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Numeracy literacy of junior high school students in implementing the Merdeka mathematics learning curriculum

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***Abstract*:**
Numeracy literacy skills play a crucial role in the Independent Learning Curriculum. Currently, students' literacy skills are geared towards more independent learning. With these skills, students can solve problems accurately and develop critical thinking towards their challenges. This study aims to evaluate students' abilities in numeracy literacy in the era of more independent learning. This study focuses on eighth-grade students at SMP Muhammadiyah 1 Probolinggo, consisting of 28 students who have followed the Independent Curriculum. This study uses a qualitative descriptive method, collecting data through written tests with five questions encompassing various aspects of numeracy literacy skills. Indicators for numeracy literacy skills include (1) Using numbers and mathematical symbols to solve everyday problems; (2) Analyzing information in various forms (graphs, tables, etc.; and (3) Interpreting analysis results to predict, formulate, and make decisions. Data were analyzed by calculating the average percentage for each indicator of numeracy literacy skills. The analysis results show that the numeracy literacy skills of junior high school students in the era of independent learning are still at a low level.

Keywords: Numeracy literacy; Mathematics learning; Merdeka curriculum; Merdeka mathematics learning curriculum.

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Introduction

Both national and international education quality emphasizes quality learning, as evidenced by government policies such as curriculum development. What children learn in school becomes valuable in honing their skills. This emphasis aligns with the Sustainable Development Goals of 2015. It aims to ensure inclusive and equitable education and promote lifelong learning opportunities for all. This statement aligns with another that states that by 2030, all children, youth, and adults, both men and women, should achieve proficiency in literacy and numeracy (Assembly, 2015). Therefore, it is not without reason that the government continuously makes efforts to develop the existing educational curriculum in Indonesia, hoping to improve the quality of education

in Indonesia and enhance the literacy and numeracy skills of the nation's future generation (Piper et al., 2018).

Mathematics development in students is influenced by crucial activities such as learning by doing or discovering independently, allowing students to understand and utilize their skills and abilities in learning. These activities can impact students' literacy (Trickett et al., 2022). Literacy in learning plays an essential role as it is a fundamental skill in education, both in reading and numeracy literacy. In Indonesia, reading and numeracy literacy are prerequisites for progressing to higher levels of education, and delays in these literacies can hinder students' achievements and development. A country's literacy lag can significantly contribute to poverty, requiring more attention from the government to address these issues (Musliman et al., 2013).

Numeracy skills involve the use of various numbers and mathematical symbols to solve everyday problems and the ability to decipher information from multiple forms of representation, such as tables, graphs, or other diagrams. Moreover, numeracy also includes the expertise to apply mathematical logic, translate mathematical concepts, and apply these principles in everyday life (Rifatul Jannah & Habiby, 2022).

One solution implemented by the Indonesian government is refining the curriculum to become an Independent Curriculum, realized in 2021. The curriculum development aims to address the shortcomings of the previous K13 curriculum and improve the quality of Indonesian education since the curriculum is central to education (Siregar, 2021). The Independent Curriculum aims to transfer knowledge and accommodate students' varied skills and abilities to create active and creative learning environments in the classroom (Aprima & Sari, 2022). Implementing the Independent Curriculum faces challenges in its process due to new concepts that need to be quickly understood by educators, requiring time for adjustment. One such change is the shift from Core Competencies and Basic Competencies, previously the main targets in learning, to Learning Outcomes (CP) in the Independent Curriculum. CP continuously combines knowledge, skills, and attitudes to build holistic competencies. As a result, learning assessments must follow the established CP standards.

Compared to previous versions, the Independent Curriculum stands out with its more straightforward, essential, independent, relevant, and actively interactive structure and content. The prioritized materials are more critical and in-depth according to students' developmental stages, avoiding content overload. Additionally, the new approach in the Independent Curriculum allows schools to implement collaborative learning models across subjects and create comprehensive assessments across subjects, such as through project-based assessments. However, the primary focus is that this learning approach is designed and implemented engagingly and enjoyably (Nurcahyono & Putra, 2022).

The implementation of the Independent Curriculum is based on the analysis of Indonesia's PISA results from previous years, which was last conducted in 2018. The study shows that the average scores of Indonesian students are still far below the OECD average (OECD, 2019). It is due to students' habits during the learning process that focus more on learning outcomes rather than the learning process itself. PISA primarily focuses on reading, mathematical, and scientific literacy, with PISA questions requiring students' reasoning and numeracy skills. Therefore, using the Independent Curriculum in mathematics learning is expected to improve the previous curriculum and enhance students' numeracy literacy.

School students do not commonly encounter the questions used in the PISA tests. These questions measure problem-solving skills, the ability to express opinions, and communication skills (Hidayati et al., 2020). Therefore, it is a new task for the government and teachers to create learning to equip students with problem-solving skills in education and daily life (Wartini et al., 2018). Students can master these skills with good literacy and numeracy skills (Wulandari et al., 2023).

In addition to PISA analysis results, research by Jannah and Habiby (2022) shows that students have not optimally achieved literacy. Due to various factors, such as learning orientations that focus more on outcomes without prioritizing the learning process and the lack of differentiated learning, students are worsened during the COVID-19 pandemic when the learning process was conducted online. Teachers' readiness to innovate in educational technology was not optimal. The lack of facilities and infrastructure to support online learning also contributed to the decline in the quality of education in Indonesia.

The Independent Learning policy is a concrete step by the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) to improve students' reading and numeracy skills. Efforts to strengthen literacy and numeracy aim to expand the learning environment in schools by creating environments rich in various texts and emphasizing logical thinking skills and modeling processes in problem-solving (Dewayani et al., 2021). It is essential to cultivate literacy habits early in students, especially in numeracy, to have a strong foundation in the learning process, not just focusing on results but having sufficient basic knowledge (Fitria et al., 2023). Reading and writing proficiency affects individual development and contributes significantly to social and economic growth and well-being. Developing quality in applying mathematics to other life contexts, such as economics, society, engineering, science, etc., can provide quality competitiveness and enhance economic well-being (Han et al., 2017).

This study aims to analyze the quality of mathematics learning in students' numeracy literacy skills at SMP Muhammadiyah 1 Probolinggo after implementing the Independent Mathematics Learning Curriculum. This school was selected because SMP Muhammadiyah 1 Probolinggo is one of the private schools implementing the Independent Curriculum. Additionally, previous studies have been conducted in public schools; therefore, this research focuses on private schools with the hope that the results can provide information to various parties such as schools, teachers, and researchers for follow-up in the learning process to continuously develop the quality of mathematics learning according to the needs of the times and follow up to improve students' numeracy literacy skills. This research is essential to evaluate the implementation of the Independent Mathematics Learning Curriculum in students' numeracy literacy skills.

This study is relevant to the research conducted by Feriyanto (2022), which states that strategies to enhance students' numeracy literacy skills can include providing facilities that support the improvement of numeracy literacy skills and collaboration between elements in the school, such as teachers, principals, students, and even parents. Parents can assist and facilitate teachers and students and supervise and guide students' use of digital media. Meanwhile, the research conducted by Khoirunnisa and Adirakasiwi (2023) indicates that the analysis carried out in middle schools in Karawang Regency has not yielded satisfactory results because the average numeracy literacy skills of students are still low. This is because various parties are still adapting to the Independent Curriculum, and thus, its implementation has not been perfect.

Additionally, the research conducted by Yayuk et al. (2023) reveals that not all teachers fully understand the Independent Curriculum, resulting in some difficulties in its application, particularly in implementing differentiated learning. Some students struggle with literacy, such as reading skills, and some find it challenging to learn numeracy, especially in arithmetic. Several suggestions for implementing this program include forming teacher working groups (KKG) for collaborative learning related to developing Independent Curriculum learning tools using various innovative learning models and integrating differentiated learning.

This research was conducted in Probolinggo to review and analyze the effect of the Independent Mathematics Learning Curriculum implementation at a private middle school level on students' numeracy literacy skills. It is a follow-up study to previous research, considering that the Independent Mathematics Learning Curriculum has been implemented for quite some time. The results of this study are expected to provide an overview of the implementation of the Independent Mathematics Learning Curriculum at the middle school level in Probolinggo and take follow-up actions to improve students' numeracy literacy skills.

Specifically, the difference between this study and previous research is that this study analyzes the implementation of the Independent Mathematics Learning Curriculum on numeracy literacy skills at the private middle school level, namely SMP Muhammadiyah 1 Probolinggo, thus representing different research subjects compared to previous studies. Previous studies typically focused on public schools, so there is a lack of discussion on numeracy literacy skills in private schools. The selection of middle school-level subjects is appropriate because PISA questions are also tested on middle school students, allowing an assessment of the progress of the Independent Curriculum projected for participation in PISA questions. After a Google Scholar search, it was found that no research in Probolinggo related to students' numeracy literacy skills after implementing the Independent Curriculum. Therefore, the results of this study are expected to provide an overview, evaluation, and follow-up actions for improvements or habits that can support students' numeracy literacy skills in middle schools in Probolinggo, particularly private schools.

Research Methods

This research is a qualitative study employing a descriptive method. Descriptive research describes or interprets an object according to reality as it is, where the researcher aims to reveal students' numeracy and literacy skills after implementing the Independent Mathematics Learning Curriculum in schools (Lailatus Syarifah, 2017). The technique for selecting subjects in this study is saturated sampling. Saturated sampling is a technique for collecting subjects that uses the entire population as research subjects. The analysis focuses on students' responses to numeracy literacy skills, involving the explanation of mathematical concepts and the ability to solve related problems. This study involves 28 students from grade VIII at SMP Muhammadiyah. The school was selected due to the implementation of the Independent Curriculum there, and purposive sampling was used to select the sample based on recommendations from subject teachers and the average student scores (Lenaini, 2021). The instrument used was a written test consisting of three validated questions, covering aspects such as (1) the ability to use various numbers and symbols related to basic mathematical operations to solve real-life situations; (2) skills in analyzing information from various forms (graphs,

tables, charts, diagrams, etc.); and (3) interpretation of analysis results to make predictions, formulations, and decisions (Fitriana, 2022). The method used in analyzing students' responses is based on the views expressed by Asrul and Rosnita (2014).

$$P = \frac{f}{N} x\ 100\%$$

The formula explains that P represents the percentage of student errors, f reflects the value obtained, and N describes the maximum or ideal score. Meanwhile, the data interpretation interval for the numeracy literacy test results used in this research is

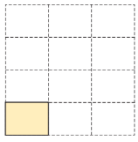
Table 1. The data interpretation interval for the numeracy literacy

Percentage	Interpretation
90% ≤ N ≤ **1**00%	Very high
70% ≤ N < 90%	High
50% ≤ N < 70%	Currently
30 ≤ N < 50%	Low
10% ≤ N < **3**0%	Very Low

The data collection technique in this study is in-depth interviews with students to understand their perceptions and experiences in learning mathematics with the Independent Curriculum. Additionally, direct classroom observations were conducted to see how the Independent Mathematics Learning Curriculum is implemented. Test questions aligned with numeracy literacy indicators were given as a data collection tool to analyze students' numeracy literacy skills. The technique for concluding is based on an in-depth analysis of the results of interviews, classroom observations, and analysis of students' answers to the given essay tests.

Table 2. The following table presents the test indicators and test questions that serve as instruments in this study

No.	Indicator Questions	Test Questions
1	The ability to use various numbers and symbols related to basic mathematical operations to solve real-life situations	The total ticket price for an art museum in Japan is 1,550 yen for one adult and three middle school students and 2,750 yen for two adults and five middle school students. Find the ticket price for each adult and one middle school student!
2	Skills in analyzing information from various forms (graphs, tables, charts, diagrams, etc.)	A rectangle has a perimeter of 28 cm. If we place 4 of these rectangles vertically and three rectangles horizontally, we will obtain a square. Find the length and width of the rectangle!



No.	Indicator Questions	Test Questions
3	Interpretation of analysis results to make predictions, formulations, and decisions	In 1990, the cost of a stamp to send a letter was Rp. 15,000. I used seven stamps consisting of one thousand and stamps worth Rp. 3.000. Find how many stamps are worth Rp. 1.000 and Rp. 3.000 were used!

Results and Discussions

Research result

Based on research conducted at SMP Muhammadiyah 1 Probolinggo with 28 students, data was obtained on students' numeracy literacy skills in mathematics learning using the Independent Curriculum, with the instrument used being essay tests that include numeracy literacy indicators. All students' complete data was recorded according to the research results.

Table 3. Obtaining Overall Student Data

Analysis	Mark
The number of students	28
Average	45,27
Standard Deviation	17,87
Maximum Value	85
Minimum Value	10

Data from the research using tests showed that the average student score was 45.27, with a standard deviation (indicating data distribution) of 17.87. The highest score achieved by students was 85, while the lowest score was 10. Table 4 below shows the percentage of students' numeracy literacy skills.

Table 4. Percentage of Numeracy Literacy Test Results Data

Percentage	Many Students	Interpretation
93%	2	Very high
83%	5	high
50%	11	Currently
31%	6	Low
13%	4	Very low

Table 4 above shows that the numeracy literacy skills of SMP Muhammadiyah students are in the medium and low categories. The medium category comprises 11 students, while the low category comprises six students. To complement this research, Table 5 shows the average accomplishment based on numeracy literacy ability markers.

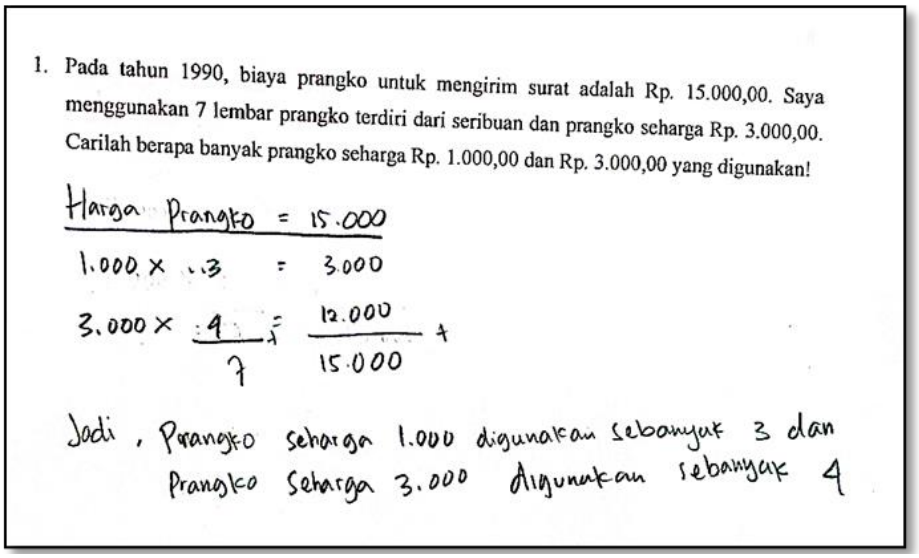
Table 5. Indicators of numeracy literacy abilities

Indicator	Percentage	Interpretation
The ability to use various numbers and symbols related to basic mathematical operations to solve real-life situations	45%	Medium
Skills in analyzing information from various forms (graphs, tables, charts, diagrams, etc.)	35%	Low
The interpretation of analytical data is used to develop forecasts, formulations, and judgments.	20%	Low
Average	34	Low

Based on the table, it is known that the first indicator obtained 45%, which means that the students' numeracy literacy ability is in the medium category. Indicator 2 is also in the low category, as is indicator 3. Therefore, the results of student achievement based on the indicator of numeracy literacy ability at SMP Muhammadiyah are in the low category. The results of classroom observation during the mathematics learning process show that the teacher has endeavored to enrich the numeracy literacy of the students in various ways, such as providing literature in the classroom, conducting mathematics learning using enjoyable models and methods, and using games during the learning process to prevent students from getting bored. However, due to the ongoing adaptation process, students are not yet accustomed to it; thus, the results of the descriptive tests given by the researcher are not optimal.

Discussions

Based on the findings from the conducted research, students' numeracy literacy skills will be classified into five categories: very high, high, moderate, low, and very low. Subsequently, an analysis of student responses in solving numeracy literacy-related problems will be presented.


1. Pada tahun 1990, biaya prangko untuk mengirim surat adalah Rp. 15.000,00. Saya menggunakan 7 lembar prangko terdiri dari seribuan dan prangko seharga Rp. 3.000,00. Carilah berapa banyak prangko seharga Rp. 1.000,00 dan Rp. 3.000,00 yang digunakan!

Harga Prangko = 15.000

1.000 × 3 = 3.000

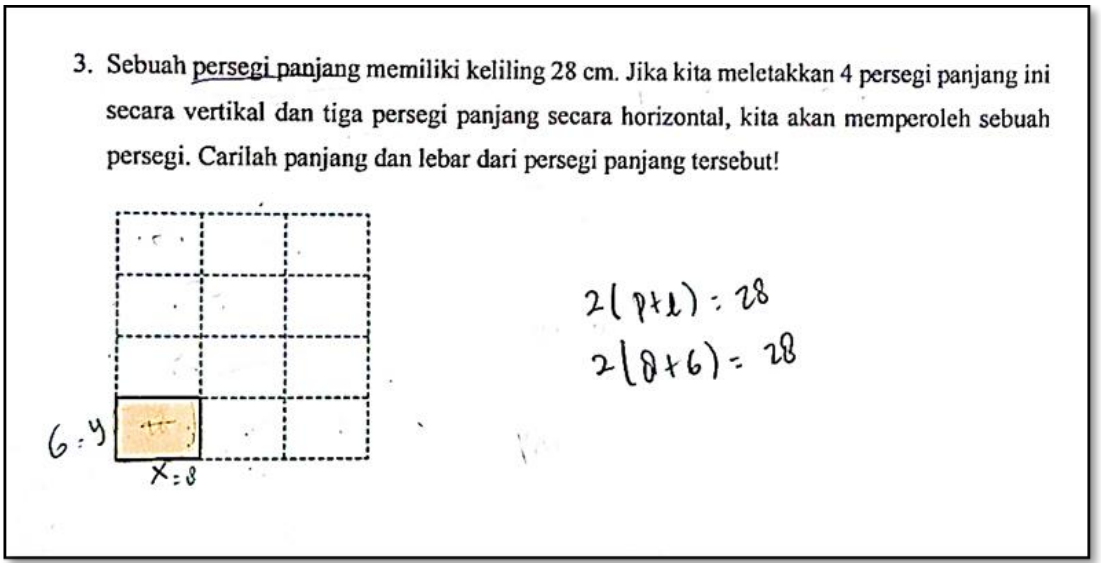
3.000 × 4 = 12.000

7 15.000 +

Jadi, Prangko seharga 1.000 digunakan sebanyak 3 dan Prangko seharga 3.000 digunakan sebanyak 4

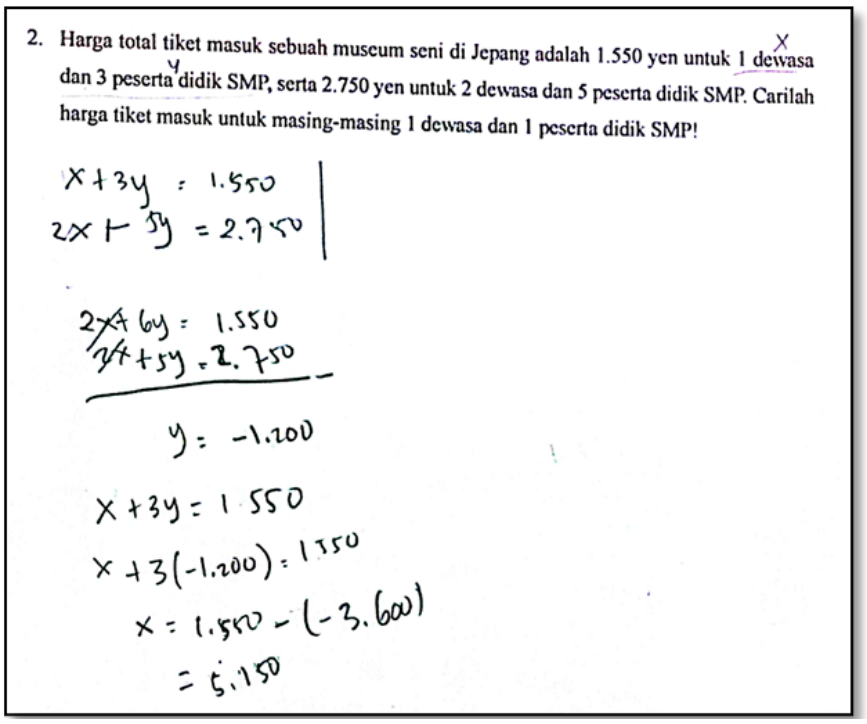
Picture 1. Very High Category Student Answers

Based on the analyzed student responses, two out of 28 students were classified as having very high literacy numeracy skills. Picture 1 above is an example of a student with very high numeracy literacy skills. The student can answer questions correctly and recognize solutions to problems using symbols and mathematical concepts to solve everyday situations. Furthermore, from the student's answer, it can be analyzed that the student can interpret the problem, decide which method to use, and formulate solutions to obtain the correct answer, providing accurate information or a proper conclusion. In the student's solution, they successfully found more than one solution, namely three stamps priced at 1,000 and 4 stamps priced at 3,000, totaling seven stamps and a total price of 15,000. It can be seen that students with high literacy skills can identify the meaning of the given problem and decide to use an appropriate method to find the correct solution.



Picture 2. High Category Student Answers

Based on the analysis of student abilities, 5 out of 28 students are categorized as high. High-level numeracy literacy skills of students can be analyzed from one student's response, as shown in the above image. Students with high categories can solve the given problems correctly, although not elaborated in detail, and they can analyze the given figure to obtain information and make decisions. The students' calculations and answers are correct, meaning the student can understand the given problem and analyze the figure correctly. The drawback is that the student did not mention or write down the details before the working process. It indicates that the student cannot


2. Harga total tiket masuk sebuah museum seni di Jepang adalah 1.550 yen untuk 1 dewasa dan 3 peserta didik SMP, serta 2.750 yen untuk 2 dewasa dan 5 peserta didik SMP. Carilah harga tiket masuk untuk masing-masing 1 dewasa dan 1 peserta didik SMP!

$x + 3y = 1.550$
$2x + 5y = 2.750$

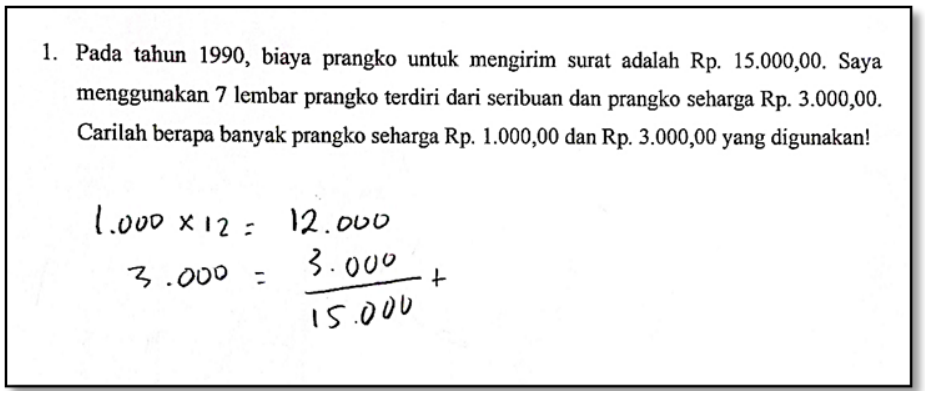
$2x + 6y = 1.550$
$2x + 5y = 2.750$ −

$y = -1.200$

$x + 3y = 1.550$
$x + 3(-1.200) = 1.550$
$x = 1.550 - (-3.600)$
$= 5.150$

Picture 3. Medium Category Student Answers

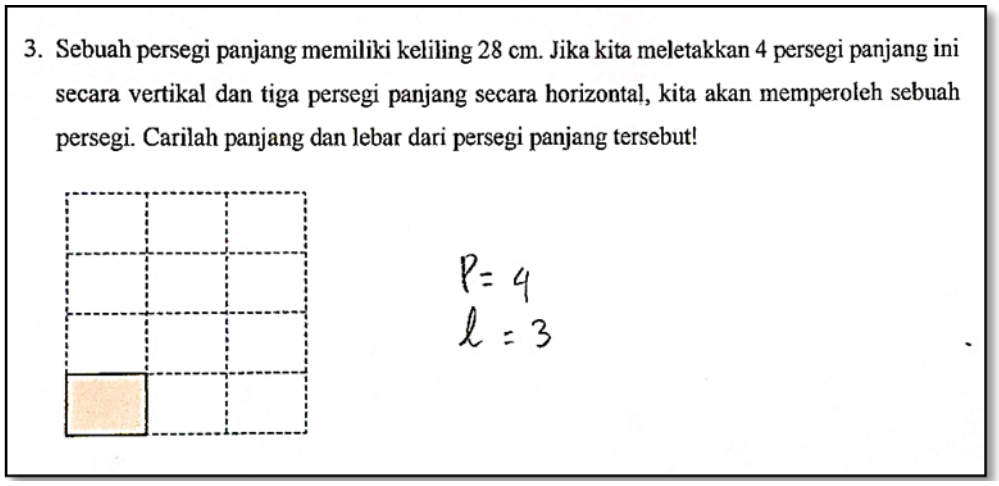
Based on the analysis conducted, there are 11 out of 28 students classified as moderate in numeracy literacy skills. The average error of students in this category is calculation errors. One example is the student's work above, where from their answer, it is seen that the student cannot perform calculations correctly. Although the process is correct, the student has not met the standard for the ability to use various numbers and symbols related to basic mathematical operations in solving everyday problems. The student makes calculation errors even though the process is correct, but it does not produce the correct answer. It is seen that the student answered the question incorrectly by making inaccurate calculations. In this case, the student used the elimination method without multiplying the number 1,550 by the number 2. It is consistent with the findings of Sari and Aini (2022) that students often make calculation errors, resulting in less accurate answers. Thus, it can be concluded that students in the moderate category have not fully met the criteria for numeracy literacy skills.


1. Pada tahun 1990, biaya prangko untuk mengirim surat adalah Rp. 15.000,00. Saya menggunakan 7 lembar prangko terdiri dari seribuan dan prangko seharga Rp. 3.000,00. Carilah berapa banyak prangko seharga Rp. 1.000,00 dan Rp. 3.000,00 yang digunakan!

$1.000 \times 12 = 12.000$
$3.000 = 3.000$ +
15.000

Picture 4. Low-Category Student Answers

The evaluation of students' abilities in the low category shows that 6 out of 28 students are in this category. Generally, students' mistakes in this category lie in their inability to use various numbers and symbols related to basic mathematics to solve everyday problems and their ability to interpret analysis results to make predictions, formulate, and make decisions. From the analyzed student responses, it is seen that students cannot explain the given problems well; thus, they cannot perform accurate calculations. The answer totals 15,000, as narrated in the question. However, when the number of stamps is added, it is not seven sheets but 13 sheets, indicating that the students do not understand the given problem; hence, the decision is less accurate.



Picture 5. Very Low Category Student Answers

From the analysis, it is found that 4 out of 28 students categorized as very low. The mistakes made by students in this category include their inability to meet all indicators of numeracy literacy skills. The student's answer above shows that they cannot analyze the given problem and cannot use numbers/symbols and mathematical operations to solve the given problems. Therefore, the decision is not based on the knowledge possessed; the answer is incorrect and cannot provide accurate information/conclusion. Thus, it can be concluded that students in the deficient category have not fully met the criteria for numeracy literacy skills in three aspects (Rezky et al., 2022), namely mastery in using various types of numbers and symbols related to basic mathematical operations to solve problems in daily life, the ability to analyze information in multiple formats (graphs, tables, diagrams, etc.), and also the ability to interpret analysis results to predict, formulate, and make decisions.

In this study, the average ability of students in numeracy literacy for each indicator is strengthened by student responses. The results of the analysis show that students still have difficulty understanding the problems and interpreting them into mathematical forms. This finding aligns with previous studies by Sudirman et al. (2018), which stated that students face obstacles in solving story problems due to a lack of carefulness and accuracy in reading, understanding, and interpreting sentences.

Additionally, students pay less attention to writing down what is known in the question, what is asked, and how the solution process is. Organizing the student's solution process to solve the given problem is essential. Students also struggle to determine strategies to solve problems, meaning they struggle to understand and apply the concepts underlying the questions asked. They struggle to understand the concepts

because they have trouble choosing the right formula to solve problems (Juanti et al., 2021). Furthermore, some student mistakes lie in their ability to analyze information presented in pictures or specific shapes and in translating story problems into visual representations such as pictures, tables, or graphs. One way to improve students' numeracy literacy skills is through innovation in learning that can enhance students' emotional intelligence (Putri et al., 2021).

The findings of this research are relevant to the study by Jannah and Habiby (2022), which states that one of the reasons for the low numeracy literacy skills experienced by students is the lack of exploration by students in solving the problems they face using mathematical knowledge to improve their mathematical literacy skills, as well as their lack of gathering information to find problem-solving strategies that can train students' mathematical literacy. Understanding problems with mathematical literacy is difficult for students because they are not accustomed to simple issues. Additionally, the implementation of Independent Learning in Mathematics has not been fully realized. The numeracy literacy skills of students must be supported by the quality of mathematics learning, which includes the planning, implementation, and evaluation of learning outcomes. The quality of the school influences students' abilities (Chowa et al., 2015). The quality of teaching is paramount in improving students' achievement in mathematical literacy (Retnawati et al., 2018). According to the concept of Independent Learning, especially in mathematics learning, to enhance students' literacy skills, it can be integrated into other learning processes, combining various contexts to improve the quality of learning. The mathematics learning process in the Independent Learning curriculum is developed to help students connect with real-world situations. Therefore, students may find it easier to understand and solve real-world mathematical literacy problems (Nisa & Arliani, 2023).

The results of this research can be used to reinforce previous studies and as an evaluation for follow-up to improve the numeracy literacy skills of students at the junior high school level. This is because comparing numeracy literacy skills predominantly falls within the moderate to lower criteria. Thus, there is a need for habits practiced by students during the mathematics learning process, more innovative activities, enjoyable learning, and Independent Learning integrated with the interests and skills of the students. This research also provides an overview for teachers to continue their efforts to improve the numeracy literacy skills of students.

Conclusion

The results of the research on the analysis of numeracy literacy skills in eighth-grade students at SMP Muhammadiyah Probolinggo in the Independent Learning curriculum show that all aspects of numeracy literacy skills have not been achieved optimally. It can be concluded that students' numeracy literacy skills are still low. Thus, this research becomes a follow-up study from previous research and reinforces that implementing the Independent Learning mathematics curriculum at SMP Muhammadiyah schools has not been fully realized. There needs to be follow-up from various parties, such as educators, school principals, parents, and the community. Educators can implement more innovative, enjoyable mathematics learning and use models and methods in the learning process to support improving students' numeracy literacy skills. It is hoped that implementing the Independent Learning concept can be more effective and enjoyable in enhancing the quality of learning, especially in

mathematics subjects. In future research, it is hoped that exploring numeracy literacy skills in other topics and implementing more effective learning models can be examined to improve numeracy literacy skills, especially in the context of the Independent Learning era.

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