculation to obtain the correct result of 96 m². A18-H also proceeded to calculate the cost for planting grass: 96 × Rp25,000, resulting in Rp2,400,000. Based on this answer, students in the high ability category were able to achieve indicator N1.

The analysis of the second indicator (N2), the ability to use concepts, facts, procedures, and mathematical reasoning, is seen in the answer to test item 2 shown in Figure 4. As seen in, Figure 4 shows that A18-H was able to use concepts and mathematical procedures correctly, for example by calculating the area of a trapezium: A = 1/2 × (20+12) × 8 = 128 m², and calculating the cost of installing tiles accurately. At this stage, A18-H fulfilled indicator N2.

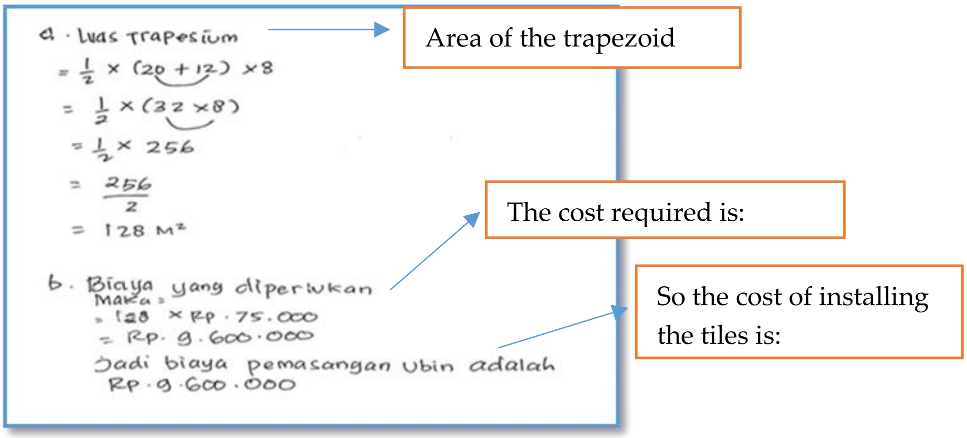

Figure 4. Answer to Test Item 2 by A18-H

The analysis for the third indicator (N3), namely interpreting, applying, and evaluating mathematical results, was based on the answer to test item 3 shown in

Figure 5. As seen in Figure 5, A18-H was able to evaluate solutions, double-check answers, and interpret solutions accurately and comprehensively. Therefore, A18-H also met indicator N3.

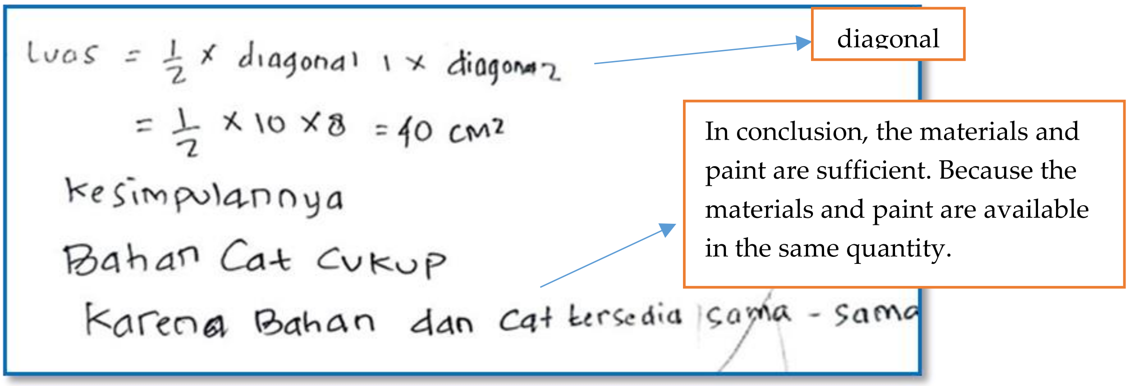

Figure 5. Answer to Test Item 3 by A18-H

Based on the analysis of test answers 1, 2, and 3, A18-H successfully met all three indicators of mathematical literacy. The following are the interview results to confirm these results:

Researcher : *"What was the first thing you thought of after reading the question?"*
A18-H : *"Looking for what information is given in the question."*
Researcher : *"Did you immediately understand what needed to be solved?"*
A18-H : *"Yes, question number 1 asks about the area of the garden and the cost of planting grass..."*
Researcher : *"What did you do after analyzing the question?"*
A18-H : *"I immediately calculated using the area formula I know, then calculated the cost."*

The interview shows that A18-H had a good understanding of mathematical literacy problems and could explain the solution process in detail, systematically, and accurately.

Medium Category Student (A4-M)
To determine the achievement of indicator N1 by A4-M, the answer to test item 1 (calculating the area of a rectangle and the cost of planting grass) was analyzed. A4-M's answer can be seen in Figure 6.

In Figure 6, A4-M was able to write down the information from the question and calculate the area of the garden ($12 \times 8 = 96$ m²). However, A4-M did not answer the

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question regarding the cost of planting grass. This shows that A4-M met indicator N1, but still needs to be more thorough.

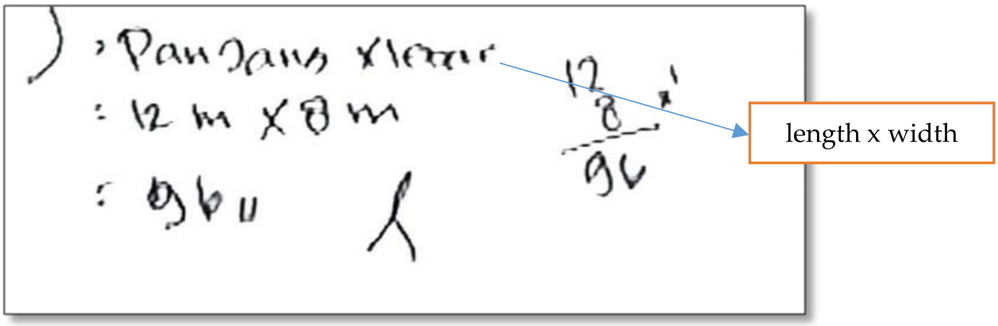

Figure 6. Answer to Test Item 1 by A4-M

For indicator N2 (using concepts, facts, procedures, and reasoning), the answer to test item 2 is shown in Figure 7.

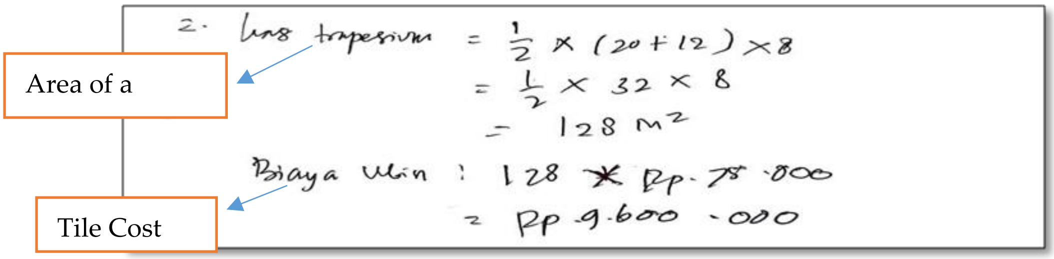

Figure 7. Answer to Test Item 2 by A4-M

In Figure 7, A4-M was able to calculate the cost of installing tiles, indicating that indicator N2 was met. For indicator N3, the answer to test item 3 by A4-M is shown in Figure 8.

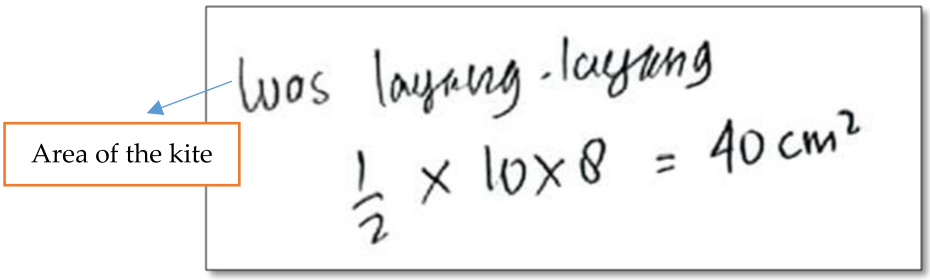

Figure 8. Answer to Test Item 3 by A4-M

Figure 8 shows that A4-M was not able to evaluate the mathematical result (indicator N3). There was no attempt to re-check or conclude the solution, even though A4-M should have determined whether the available paint was sufficient to paint the kite design of 40 cm^2.

To confirm this answer, the following interview was conducted:
Researcher : *"What did you do when you were first given the question?"*
A4-M : *"Understanding the information in the question..."*
Researcher : *"What steps did you take after finding out the information?"*
A4-M : *"Recalling the formula because I often forget, then working as best I can."*
Researcher : *"Any difficulties?"*
A4-M : *"I often get confused and do not review my answers."*

From the interview, it can be concluded that A4-M was able to understand mathematical concepts and procedures (N1 and N2), but was not optimal in evaluating the mathematical results (N3).

Low Category Student (A13-L)
The answer to test item 1 from A13-L can be seen in Figure 9.

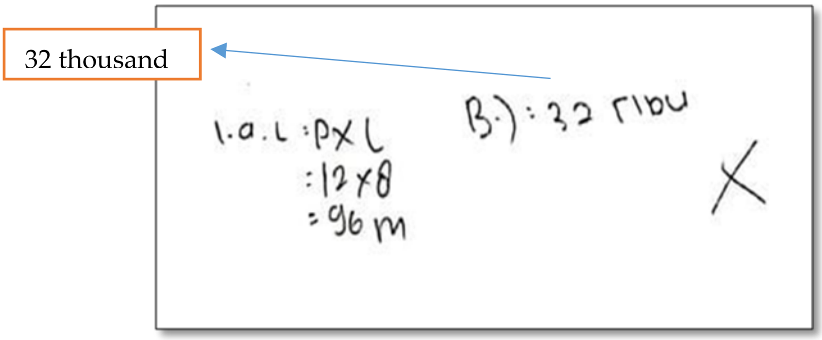

Figure 9. Answer to Test Item 1 by A13-L

In Figure 9, A13-L calculated the area of the garden (12 × 8 = 96 m), but made a mistake in calculating the cost of planting grass (wrote 32 thousand, whereas the correct answer is Rp2,400,000). This indicates that A13-L was not able to formulate real situations mathematically (N1 not achieved).

The answer to test item 2 from A13-L is shown in Figure 10.

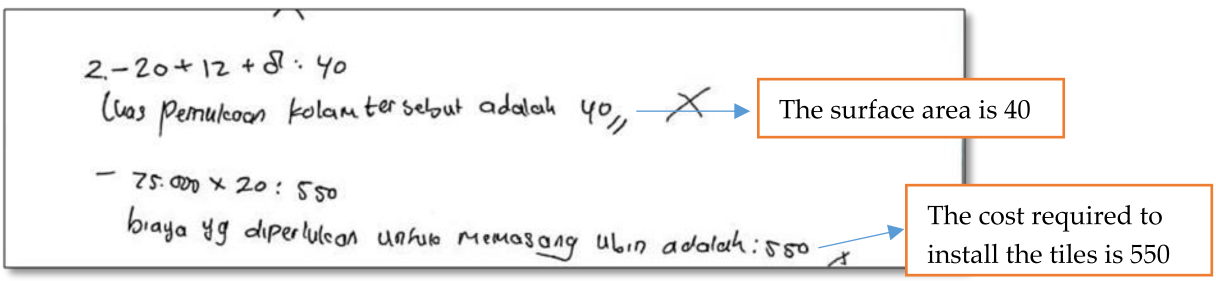

Figure 10. Answer to Test Item 2 by A13-L

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p-ISSN 2477-409X, e-ISSN: 2549-9084

In Figure 10, A13-L was not able to use mathematical concepts to determine the area of the trapezium, resulting in an incorrect calculation for the cost of installing tiles. Thus, indicator N2 was not achieved.

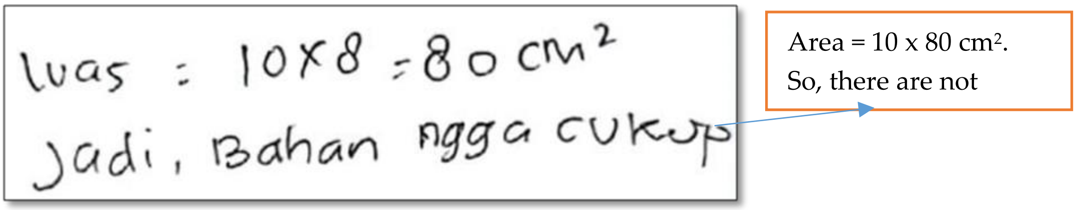

Figure 11. Answer to Test Item 3 by A13-L

The answer to question 3 of A13-L can be seen in Figure 11 above. It can be seen that A13-L was unable to apply the results of mathematical calculations and reasoning, and did not evaluate or double-check the results. Therefore, indicator N3 was not achieved.

To confirm this answer, the following interview transcript was conducted:

Researcher : *"What did you do when you were first given the question?"*
A13-L : *"Understanding the information in the question and the steps to solve it."*
Researcher : *"What was your next step?"*
A13-L : *"Recalling the formula again because I often forget the concepts."*
Researcher : *"Any difficulties?"*
A13-L : *"Yes, I have difficulty understanding word problems..."*

The interview shows that A13-L had difficulty understanding concepts, was unable to communicate answers in writing effectively, and was not able to evaluate the problem. At this stage, A13-L did not achieve indicators N1, N2, or N3.

Data Analysis (Reduction, Presentation, Conclusion Drawing)

The data from the tests and interviews were classified based on mathematical literacy indicators (N1, N2, N3) and student ability categories (high, medium, low). A summary of the attainment of mathematical literacy indicators is presented in Table 2.

Table 2. Summary of Indicator Attainment in Three Student Categories

Indicator	High (A18-H)	Medium (A4-M)	Low (A13-L)
N1	Complete, correct	Partially correct	Less accurate
N2	Correct, systematic	Some errors	Incorrect procedure
N3	Complete evaluation	No evaluation	No/incorrect evaluation

Based on Table 2 above, it can be seen that students in the high category fulfilled all mathematical literacy indicators, demonstrating systematic thinking and accurate answers. Students in the medium category fulfilled the first and second indicators, but were not optimal in evaluating and interpreting results. Meanwhile, students in the low category experienced difficulties with all indicators, especially in applying procedures and evaluating results. The summary of the number of students in each mathematical literacy ability category is presented in Figure 12.

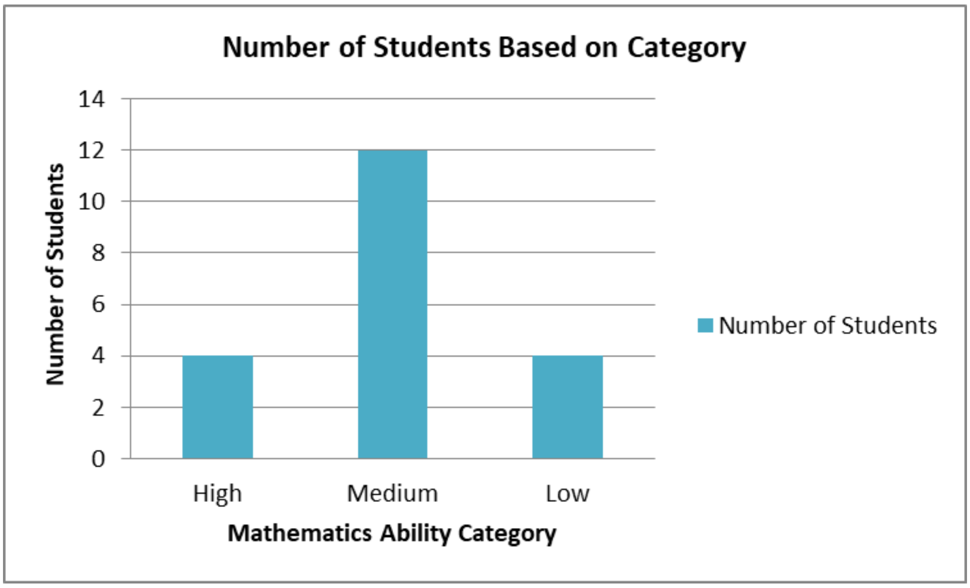

Figure 12. Bar Chart of Number of Students in Each Category

Figure 12 shows the proportion of students with high mathematical literacy skills: 4 students (20%), 12 students (60%), and 4 students (20%) with low mathematical literacy skills. Thus, the majority of the subjects fell into the moderate category. One student was selected for each category as a sample, reflecting the conditions of students in each category.

Discussions

The results of this study show that the proportion of students with high mathematical literacy ability is 20%, medium 60%, and low 20%. Students in the high category are able to fulfill all mathematical literacy indicators (N1, N2, N3) with systematic thinking processes and accurate answers. Students in the medium category are only able to fulfill the indicators of formulating problems (N1) and applying procedures (N2), but are not yet optimal in evaluating and interpreting results (N3). Meanwhile, students in the low category experience difficulties in all indicators, especially in the application of procedures and evaluation of results. These findings clarify the distribution of mathematical literacy abilities as reported in previous studies (Hayati & Kamid, 2019; Ratnasari & Abadi, 2018), where the majority of Indonesian students are still in the medium to low category in mathematical literacy aspects.

This study also confirms that only high-ability students can formulate real-world problems into mathematical form (N1), use mathematical concepts, facts, procedures, and reasoning (N2), and accurately interpret, apply, and evaluate calculation results (N3). In contrast, students with low mathematical ability have not been able to perfectly formulate real-world problems into mathematical form. This is highly consistent with PISA results and the literature by Hayati & Kamid (2019) and Ratnasari & Abadi (2018), which show that the formulate process remains a major weakness for Indonesian students. Afni & Hartono (2020) add that this low ability is strongly influenced by mathematics instruction that lacks real-life context and overemphasizes rote memorization of formulas, causing students to struggle in transforming real problems into mathematical models.

Furthermore, the study shows that only high-ability students consistently apply mathematical concepts and procedures correctly in various contexts (indicator N2), which not all students in the medium category are able to do. Students in the medium and low categories often make mistakes in using mathematical concepts and procedures. This aligns with the findings of Ratnaningsih & Hidayat (2021) and Rohanifar et al. (2020), who emphasize that weak conceptual understanding among students is the reason for their inability to use concepts and apply the correct procedures to solve mathematical literacy problems.

In terms of interpretation and evaluation (N3), only a few students are able to interpret and evaluate calculation results meaningfully. Students in the medium and low groups tend to stop at numerical answers without engaging in reflection or solution assessment. This finding is consistent with Ratnasari & Abadi (2018) and Samawati & Kurniasari (2021), who emphasize that the evaluation stage is the weakest part of the mathematical literacy cycle for Indonesian students. Furthermore, Ma'ruf et al. (2024) quantitatively proved that mathematical literacy has a very strong influence on mathematical problem-solving ability, with literacy contributing more than 90% to the achievement of problem-solving skills. This confirms that improving mathematical literacy will have a direct and significant impact on students' success in solving mathematical problems in various contexts.

Based on these findings, there are important implications for teaching practice. Teachers are strongly advised to integrate mathematics learning strategies that can improve students' literacy, modeling, reasoning, and mathematical communication, one of which is the Contextual Teaching Learning (CTL) model (Afni & Hartono, 2020). Teachers also need special training in designing context-based literacy questions and building collaborative and inclusive classrooms (Tashtoush & Wardat, 2023; Alali & Wardat, 2024). In addition, assessment should not only evaluate final results but also assess students' thinking processes, reflection, and communication (Hayati & Kamid, 2019; Samawati & Kurniasari, 2021). By adopting these approaches, teachers can act as facilitators who encourage students to think critically and creatively, and equip them with mathematical literacy skills relevant to 21st-century challenges. In the future, the results of this study are expected to serve as a reference for curriculum development, innovative learning design, and teacher training programs aimed at improving students' mathematical literacy skills. The limitations of this study lie in the limited sample size and instruments that have not yet covered the full range of geometry contexts, so the research results cannot yet be widely generalized.

Conclusion

This study mapped the mathematical literacy skills of eighth-grade students in basic geometry, particularly two-dimensional shapes, based on the indicators developed by Stacey and Turner, which include formulating real-world situations mathematically (N1), applying mathematical concepts and procedures (N2), and interpreting and evaluating mathematical results in real-life contexts (N3). The findings indicate that most students fall into the medium ability category, while the number of students with high or low abilities is relatively small. High-ability students are able to fulfill all indicators well, from formulating mathematical problems, using appropriate concepts and procedures, to interpreting and evaluating their solutions within real-world contexts. Conversely, students in the medium and low categories still face difficulties, especially in applying concepts and procedures (N2) and in evaluating the solutions obtained (N3). The main weaknesses of students lie in their limited skills in connecting mathematical concepts to everyday life and their low ability to reflect on the processes and outcomes of problem-solving. These findings suggest that students' mathematical literacy in basic geometry still needs improvement, particularly in the aspects of using mathematical concepts and evaluating calculation results. The literature review shows that a predominantly procedural approach to learning and minimal integration of contextual problems are among the inhibiting factors for the development of students' mathematical literacy. The limitations of this study include a limited sample size and instruments that do not cover the full range of geometry contexts, so future research is recommended to expand the scope and develop more varied instruments. Overall, the results of this study are expected to serve as a reference for the development of policies and mathematics teaching practices that focus on strengthening students' mathematical literacy.

Acknowledgement

We would like to express our gratitude to all the teachers and principal of MTs Miftahul Huda, who have allowed the research team to collaborate in the data collection process for this study.

Author's Declaration

Author Contribution	:	Author 1: Conceptualization, Writing - Original Draft, APC Payments Author 2: Writing - Review & Editing Author 3: Data Retrieval Author 4: Data Retrieval Author 5: Validation Author 6: Supervision
Funding Statement	:	Research and publication funding is borne personally by the researchers.
Conflict of Interest	:	there is no conflict of interest whatsoever in the research process up to the publication of this article
Additional Information	:	-

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