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Analysis of Numeracy Literacy Skills of Grade IV Students on Geometry Materials in Elementary Schools

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ABSTRACT

The research was conducted to describe the numeracy literacy abilities of class IV students in geometry material at SDN Kesatrian 1 Malang City and techniques for solving numeracy literacy questions in geometry material. The type of research is qualitative research with a case study method. The data collection technique goes through two stages: tests and interviews. The data collection instruments used in this research were test questions and interview grids. Data analysis using student test result documents and interview results using the Miles & Huberman model, namely data reduction, presentation and conclusion. Students with high numeracy literacy abilities have communication skills and context mathematization abilities, students with moderate numeracy literacy abilities can choose problem-solving strategies but do not carry out communication skills, and students with low numeracy literacy abilities do not meet the indicators for numeracy literacy abilities. The problem-solving technique students use is the formula for the perimeter and area of a rectangle. This research aims to help teachers organize mathematics learning based on numeracy literacy.

Keywords: Numerical Literacy, Elementary School, Mathematics, Education

ABSTRAK

Penelitian dilakukan untuk mendeskripsikan kemampuan literasi numerasi siswa kelas IV pada materi geometri di SDN Kesatrian 1 Kota Malang, serta teknik penyelesaian soal literasi numerasi materi geometri. Jenis penelitian adalah penelitian kualitatif dengan metode studi kasus. Teknik pengumpulan data melalui dua tahapan, yakni tes dan wawancara. Instrumen pengumpulan data yang digunakan dalam penelitian ini adalah soal tes dan kisi-kisi wawancara. Analisis data menggunakan dokumen hasil tes siswa, serta melakukan analisis hasil wawancara menggunakan model Miles & Humberman yakni reduksi data, penyajian, dan penarikan kesimpulan. Siswa kemampuan literasi numerasi tinggi memiliki kemampuan komunikasi dan kemampuan matematisasi konteks, siswa kemampuan literasi numerasi sedang mempunyai kemampuan memilih strategi memecahkan masalah namun tidak melakukan kemampuan komunikasi, dan siswa kemampuan literasi numerasi rendah tidak memenuhi indikator kemampuan literasi numerasi. Teknik penyelesaian soal yang digunakan siswa adalah rumus keliling dan luas persegi panjang. Implikasi dari penelitian ini adalah membantu guru menyusun pembelajaran matematika berbasis literasi numerasi.

Kata Kunci: Literasi Numerasi, Sekolah Dasar, Matematika, Pendidikan

INTRODUCTION

Numeracy skills are needed in all aspects of life in the home and community. We know that numeracy is used in everyday life, such as building a house, shopping at the market, getting health

information, etc. This requires numeracy, for example, providing graphical and numerical data. Subscribe to DeepL Pro to edit this document. Visit www.DeepL.com/pro for more information. 2 Nevy Iruntyasari, Ni Luh Sakinah Nuraini, and Siti Mas'ula Analysis of Numeracy Literacy Skills of Grade IV Students on Geometry Materials in Elementary School presentations. Primary school students need to master numeracy literacy skills. This ability will give students the ability to process numbers and symbols related to basic mathematics, which solves practical problems in everyday life, followed by analyzing information in various forms and interpreting the results of the analysis in decision-making. (Kemdikbud, 2017). In general, numeracy literacy skills have several main competencies: mathematical thinking and reasoning, mathematical argumentation, mathematical communication, modelling, problem-solving and solving, representation, symbols, and tools and technology. (Rizki & Priatna, 2019).

Several studies related to numeracy literacy have been conducted. Research conducted by Guhl (2019) found that literacy is the main focus of students, including materials in mathematics that need to be mastered by students, namely early math skills such as counting, comparing, classifying, thinking skills, and geometry, which can create a foundation for students in future math skills and success in school. Students must master basic skills before they learn more. Seeing this, geometry is one of the materials that students need to master in numeracy literacy. In this material, students often experience some difficulties. Fauzi & Arisetyawan (2020) found that 4th-grade students of SD Negeri Asmi 033 Bandung City have not been able to state the meaning of terms that represent the concept of flat buildings and have not been able to use ideas and principles in flat building materials. One of the difficulties is caused by the lack of numeracy literacy skills. This is the importance of mastering numeracy literacy because it can require students to master and apply knowledge and encourage students to think mathematically, not just memorize formulas (Hapsari, 2019).

Many students view geometry as a complex subject to learn. Sahara & Nurfauziah (2021) found that one of the difficulties students encounter in flat-sided space building materials is that it is challenging to solve problems and analyze the properties of space buildings. This happens because students have a lack of understanding of geometry concept material, as well as a lack of experience in solving problems. Another factor is that students cannot draw deductive conclusions. Putri & Pujiastuti (2021) found that the difficulties experienced by fifth-grade students while solving problems on building space material are in the process of understanding and identifying information in the situation, which they have been unable to do.

Research related to numeracy literacy geometry material has been done before. Study by (Rezky et al., 2022) stated that junior high school students in grade IX at SMP Negeri 138 Jakarta, students with low numeracy literacy skills have not been able to understand the meaning of the problems presented, students with moderate numeracy literacy skills have not met the indicators of being able to represent and use mathematical symbols and language, and students with high numeracy literacy skills can implement mathematical understanding in solving problems so that they can meet the indicators of numeracy literacy skills. Other research by Irmawati & Ilmah (2022) found that the numeracy literacy skills of fifth-grade students of SDN Saptorenggo 3 Malang are in the medium category. Namely, students have not been able to understand the context of problems

related to everyday life, so students have difficulty reasoning in problem-solving problems. There is also research on numeracy literacy by Sari et al. (2021) found that the ability of fourth-grade students in RT 04 Pasirjaya Tasikmalaya City was low in solving geometry problems on the Minimum Competency Assessment Asesmen Kompetensi Minimum (AKM).

Other research conducted (Rahmawati, 2021) regarding students' numeracy literacy skills is low due to a lack of habituation during learning, where students have the same concept but cannot solve questions in numeracy problems. Other findings by (Ate & Lede, 2022) found that the ability of Class VIII Junior High School Students of St. Josef Freinadementz, Southwest Sumba Regency when working on numeracy literacy questions, was deficient. Other research results (Pulungan, 2022) related to students' numeracy literacy skills on linear equation material at Pab 2 Helvetia Junior High School are in a suitable category. Other findings by Nurhayati et al. (2022) found that high-grade students of SDN 1 Teniga have low numeracy skills in geometry material. Namely, students have not been able to understand the problems in the problem because they are not used to answering issues related to everyday problems. However, not many studies focus on measuring the numeracy literacy skills of fourth-grade students in geometry material. This research needs to describe the numeracy literacy skills of grade IV students. The urgency of this research is to create a reference of the numeracy literacy ability of quality IV students so that the information in this research can be used as a basis for designing better learning activities. Students' numeracy literacy skills must be known and analyzed as early as possible to prepare students for the next grade level. So, it is necessary to do a more in-depth analysis of the numeracy literacy skills of students on geometry material, as well as the problem-solving techniques that students use.

Researchers will conduct this research on grade IV students of SDN Kesatrian 1. This research was conducted on grade IV students so that teachers can find out early about students' numeracy literacy skills. So that teachers can develop a mathematics learning framework related to numeracy literacy as a preparation for grade IV students at the next grade level. Researchers have formulated two research problems: (1) What is the numeracy literacy ability of Class IV students on geometry material at SDN Kesatrian 1 Malang City? and (2) How do students use the numeracy literacy problem-solving technique of geometry material? This research aims to describe the numeracy literacy skills of Class IV students on geometry material at SDN Kesatrian 1 Malang City and the numeracy literacy problem-solving techniques used by students.

METHOD

Descriptive research of the case study type was used and conducted at SDN Kesatrian in Malang City. The subjects in this study were six students with details of two students with the highest score test results symbolized by S1 and S2, two students with medium test results represented by S3 and S4, then S5 and S6 will represent two students with the lowest test results. Table 1 is the demographic data of the subjects in this study.

Table 1. Description of Research Subjects

Variables		Total	Percentage
Gender	Male	2	33%
	Female	4	67%
Age	10	2	33%
	11	4	67%

The reason for choosing this school as the research location is that no research has been conducted regarding the analysis of numeracy literacy skills at SDN Kesatrian I. Besides, the fifth-grade teacher also does not know about students' abilities related to numeracy literacy. So, to be known earlier, the research was conducted in grade IV students.

In this study, researchers conducted tests and interviews. The test result documents were analyzed to describe students' numeracy literacy skills. At the same time, interviews were conducted to characterize the numeracy literacy problem-solving techniques of geometry material used by students.

Data collection techniques were carried out through two stages, namely, the first test and the second interview. The test was carried out to analyze students' numeracy literacy skills so that the solution techniques carried out by these students could be known. Table 2 shows the test questions used in the study.

Table 2: Student Numeracy Literacy Test Questions

TEST 1

The following is a drawing of the garden construction plan. In this park, four fish ponds will be built in each different place.

Pond	Long	Width
A	4 meters	1 meter
B	3 meters	2 meters
C	4 meters	2 meters
D	1 meter	6 meters

Look at the picture and table above. The table has provided the length and width of each fish pond to be made. Determine which fish pond will cost the most to build! Remember that the bigger the fish pond, the more it will cost to build!

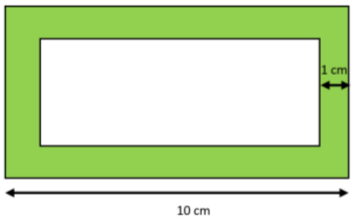
TEST 2

The following picture is a swimming pool whose surface is rectangular and 2 meters deep.

Around the outside of the swimming pool, a 1-meter wide path will be made, and tiles will be laid. The length of the swimming pool is 12 meters. The width of the collection is half the length. If the cost of ceramic tile installation is Rp50.000,00/m^2.
What is the total cost of the tiles?

TEST 3

Sinta wants to make a handicraft pigora from cardboard. The length of Sinta's pigora is 10 cm. The edges will be covered with green paper with a width of 1 cm.



If the width of the pigora is half the length of the pigora, then what is the area of the green edge of the pigora?

TEST 4

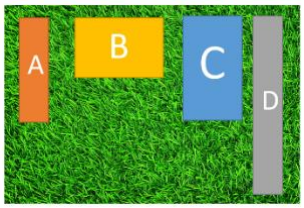
Mr. Ahmad wants to build a terrace. The terrace has a circumference of 14 meters, with a length and width of 4x3 m. This terrace will be tiled. Mr. Ahmad already has three types of tiles: white, blue, and green. Each of these tiles has a different size.

Types of Ceramics	Size
White	Length: 20 cm, Width: 15 cm
Blue	Length: 10 cm, Width: 7 cm
Green	Length: 15 cm, Width: 8 cm

Of the three sizes of ceramics above, what type of colour ceramics can be used for the terrace of Mr. Ahmad's house? Explain why!

TEST 5

The following is a drawing of the garden construction plan. In this park, four fish ponds will be built in each different place.



Pond	Long	Width
A	4 meters	1 meter
B	3 meters	2 meters
C	4 meters	2 meters
D	1 meter	6 meters

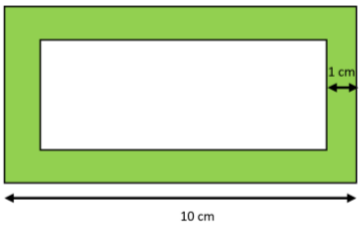
Look at the picture and table above. The table has provided the length and width of each fish pond that will be made. Which of the following statements is true?
I. Pond B and Pond D cost the same to build
II. Pond D is the pond that has the smallest area
III. Pond A is the pond that costs the least to build
IV. Pond C is the pond that has the most significant area

TEST 6

Dad wants to build 2 koi ponds. Both ponds will be tiled at the bottom only. The first pool has an area of 63 m^2 and is planned to be tiled with 3x3 m^2. The second pool has an area of 36 m^2 and is designed to be tiled with 2x2 m^2.
Dad has bought 11 pieces of 3x3 m^2 tiles. Do you agree if your father changes his mind and wants to use 3x3 m^2 tiles for the second pool? Explain!

TEST 7

Sinta wants to make a handicraft pigora from cardboard. The length of Sinta's pigora is 10 cm. The edges will be covered with green paper with a width of 1 cm.



If the width of the pigora is half the length of the pigora, then what is the area of the inside of the pigora (the white part)?

The author uses numeracy literacy indicators to measure the extent of students' numeracy literacy skills. The research uses numeracy literacy indicators formulated by the Organisation for Economic Co-operation and Development (OECD, 2016). These indicators include (1) communication skills, (2) mathematization skills, (3) representation skills; (4) reasoning and argumentation skills; (5) ability to choose strategies to solve problems; (6) ability to use language and symbolic, formal and technical operations; (7) ability to use mathematical tools. The following is a more detailed presentation of each component in Table 3.

Table 3: Math skill indicators on the PISA Framework (Application)

Indicator assessed		**Response to Question**
Communication Skills	Write down the process in reaching the solution	Unable to write down the process of acquiring the solution
		Can write down the process in reaching the solution, but still incomplete
		Can write the process for reaching the solution thoroughly and correctly
	Summarize math results	Unable to deduce math results
		Can conclude math results, but still incomplete
		Can conclude math results entirely and correctly
Mathematization Ability	Using context understanding to solve math problems	Unable to use context understanding to solve math problems
		Can use context understanding to solve math problems, but still incomplete
		Can use context understanding to solve math problems completely
Representation Ability	Connecting various representations when solving problems	Unable to connect different representations when solving problems
		Can connect various representations to solve the problem, but still incomplete
		Can connect various representations to solve the problem completely
	Use a variety of models in problem-solving	Unable to use a variety of models in Problem-solving
		Can use a variety of representations in solving problems, but still incomplete
		Can use a variety of representations in solving problems completely and correctly
Reasoning and Argument Skills	Explain the justification for determining the processes and procedures used to determine mathematical results or solutions	Unable to explain the justification in determining the process and procedure used to determine the mathematical result or solution.
		Can explain the justification in determining the process and procedure used to determine the result or solution mathematical, but still incomplete
		Can explain the justification in determining the process and procedure used to determine the result or solution mathematically complete
	Infer from various mathematical arguments	Unable to infer from multiple mathematical arguments
		Can infer from various mathematical arguments, but still incomplete
		Can conclude from various mathematical arguments completely
Ability to Choose	Strategizing through various procedures that	Unable to use strategies through various procedures that lead to mathematical solutions and conclusions
		Can use strategies through various procedures that lead

Indicator assessed		Response to Question
Strategies to Solve Problems	lead to mathematical solutions and conclusions	to mathematical solutions and conclusions, but still incomplete Can use strategies through various procedures that lead to complete mathematical solutions and conclusions
Ability to use Symbolic, Formal and Technical Languages and Operations	Use formal forms based on mathematical definitions and rules	Unable to use traditional forms based on mathematical definitions and rules Can use formal forms based on mathematical definitions and rules, but still incomplete Can use formal forms based on definitions and mathematical rules completely
Ability to use Math Tools	Use mathematical tools to recognize mathematical structures or to describe mathematical relationships.	Unable to use mathematical tools to recognize mathematical structures or to describe mathematical relationships Can use mathematical tools to recognize mathematical structures or to describe mathematical relationships, but still incomplete Can use mathematical tools to recognize mathematical structures or to describe mathematical relationships completely.

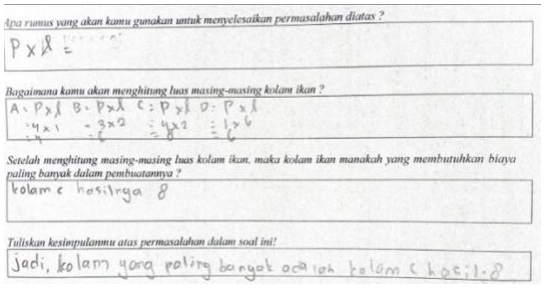
Semi-structured interviews, documentation, and tests were conducted using data collection techniques and procedures. Semi-structured interviews were conducted to find problems more openly, where the interviewees were asked for their opinions and ideas. (Samsu, 2017). Furthermore, the data triangulation technique checks data validity through data or information comparison activities in various ways, namely interview activities. Model Miles & Huberman's (1994) model was used in the data analysis process in this study. This model consists of 3 data analyses: data reduction, data display, and conclusion drawing/verification. Data reduction was carried out by researchers continuously during the research. Researchers observed when students solved numeracy literacy problems and conducted semi-structured interviews. During data collection, a further reduction occurred. Namely, researchers read and made summaries based on the results of student work on numeracy literacy questions and analyzing student test results from documents. The researcher also made memos and summaries based on the results of interviews conducted with students after completing numeracy literacy problems. Researchers can determine students' problem-solving techniques and numeracy literacy skills based on this stage. The presentation of data in this study is in the form of descriptions based on the results of data reduction obtained by researchers. The last step is drawing conclusions based on the research that has been done.

RESULT AND DISCUSSION

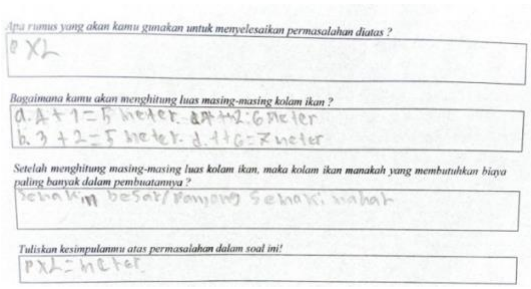
Result

During the research process, the researcher observed students during the problem-solving process and interviewed them. 6 grade IV students with numeracy literacy got the highest score on test results (S1 and S2), two students with medium student test results (S3 and S4), and two students with the lowest test results (S5 and S6). The researcher analyzed the documents of S1 and S2 test results, and these two students showed indicators of communication skills; namely, S1 was able to write the process of reaching the solution thoroughly and correctly and conclude the mathematical results. S2 reported the process of getting the answer, but it was still incomplete; it was only writing

the solution formula. The problem-solving technique used by S1 and S2 is correct, namely, using the rectangular area formula. The following are the results of S1 and S2's work in the Figure 1.



(a) Results of S1 work



(b) The result of S2's work

Figure 2. The result of S2's work

Based on the picture above, S1 and S2 have shown the ability to mathematize the context to solve mathematical problems. They have also demonstrated strategies for solving problems using the rectangular area formula. The problem-solving technique used by these students is by writing the recipe. Students' writing of p x l as a formal form of mathematical rules is also correct. The results of the interview with S1 are that he still remembers how to calculate the area and perimeter of squares and rectangles. S2 only retains the formula but cannot solve the problem correctly. S1 solved the problem using the perimeter formula (Figure 3) but did not notice a width of the tilapia and wader fish ponds that did not need to be included to add up because the width of these two fish ponds was not fenced.

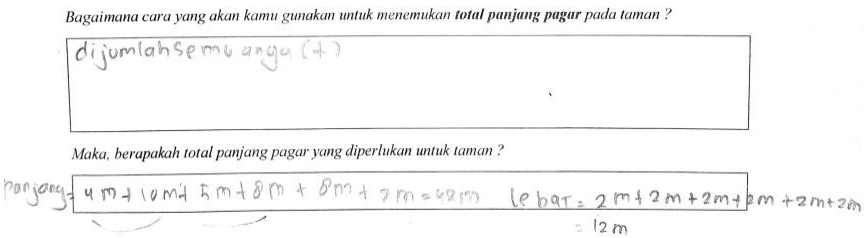
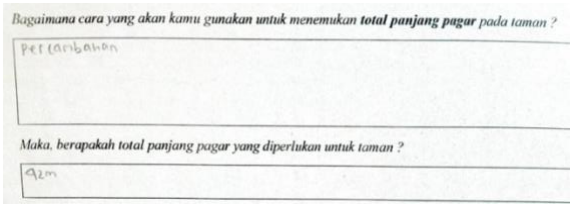
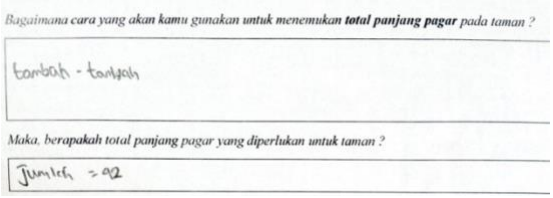


Figure 3. The result of S1's work1

S3 and S4 show indicators of the ability to choose strategies to solve problems in the problem. In problem 3, namely determining the perimeter of a rectangular garden, students can decide how to solve the problem of addition. They are only able to write "addition" and "plus-add". This is appropriate because the perimeter is the sum of all sides of the rectangle. The problem-solving technique these students chose is correct, but they cannot perform communication skills, namely, not writing the process of reaching a solution and no mathematical conclusion. This shows students cannot use formal forms based on mathematical definitions and rules. Based on the interview results, S3 and S4 gave the original answer (see Figure 4).



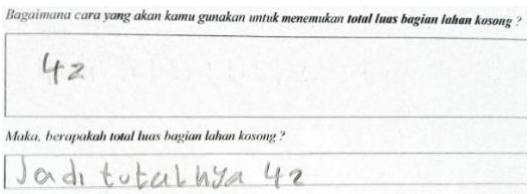
(a) Results of S3 work



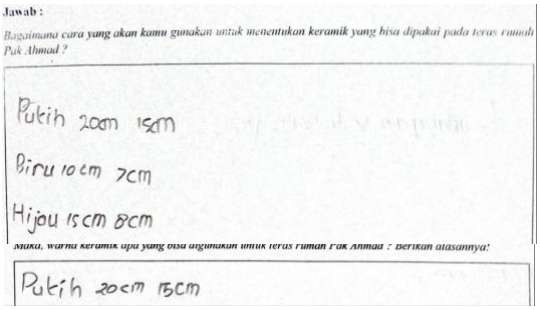
(b) The result of S4 work

Figure 3. The result of S4's work

S5 and S6 did not fulfil the numeracy literacy indicators. The document analysis results showed that these students answered the problem by simply copying the writing on the problem. Students stated that they did not understand the meaning of the problem in the problem. This shows that students have not demonstrated communication and context mathematical skills to solve mathematical problems. Students also do not use various representations in problem-solving, so they do not show the techniques and strategies for solving the problem. Figure 4 are the results of the work of S5 and S6.



(a) Results of S5 work



(b) The result of S4 work

Figure 4. The result of S4's work

Discussion

Students with high numeracy literacy skills have communication skills in writing, which is the process of achieving solutions entirely and correctly. Students can also mathematize the context to solve mathematical problems and show strategies for solving problems. In line with research by Allen et al. (2020) that mathematical communication is the first step in sharing ideas and thoughts, mathematical communication can clarify students' understanding so that they can clearly communicate something mathematically, either orally or in writing, and can solve math problems well. The problem-solving technique this student uses is appropriate, namely, using the formula for the perimeter and area of a rectangle. Students explain the problem-solving in the problem using numbers and formulate the method correctly to obtain the appropriate answer. This shows that students have numeracy literacy skills, which can explain information related to numbers, develop problems, analyze, and solve problems. (Sutama et al., 2020).

Students with moderate numeracy literacy skills show indicators of the ability to choose strategies to solve problems in the problem. Still, they cannot use communication skills, namely, not writing the process of reaching a solution and making no mathematical conclusions. Mathematical communication skills are shown by students being able to receive, perceive, and understand mathematical concepts and can inform orally or in writing. (Fatkhiyyah et al., 2019). This indicates students cannot use formal forms based on mathematical definitions and rules. The problem-solving

technique these students use is appropriate, namely, using the basic concepts of the area and perimeter of a rectangle. Still, they cannot solve the problems in the problem further because they do not correctly understand the use of mathematical rules, even though mathematical understanding is an essential part of achieving numeracy literacy skills. (Khakima et al., 2021).

Students with low numeracy literacy skills do not meet the indicators of numeracy literacy skills. Namely, they do not show communication and context mathematization skills to solve mathematical problems. There is no use of various representations in problem-solving, so students do not show the use of techniques and strategies in solving the issue. Students with low numeracy literacy categories do not master essential math skills. In mathematical literacy, such as reading, writing, and counting, students must master and adjust their understanding of mathematical literacy (Simarmata et al., 2020). This is in line with research by (Rohmah et al., 2022) that numeracy literacy skills in learning mathematics in elementary schools are still low because students are not used to solving problems with complex questions. This study found that students have difficulty understanding the issues of the concern.

The implication of the results of this study is a description of students' numeracy literacy skills that teachers can use in developing numeracy literacy-based mathematics learning. Numeracy literacy skills are essential to be well honed, in line with the opinion of Ferdianto et al. (2022) that teachers need to learn students' mathematical mindset to be better prepared to face mathematical problems. Teachers need to observe students' abilities to plan lessons that foster students' numeracy literacy skills in learning mathematics. Numeracy literacy skills require mathematical knowledge, but mathematics learning may not be able to foster these skills if it is not prepared beforehand. (Rohim et al., 2021).

CONCLUSION

Students with high numeracy literacy have communication skills in writing the process of achieving solutions entirely and correctly, can mathematize the context in solving mathematical problems, and show strategies in solving problems in the issue. The problem-solving technique students use is the formula for the perimeter and area of a rectangle. Students explain the problem-solving in the trial using numbers and formulate the method correctly to obtain the appropriate answer. Students with moderate numeracy literacy skills show indicators of the ability to choose strategies to solve problems in the problem. Still, they cannot use communication skills, namely, not writing the process of reaching a solution and making no mathematical conclusions. Students cannot use formal forms based on mathematical definitions and rules. The problem-solving technique students use is appropriate: the basic concepts of area and perimeter of rectangles. However, they cannot solve the problems in the problem further because they do not understand correctly the use of mathematical rules. Students with low numeracy literacy skills do not meet the indicators of numeracy literacy skills. Namely, they do not show communication and context mathematization skills in solving mathematical problems. There is no use of various representations when solving issues, so students do not show the use of solving techniques and strategies. Describing students' numeracy literacy skills and methods for solving numeracy literacy problems in geometry material

used by students helps develop numeracy literacy-based mathematics learning. Students need to be accustomed to solving numeracy literacy-based issues so that their numeracy literacy skills can grow better.

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