**AlphaMath**
*Journal of Mathematics Education*, 10(1) May 2024
p-ISSN 2477-409X, e-ISSN: 2549-9084
Available online: https://jurnalnasional.ump.ac.id/index.php/alphamath/

# Mathematical Literacy in Terms of Learning Independence of Junior High School Students

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http://dx.doi.org/10.30595/alphamath.v10i1.21642

## ABSTRACT

This study is a qualitative study with a descriptive approach that aims to describe the level of mathematical literacy of SMP Negeri 5 Semarang students from the perspective of learning independence. The study involved 6 students of class VII H from SMP Negeri 5 Semarang who were divided based on their level of learning independence, identified through questionnaire results as high, medium, and low learning independence. The data collection methods used were tests and interviews. The instruments used included mathematical literacy test, learning independence questionnaire, and interview guide. Data analysis was conducted through condensation, presentation, and conclusion drawing. The results showed that (1) Students with high learning independence managed to master all aspects of mathematical literacy satisfactorily, including communication, mathematization, representation, reasoning, problem-solving strategies, use of symbols, and mathematical tools; (2) Students with moderate learning independence were able to master most aspects of mathematical literacy well, with an emphasis on representation, reasoning, problem-solving strategies, use of symbols, and mathematical tools, although they still need improvement in communication and mathematization; (3) Students with low learning independence have not yet achieved competence in mathematical literacy.
**Keywords:** Learning Independence, Mathematical Literacy, Problem-Solving Strategies

## ABSTRAK

Penelitian ini merupakan studi kualitatif dengan pendekatan deskriptif yang bertujuan untuk menggambarkan tingkat literasi matematika siswa SMP Negeri 5 Semarang dari perspektif kemandirian belajar. Studi ini melibatkan 6 siswa kelas VII H dari SMP Negeri 5 Semarang yang dibagi berdasarkan tingkat kemandirian belajar mereka, yang diidentifikasi melalui hasil angket sebagai kemandirian belajar tinggi, sedang, dan rendah. Metode pengumpulan data yang digunakan adalah tes dan wawancara. Instrumen yang digunakan termasuk tes literasi matematika, angket kemandirian belajar, dan panduan wawancara. Analisis data dilakukan melalui kondensasi, penyajian, dan penarikan kesimpulan. Hasil penelitian menunjukkan bahwa (1) Siswa dengan kemandirian belajar tinggi berhasil menguasai semua aspek literasi matematika secara memuaskan, termasuk komunikasi, matematisasi, representasi, penalaran, penyusunan strategi penyelesaian masalah, penggunaan simbol, serta alat matematika; (2) Siswa dengan kemandirian belajar sedang mampu menguasai sebagian besar aspek literasi matematika dengan baik, dengan penekanan pada representasi, penalaran, strategi penyelesaian masalah, penggunaan simbol, dan alat matematika, meskipun masih perlu peningkatan dalam komunikasi dan matematisasi; (3) Siswa dengan kemandirian belajar rendah belum mencapai kompetensi dalam literasi matematika.
**Kata kunci**: Kemandirian Belajar, Literasi Matematika, Strategi Pemecahan Masalah

Received : April 21, 2024
Accepted : May 29, 2024
Published : May 30, 2024

## Introduction

Indonesia actively participates in international student assessments conducted by the OECD (Organization for Economic Cooperation and Development), particularly the PISA (Program for International Student Assessment) initiated in 2001 and held every three years. PISA aims to gauge knowledge and skills, with a focus on reading, math, and science (OECD, 2019). According to the 2018 PISA assessment, Indonesia scored 379, ranking 72nd out of 77 countries (OECD, 2019). Similarly, the TIMSS (Trends in International Mathematics and Science Study) assessment, organized by the IEA (International Association for the Evaluation of Educational Achievement) every four years, revealed Indonesia's score in 2019 as 397, significantly below the global average of 500. These outcomes suggest that Indonesia's students lag behind in mathematical literacy, as indicated by the low scores in international assessments.

Students' inadequate mathematical literacy often stems from various errors encountered while solving problems. These errors include misinterpretation of the problem, inaccuracies in constructing mathematical models, and mistakes in understanding concepts and procedural steps (Anggriani, 2020). On the contrary, a study on mathematical literacy revealed that the mathematics proficiency of high school students remains low (Hertiandito, 2016). This finding suggests that despite efforts to improve mathematical literacy, there are still significant challenges in achieving desired levels of competency among high school students. High school mathematics instruction should motivate students to engage in mathematical manipulations, analyze the elements of problem-solving, and convey mathematical concepts clearly (Ahmad & Nasution, 2019). Students tend to approach math problem-solving by replicating or imitating the steps or strategies taught by their teachers (Yustianingsih et al., 2017). Mathematics is an important tool used to solve problems in both science and everyday life (Unlu et al., 2017).

Learning math makes our brains accustomed to solving problems systematically (Laurens et al., 2018). For some students, mathematical concepts can pose challenges, resulting in frustration and disengagement with the subject. Additionally, external factors such as limited resources, ineffective teaching methods, and inadequate support may contribute to poor performance in mathematics. A significant number of students may easily give up when confronted with difficult questions, which can be attributed to their low adversity quotient attitude. Mathematical literacy among students is achieved when they can effectively solve real-life problems, analyze data, interpret findings, and use these insights to make informed decisions (Mahmud & Pratiwi, 2019; Maulidina, 2019). One of the factors affecting the low acquisition of mathematical literacy scores in the PISA test is the low learning independence of students. 21% of the total respondents had a low level of learning independence, while

the rest were at the medium and high levels. Low student learning independence is influenced by three causes, including motivation, goals, and self-belief. Learning independence is an activity of awareness to learn, without coercion by the surrounding environment to carry out responsibility as a student when encountering a learning difficulty. The absence of independence (self-regulation) in students will make students shy, lack motivation for school, and poor study habits. Consistent with the notion that students with high levels of learning independence tend to outperform those with lower levels of independence. Students with greater learning independence are more likely to possess proficient mathematical literacy skills.

Mathematical literacy is a person's ability to reason mathematically and to formulate, apply, and interpret in solving problems in various real-world contexts (Haara et al., 2021). Mathematical literacy, as described by Han and Susanto (2017), encompasses the capacity to employ numerical concepts and arithmetic operations effectively in various real-life contexts, such as household activities, community engagement, and the interpretation of information in our surroundings. The indicators of mathematical literacy can be seen in Table 1 (OECD, 2019).

**Table 1.** Math Literacy Indicator

| Math Literacy Indicator | Criteria |
|---|---|
| Communication | Students are able to understand and recognize the problems in the problem |
| Mathematising | Students exhibit mathematical literacy when they can translate real-world problems into mathematical representations and vice versa |
| Representation | Students are able to involve objects in mathematics |
| Reasoning and argument | Students demonstrate mathematical literacy when they can employ logical reasoning to solve problems and effectively communicate their conclusions. |
| Devising strategies for solving problems | Students are able to explain strategies in solving problems and can solve problems with correct procedures |
| Using symbolic, formal, and technical language and operations | Students exhibit mathematical literacy when they can proficiently utilize symbols, formal language, techniques, and mathematical operations to solve problems. |


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

| Math Literacy Indicator | Criteria |
|---|---|
| Using mathematical tools | Students are able to use mathematical tools to create figures and tables and underline important information in the problem. |

Learning independence is an individual who is actively involved in the learning environment, organizes training, and uses their abilities effectively, and has positive motivational beliefs about their abilities in learning (Iwamoto et al., 2017). It relies on existing knowledge or skills. The learner takes charge of determining the learning objectives, methods, timing, location, pace, rhythm, and evaluating outcomes. Sumarni and Sumarmo (2016) outline indicators of learning independence, including intrinsic motivation, analyzing learning needs, setting goals, viewing difficulties as challenges, accessing and utilizing learning resources, employing learning strategies, evaluating the learning process and outcomes, and fostering a positive self-concept or self-efficacy.

This study aims to elucidate mathematical literacy concerning the learning independence of SMP Negeri 5 Semarang students. Several prior studies inform the current research: 1) Wijayanti and Wardono (2020) investigation titled "Analysis of Mathematics Literacy in the Context of Learning Independence of Junior High School Students in DAPIC-Problem-Solving Learning with the PMRI Approach supported by Schoology" yielded the following insights (1) The DAPIC-Problem-Solving learning approach with the PMRI method aided by Schoology exhibits high quality and enhances mathematical literacy significantly, as evidenced by the exemplary planning, implementation, and evaluation of learning; (2) Learning independence significantly influences students' mathematical literacy within the DAPIC-Problem-Solving learning framework with the PMRI approach supported by Schoology, accounting for 55.3% of the variance; and (3) Students with high learning independence excel in communication and the utilization of mathematical tools. Those with moderate independence excel in communication, representation, and using mathematical tools. Students with low learning independence show strength in various aspects of mathematical literacy, including communication, representation, using symbolic, formal, and technical language and operations, as well as using mathematical tools; 2) Juniansyah el al (2023) study titled "Mathematics Literacy Ability of Class VIII Students in View of Learning Independence" revealed: (1) Students with high learning independence demonstrate proficiency in all mathematical literacy processes, while those with moderate independence excel in the initial processes but struggle with subsequent ones. Students with low independence face challenges in all processes; (2) Factors influencing students' mathematical literacy encompass internal factors such as intelligence, concentration, interest, motivation, and external factors like learning

resources; 3) Tambunan and Mukhtar (2023) conducted a study titled "Application of Problem-Based

Learning Model assisted by Geogebra to Improve Mathematical Literacy Ability of Class X Students of SMA Negeri 4 Medan." Their findings revealed significant improvements in students' mathematical literacy abilities following the implementation of the problem-based learning model supported by Geogebra. Initially, students scored an average of 51.53 in the ability test, categorizing their performance as low, with only 30.56% achieving completeness. However, after the first cycle of intervention, there was a notable increase in the average score to 69.18, now categorized as good, with 61.11% achieving completeness. Despite this improvement, the study had not yet met the desired success indicators, prompting the implementation of a second cycle. In the first cycle, the average score further increased to 79.40%, remaining in the good category, with 88.89% achieving completeness. Consequently, it can be inferred that the application of the problem-based learning model with Geogebra significantly enhanced students' mathematical literacy skills and the overall completeness of their learning.

Basically, every student is born with different characteristics from the others. This is characterized by different student learning independence in solving math problems. The difference in learning independence of each student will allow different mathematical literacy skills. From this, the purpose of this study is to describe students' mathematical literacy skills in terms of learning independence.

**Research Methods**

In this study, qualitative research with a descriptive approach was employed. The qualitative descriptive approach is selected due to its effectiveness in acquiring descriptive information through written or oral data collection, surpassing non-qualitative methodologies (Nurhikmah, 2019). Data collection as the main stage in research can maintain the quality of achieving results by reducing the possibility of errors that may occur during the research project (Taherdoost, 2021). The research subjects were chosen from class VII H of SMP Negeri 5 Semarang using purposive sampling (Sugioyono, 2022). Data collection methods included tests and interviews, with instruments such as mathematical literacy tests, learning independence questionnaires, and interview guidelines. Data validity was ensured through triangulation techniques, comparing the mathematical literacy test results with interview findings from the research subjects. Data analysis involved condensing, presenting, and drawing conclusions or verifying them.


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

## Result and Discussions

Student grouping data based on learning independence is obtained from filling out a learning independence questionnaire with 29 questions, the grouping categories are high, medium and low. A recapitulation of the results of the division of student groups based on learning independence can be seen in Table 2.

**Table 2.** Recapitulation of Student Group Division Results Based on Learning Independence

| Interval | Calculation | Groups | Many Students |
|---|---|---|---|
| $M + S \leq X$ | $102 \leq X$ | High | 5 |
| $M - S \leq X < M + S$ | $89 \leq X < 102$ | Medium | 20 |
| $X < M - S$ | $X < 89$ | Low | 8 |

Interviews were conducted with a total of 6 students who were selected from classes utilizing the Problem-Based Learning (PBL) approach with the Realistic Mathematics Education (PMRI) method supported by Learning Management Systems (LMS). The students were chosen as research subjects, with each group comprising 2 students categorized into high, moderate, and low levels of learning independence. The coding of students according to the grouping of learning independence can be seen in Table 3.

**Table 3.** Coding Students According to Learning Independence Grouping

| Student Code | Description |
|---|---|
| SKT1 | The first research subject from the high learning independence group |
| SKT2 | The second research subject from the high learning independence group |
| SKS1 | The first research subject of moderate learning independence group |
| SKS2 | The second research subject of the moderate learning independence group |
| SKR1 | The first research subject of the low learning independence group |
| SKR2 | The second research subject of the low learning independence group |

The selected research subjects will provide descriptions of their mathematical literacy, encompassing seven components: communication, mathematizing, representation, reasoning and argumentation, devising strategies for problem-solving, employing symbolic formal and technical operations, and utilizing mathematical tools. These components collectively reflect the students' proficiency in understanding, interpreting, and solving mathematical problems across various contexts.

### *Mathematical Literacy of Students with High Learning Independence*

Subject SKT1 and SKT2, both demonstrating high levels of learning independence, exhibit proficiency across all components of mathematical literacy. They excel in

communication, mathematizing, representation, reasoning and argumentation, devising problem-solving strategies, employing symbolic formal and technical operations, and utilizing mathematical tools. Their competence in each component reflects their ability to effectively understand, analyze, and solve mathematical problems in various contexts.

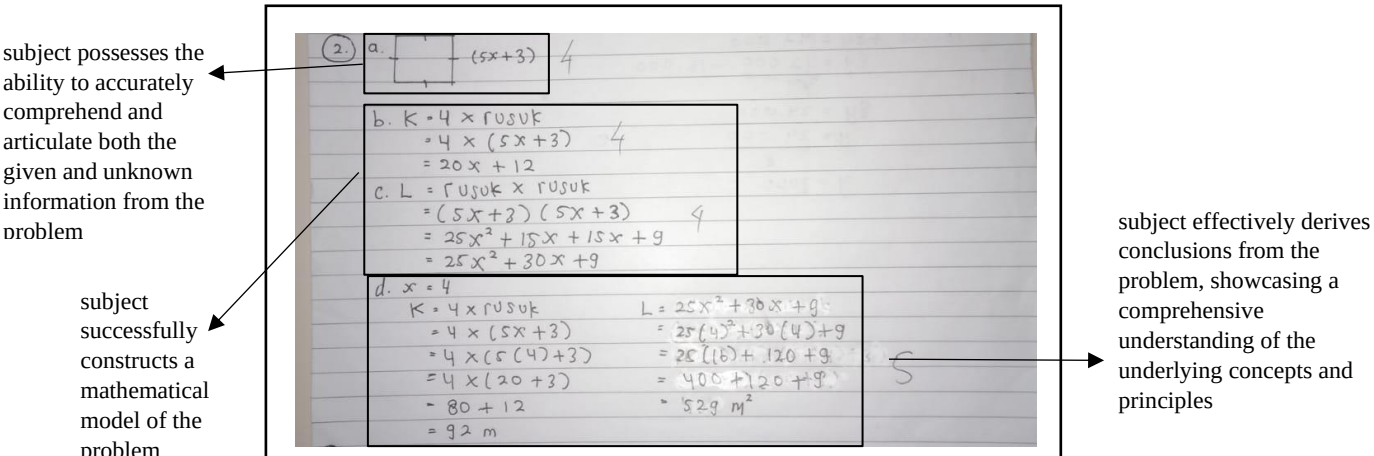


**Figure 1.** Answers of the First Subject of Students with High Learning Independence (SKT1)

From Figure 1, it is evident that the subject possesses the ability to accurately comprehend and articulate both the given and unknown information from the problem. Moreover, the subject adeptly illustrates the problem through accurate visual representations. Furthermore, the subject successfully constructs a mathematical model of the problem. Additionally, the subject effectively derives conclusions from the problem, showcasing a comprehensive understanding of the underlying concepts and principles. This can be confirmed in the following interview transcript, can be seen in Table 4:

**Table 4.** Interview Results of the First Subject of Students with High Learning Independence (SKT1)

| | | |
|---|---|---|
| P | : | *Try to explain what is known and asked from the problem!* |
| SKT1 | : | *So what is known is that the length of the side of the durian garden which is square is* $5x + 3$. *Then what is asked is the drawing, perimeter, area and in part (d) it is asked if what is the perimeter and area if* $x = 4$ |
| P | : | *How can you turn it into a mathematical model?* |
| SKT1 | : | *I remembered the formula for the perimeter and area of a square sir, then I changed the side to* $5x + 3$. *So for example, the perimeter of a square is* $4 \times$ *the side so I wrote* $4 \times (5x + 3)$ |
| P | : | *Explain how you solved the problem until the conclusion stage!* |
| SKT1 | : | *After I changed it into a mathematical model, I worked it out as I had learned in the previous meeting about the multiplication operation. Then I got the result as I wrote on the answer sheet, sir.* |


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

| | | |
|---|---|---|
| P | : | *How can you make a picture of the problem?* |
| SKT1 | : | *I saw in the question that the durian garden is square and the side length is* $5x + 3$*, so I drew a square and then I wrote the size on the side of the square, sir.* |

Based on the interview findings, it is evident that subject SKT1 possesses a strong grasp of mathematical literacy. SKT1 effectively understands and articulates both the given information and the problem's requirements. Furthermore, SKT1 provides clear explanations for constructing a mathematical model of the problem, elucidates the steps taken to solve the problem and reach a conclusion, and articulates the rationale behind creating a visual representation of the problem. These abilities demonstrate SKT1's comprehensive understanding and proficiency in mathematical literacy. Therefore, in solving problem number 2 by the first subject of students with high learning independence (SKT1), it is concluded that it fulfills the indicators (1) Communication, (2) Mathematising, (3) Representation, (4) Reasoning and argument, (5) devising strategies for solving problems, (6) Using symbolic, formal, and technical language and operations, and (7) Using mathematical tools.

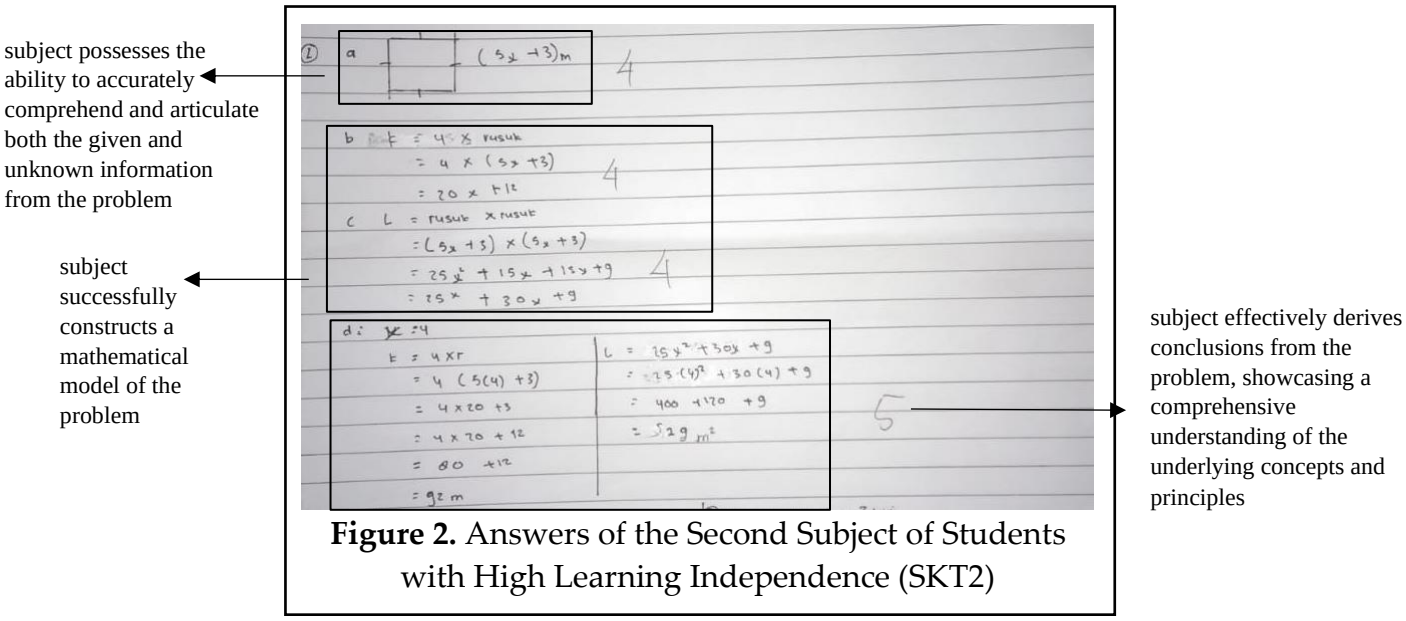



**Figure 2.** Answers of the Second Subject of Students with High Learning Independence (SKT2)

From Figure 2, it is apparent that the subject adeptly comprehends and accurately records both the given information and the unknowns from the problem. Additionally, the subject effectively illustrates the problem through a correct visual representation. Furthermore, the subject successfully formulates a mathematical model of the problem and draws accurate conclusions based on the given information. This demonstrates the subject's proficiency in understanding, analyzing, and solving mathematical problems. This can be confirmed in the following interview transcript in Table 5.

**Table 5.** Interview Results of the Second Subject of Students with High Learning Independence (SKT2)

| | | |
|---|---|---|
| P | : | *Try to explain what is known and asked from the problem!* |
| SKT2 | : | *You are given a durian garden in the shape of a square with the length of one of its sides* $5x + 3$. *What is asked is how to draw it, what is the perimeter, what is the area and what is the area and perimeter if* $x = 4$. |
| P | : | *How do you turn it into a mathematical model?* |
| SKT2 | : | *Because the perimeter of the square is* $4 \times$ *the side so I can write it as* $4 \times (5x + 3)$, *as well as if using the square area formula which is side×side means* $(5x + 3) \times (5x + 3)$. |
| P | : | *Explain how you solve the problem until the conclusion stage!* |
| SKT2 | : | *Because it has been converted into mathematical form so I just need to multiply it. So I get the answer which is the perimeter* $20x + 12$, *the area is* $25x^2 + 30x + 9$, *then if* $x = 4$ *then the perimeter becomes 92 and the area becomes 529.* |
| P | : | *How can you make a picture of the problem?* |
| SKT2 | : | *Because the question has mentioned that the durian garden is square, so I drew a square with a side length of* $5x + 2$. |

Based on the interview findings, subject SKT2 demonstrates a strong command of mathematical literacy. SKT2 effectively comprehends and articulates both the given information and the problem's requirements. Additionally, SKT2 provides clear explanations for constructing a mathematical model of the problem, elucidates the steps taken to solve the problem and reach a conclusion, and articulates the rationale behind creating a visual representation of the problem. These abilities highlight SKT2's comprehensive understanding and proficiency in mathematical literacy. Therefore, in solving problem number 2 by the second subject of students with high learning independence (SKT2), it is concluded that it fulfills the indicators (1) Communication, (2) Mathematising, (3) Representation, (4) Reasoning and argument, (5) devising strategies for solving problems, (6) Using symbolic, formal, and technical language and operations, and (7) Using mathematical tools.

***Mathematical Literacy of Students with Moderate Learning Independence***

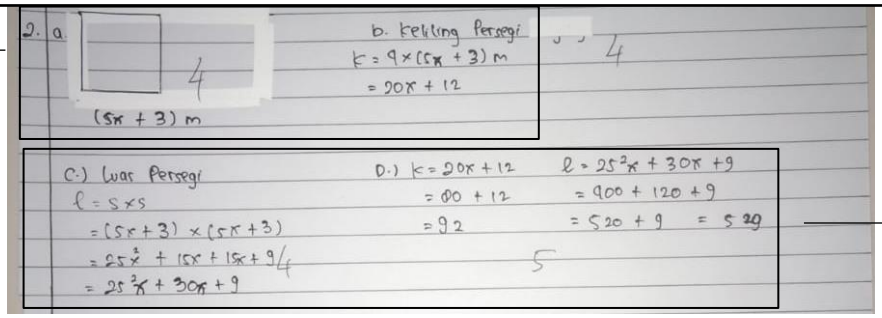
The first subject (SKS1) and the second subject (SKS2) students with moderate learning independence fulfill all components of mathematical literacy well, namely representation, reasoning and argument, devising strategies for solving problems, using symbolic formal and technical operations, and using mathematical tools. However, it is quite good in several components, namely communication, mathematising.

From Figure 3, it is evident that both subjects (SKS1) with moderate learning independence effectively comprehend and accurately record both the given and


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

unknown information from the problem. Additionally, they adeptly illustrate the problem through correct visual representations.

Subject accurately record both the given and unknown information from the problem and adeptly illustrate the problem




Subject successfully formulate a mathematical model of the problem and draw

**Figure 3.** Answers of the First Subject of Students with Moderate Learning Independence (SKS1)

Furthermore, they successfully formulate a mathematical model of the problem and draw accurate conclusions based on the given information. This demonstrates their proficiency in understanding, analyzing, and solving mathematical problems. This can be confirmed in the following interview transcript (Table 6):

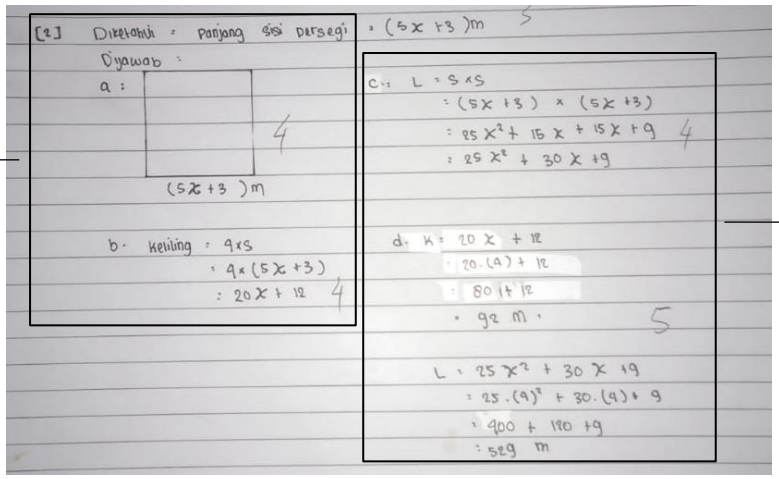
**Table 6.** Interview Results of the First Subject of Moderate Learning Independence Students (SKS1)

| | | |
|---|---|---|
| P | : | *Try to explain what is known and asked from the problem!* |
| SKS1 | : | *The length of one side of the durian garden is* $5x + 3$. *Asked how the picture, how much is the perimeter, how much is the area and how much is the area and perimeter if* $x = 4$. |
| P | : | *How do you turn it into a mathematical model?* |
| SKS1 | : | *Because the square area formula is side × side so I can write it as* $(5x + 3) \times (5x + 3)$. |
| P | : | *Explain how you solve the problem until the conclusion stage!* |
| SKS1 | : | *Because the perimeter of the square is* $4 \times (5x + 3)$ *so* $4 \times 5x$ *plus* $4 \times 3$ *is the perimeter* $20x + 12$, *the same goes for the area. So I get the result that the perimeter is* $20x + 12$, *the area is* $25x^2 + 30x + 9$, *then for part (d) I replace* $x = 4$ *then the perimeter becomes 92 and the area becomes 529.* |
| P | : | *How can you make a picture of the problem?* |
| SKS1 | : | *I just drew a square with the length as mentioned in the problem.* |

Based on the interview findings, subject SKS1 demonstrates a strong command of mathematical literacy. SKS1 effectively comprehends and articulates both the given information and the problem's requirements. Additionally, SKS1 provides clear explanations for constructing a mathematical model of the problem, elucidates the steps taken to solve the problem and reach a conclusion, and articulates the rationale

behind creating a visual representation of the problem. These abilities highlight SKS1's comprehensive understanding and proficiency in mathematical literacy. Therefore, in solving problem number 2 by the first subject of students with moderate learning independence (SKS1), it is concluded that it fulfills the indicators (1) Communication, (2) Mathematising, (3) Representation, (4) Reasoning and argument, (5) devising strategies for solving problems, (6) Using symbolic, formal, and technical language and operations, and (7) Using mathematical tools.

subject adeptly comprehends and accurately records both the given and unknown information from the problem. Additionally, the subject effectively illustrates the problem through a correct visual




subject successfully formulates a mathematical model of the problem and draws accurate conclusions based on the given information. This demonstrates the subject's proficiency in understanding, analyzing, and solving mathematical problems

**Figure 4.** Answer of the Second Subject Moderate Learning Independence Student (SKS2)

From Figure 4, it is evident that the subject adeptly comprehends and accurately records both the given and unknown information from the problem. Additionally, the subject effectively illustrates the problem through a correct visual representation. Furthermore, the subject successfully formulates a mathematical model of the problem and draws accurate conclusions based on the given information. This demonstrates the subject's proficiency in understanding, analyzing, and solving mathematical problems. This can be confirmed in the following interview transcript (Table 7):

**Table 7.** Interview Results of the Second Subject of Moderate Learning Independence Students (SKS2)

| | | |
|---|---|---|
| P | : | *Try to explain what is known and asked from the problem!* |
| SKS2 | : | *The length of one side is* $5x + 3$. *It is asked how the picture, how much is the perimeter, how much is the area and if* $x = 4$ *how much is the area and perimeter if* $x = 4$. |
| P | : | *How do you turn it into a math model?* |
| SKS2 | : | *I put the numbers in the formula so for the area of a square, it is* $side \times side$ *so I can write it as* $(5x + 3) \times (5x + 3)$, *as well as the perimeter.* |
| P | : | *Explain how you solved the problem until the conclusion stage!* |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| | | |
|---|---|---|
| SKS2 | : | *Because everything is already in the form of a mathematical model, so I just do the multiplication operation as learned in the previous meeting such as the perimeter of the square is* $4 \times (5x + 3)$ *so* $4 \times 5x$ *plus* $4 \times 3$ *is the perimeter* $20x + 12$*, as well as for the area.* |
| P | : | *How can you make a picture of the problem?* |
| SKS2 | : | *I drew a square whose length is* $5x + 3$ |

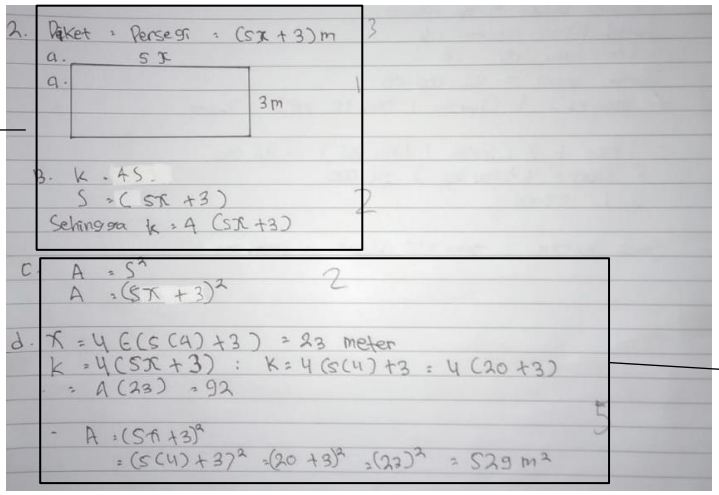
Based on the interview findings, subject SKS2 demonstrates a strong understanding of mathematical problem-solving. SKS2 effectively comprehends and explains both the given information and the problem's requirements. Additionally, SKS2 provides clear explanations for constructing a mathematical model of the problem, elucidates the steps taken to solve the problem and reach a conclusion, and articulates the rationale behind creating a visual representation of the problem. These abilities highlight SKS2's comprehensive understanding and proficiency in mathematical literacy. Therefore, in solving problem number 2 by the second subject of students with moderate learning independence (SKS2), it is concluded that it fulfills the indicators (1) Communication, (2) Mathematising, (3) Representation, (4) Reasoning and argument, (5) devising strategies for solving problems, (6) Using symbolic, formal, and technical language and operations, and (7) Using mathematical tools.

***Mathematical Literacy of Students with Low Learning Independence***

The first subject (SKR1) and the second subject (SKR2) students with low learning independence did not fulfill the components of mathematical literacy. From Figure 5, it is apparent that the subject faces challenges in comprehending and accurately recording both the given and unknown information from the problem. Additionally, the subject struggles to illustrate the problem accurately through visual representation and formulate a mathematical model effectively. Furthermore, the subject encounters difficulties in drawing accurate conclusions based on the given information. These challenges suggest areas where the subject may require additional support and guidance in understanding and solving mathematical problems effectively.

This can be confirmed in the following interview transcript in Table 8. Based on the interview finding in Table 8, subject SKR1 encounters difficulties in understanding and explaining both the given information and the problem's requirements. Additionally, SKR1 struggles to provide explanations for constructing a mathematical model of the problem and elucidating the steps taken to solve the problem and reach a conclusion. These challenges suggest areas where SKR1 may require additional support and guidance in comprehending and effectively solving mathematical problems. The subject was also unable to explain his reasoning in making a picture of the problem. Therefore, in solving problem number 2 by the first subject of students with low learning independence (SKR1), it is concluded that it does not fulfill any indicators.

subject faces challenges in comprehending and accurately recording both the given and unknown information from the problem. Additionally, the subject struggles to illustrate the problem




subject encounters difficulties in drawing accurate conclusions based on the given information. These challenges suggest areas where the subject may require additional support and guidance in understanding and solving mathematical problems effectively

**Figure 5.** Answers of the First Subject of Students with Low Learning Independence (SKR1)

**Table 8.** Interview Results of the First Subject of Students with Low Learning Independence (SKR1)

| | | |
|---|---|---|
| P | : | *Try to explain what is known and asked from the problem!* |
| SKR1 | : | *The length of the side is* $5x + 3$*. It is asked how the picture, how much is the perimeter, how much is the area and if* $x = 4$ *what is the area and perimeter.* |
| P | : | *How do you turn it into a mathematical model?* |
| SKR1 | : | *I don't know sir, I just saw my friend's answer.* |
| P | : | *Explain how you solve the problem until the conclusion stage!* |
| SKR1 | : | *I only got the answer from my friend sir* |
| P | : | *How can you make a picture of the problem?* |
| SKR1 | : | *I drew a rectangle whose length is* $5x$ *and width is 3.* |

From Figure 6, it is evident that the subject encounters challenges in comprehending and accurately recording both the given and unknown information from the problem. Additionally, the subject struggles to illustrate the problem accurately through visual representation and formulate a mathematical model effectively. Furthermore, the subject faces difficulties in drawing accurate conclusions based on the given information. These challenges suggest areas where the subject may require additional support and guidance in understanding and solving mathematical problems effectively. This can be confirmed in the following interview transcript:

Based on the interview findings in Table 9, subject SKR2 experiences challenges in understanding and explaining both the given information and the problem's requirements. Additionally, SKR2 struggles to provide explanations for constructing a mathematical model of the problem and elucidating the steps taken to solve the problem and reach a conclusion. These challenges indicate areas where SKR2 may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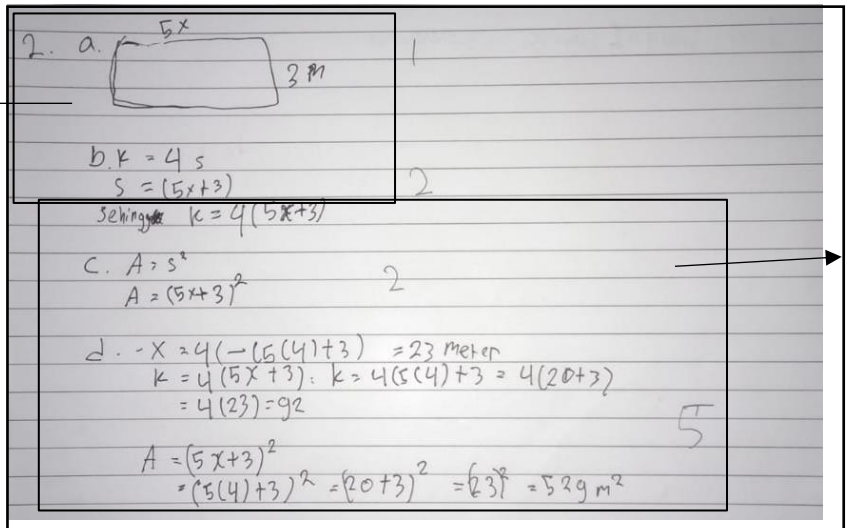
**p-ISSN 2477-409X, e-ISSN: 2549-9084**

require additional support and guidance in comprehending and effectively solving mathematical problems. The subject was also unable to explain the reason for making a picture of the problem. Therefore, in solving problem number 2 by the second subject of students with low learning independence (SKR2), it is concluded that it does not fulfill any indicators.

subject encounters challenges in comprehending and accurately recording both the given and unknown information from the problem. Additionally, the subject struggles to illustrate the problem accurately through visual representation and formulate a mathematical model effectively




subject faces difficulties in drawing accurate conclusions based on the given information. These challenges suggest areas where the subject may require additional support and guidance in understanding and solving mathematical problems effectively

**Figure 6.** Answers of the Second Subject of Students with Low Learning Independence (SKR2)

**Table 9.** Interview Results of the Second Subject of Students with Low Learning Independence (SKR2)

| | | |
|---|---|---|
| P | : | *Try to explain what is known and asked from the problem!* |
| SKR2 | : | *The durian garden is square. It is asked how to draw, what is the perimeter, how much is the area and if* $x = 4$ *what is the area and perimeter.* |
| P | : | *How do you turn it into a mathematical model?* |
| SKR2 | : | *I don't know sir* |
| P | : | *Explain how you solve the problem until the conclusion stage!* |
| SKR2 | : | *I saw my friend's answer sir* |
| P | : | *How can you make a picture of the problem?* |
| SKR2 | : | *I saw my friend draw a rectangle so I followed him.* |

### *Data Validity*

**Table 10.** Triangulation Technique

| Component | High Learning Independence (SKT1 and SKT2) | Moderate Learning Independence (SKS1 and SKS2) | Low Learning Independence (SKR1 and SKR2) |
|---|---|---|---|
| Communication | the subject fulfills the communication component | the subject fulfills the communication component | the subject did not fulfill the |

| Component | High Learning Independence (SKT1 and SKT2) | Moderate Learning Independence (SKS1 and SKS2) | Low Learning Independence (SKR1 and SKR2) |
|---|---|---|---|
| | | | communication component |
| Mathematising | the subject fulfills the mathematising component | the subject fulfills the mathematising component | the subject did not fulfill the mathematising component |
| Representation | the subject fulfills the representation component | the subject fulfills the representation component | the subject did not fulfill the representation component |
| Reasoning and argument | the subject fulfills the reasoning and argument component | the subject fulfills the reasoning and argument component | the subject did not fulfill the reasoning and argument component |
| Devising strategies for solving problems | the subject fulfills the devising strategies for solving problems component | the subject fulfills the devising strategies for solving problems component | the subject did not fulfill the devising strategies for solving problems component |
| Using symbolic, formal and technical language and operation | the subject fulfills the using symbolic, formal and technical language and operation component | the subject fulfills the using symbolic, formal and technical language and operation component | the subject did not fulfill the using symbolic, formal and technical language and operation component |
| Using mathematical tools | the subject fulfills the using mathematical tools component | the subject fulfills the using mathematical tools component | the subject did not fulfill the using mathematical tools component |

Based on Table 10 we know that Both subjects, SKT1 and SKT2, who exhibit high levels of learning independence, demonstrate proficiency in all components of mathematical literacy. This is in line with research conducted by Wijayanti and Wardono (2020) that students with high learning independence fulfill all components of mathematical literacy with good criteria. Both subjects, SKS1 and SKS2, who demonstrate moderate levels of learning independence, demonstrate proficiency in several components of mathematical literacy. However, they exhibit room for improvement in communication and mathematising components. Overall, they display solid competency in mathematical literacy, with opportunities for further development in specific areas. This is in line with research conducted by Iir Amelia et al (Amelia et al., 2023) that students with moderate learning independence fulfill all components of

mathematical literacy well. However, it is quite good in several components. Both subjects, SKR1 and SKR2, who exhibit low levels of learning independence, do not fulfill the components of mathematical literacy. This suggests a need for additional support and guidance to enhance their mathematical literacy skills.

## Conclusion

Based on the research findings and discussion, the following conclusions can be drawn regarding the characteristics of students' mathematical literacy based on their level of learning independence: 1) Students classified as having high learning independence demonstrate proficiency in all components of mathematical literacy; 2) Students categorized as having moderate learning independence exhibit competence in all components of mathematical literacy, albeit with some areas showing room for improvement; 3) Students classified as having low learning independence do not meet the requirements for mathematical literacy across all components. These conclusions underscore the significant impact of learning independence on students' mathematical literacy levels, highlighting the importance of fostering self-regulated learning skills to enhance mathematical proficiency. Based on this study, the researcher suggests: 1) Teachers should focus on students' learning independence in mathematics due to variations in how students absorb material; 2) Incorporating problems that enhance mathematical literacy in lessons is essential for improving students' skills; 3) Further research is needed to quantify each level of learning independence to guide curriculum development, acknowledging diverse student learning methods.

## Acknowledgement

We would like to express our deepest gratitude to Semarang State University for supporting the completion of this article. We also thank the lecture who have helped and contributed to this research.

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