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Elementary Students' Difficulties in Solving Numeracy Problems

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Abstract. The Numeracy is a skill that a person has to apply mathematical concepts in real life. Based on the PISA 2022 results, all countries experienced a decline, as well as Indonesia. Although the rankings increased, the average literacy and numeracy scores obtained by Indonesian students were still far below the international average. The numeracy achievement in Sumedang Regency is still below 60. The purpose of this study is to identify elementary students' difficulties in solving numeracy problems. This research used qualitative method and descriptive approach. The participants in this study were 30 fifth-grade elementary school students from an elementary school in the Rancakalong Sub-district of Sumedang, selected using purposive sampling. The data collection techniques used were interviews and tests. The data processing and analysis technique carried out in this study consists of three stages, namely data reduction, data presentation and conclusion drawing. The results showed that the numeracy skills of elementary school students as a whole had an average value of 49.83 and the value was included in the sufficient category. However, there are still many students who fall into the category of less which is as much as 40%. Then the numeracy skills of students at all levels are mostly included in the insufficient category. Students' difficulties in solving problems are divided into 3 parts, namely difficulties in understanding concepts, difficulties in numeracy skills, and difficulties in solving problems. The number of students who have difficulty understanding concepts is 19 people or 63.33%. The number of students who had difficulty in numeracy skills was 15 people or 50%. Finally, 20 or 66.67% of students had difficulty in problem solving.

Keywords: numeracy, problem solving difficulties, elementary school

INTRODUCTION

In the 21st century, numeracy is key for students to access and understand the world, equipping them with awareness and understanding of the important role of mathematics in the modern world (Askew, 2015; Beswick & Fraser, 2019; Maass dkk., 2019; Rehman dkk., 2023; Szabo dkk., 2020). Emphasis on the application of mathematics related to everyday life allows students to develop the skills and confidence to think numerically, spatially, and with data to interpret and critically analyze everyday situations and solve problems (Susanto et al., 2021). There is no doubt that literacy and numeracy are at the heart of human and economic development and thus receive widespread attention today.(Blunch, 2014). Numeracy is a person's ability to analyze and understand a statement, using symbols and mathematical operations that are applied in everyday life(Ekowati et al., 2019; Perdana & Suswandari, 2021). Meanwhile, according to Yustitia et al.,(2021) numeracy refers to the ability to understand, apply, interpret, and convey mathematical concepts and information within a specific context. Then the Australian Association of Mathematics Teachers,(2005)defines numeracy as the ability that underlies the concept of mathematical skills from all disciplines as well as thinking and strategies in the context of everyday life. From several definitions, it can be concluded that numeracy is a skill that someone has to apply mathematical concepts in real life.

Numeracy is part of mathematics, so they are related to each other. The relationship lies in the components of how numeracy is used which are inseparable from mathematical material.

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In its development, numeracy is not only related to mathematics but also develops in other sciences such as science, social sciences, and even art.(OECD, 2023)This is because other subjects also contain the basics of numeracy such as reasoning, basic calculations, understanding diagrams, and so on. For example, in science there is material on speed, to be able to calculate the speed of an object, numeracy skills are needed.

Based on the results of the interview, the following is data regarding literacy and numeracy achievements in education report cards in Sumedang Regency.

Table 1. Literacy Achievements

Level	Literacy			Numeracy		
	2022	**2023**	**Ascension**	**2022**	**2023**	**Ascension**
SD	65.03	70.75	5.72	42.31	53.61	11.3
JUNIOR HIGH SCHOOL	65.28	70.1	4.82	45.61	48.25	3.09

From table 1. it can be concluded that although there was an increase from 2022, the numeracy achievement in Sumedang Regency was still below 60. Furthermore, based on the results of PISA 2022, all countries experienced a decline, including Indonesia. However, in terms of ranking, Indonesia experienced an increase in position of around 5 to 6 ranks compared to PISA in 2018.(OECD, 2023). Although increasing, the average score obtained by Indonesian students is still far below the international average. This shows that the literacy and numeracy of Indonesian students are still far behind other countries.

Several studies have explored numeracy literacy, emphasizing the difficulties that elementary school students encounter in developing these skills. For instance, a study by Perdana & Suswandari,(2021) titled "Numeracy Literacy in Thematic Learning of Upper Elementary School Students". The conclusion shows that numeracy literacy in thematic learning of upper elementary school students can be done by providing stimulus to students. In a similar vein, research by Megawati & Sutarto,(2021) entitled "Analysis of numeracy literacy skills in terms of standardized math problems on a minimum competency assessment", It was found that students' numeracy literacy skills are shaped by physical factors (such as health), cognitive factors, their thinking abilities, and their capacity to analyze and apply fundamental mathematical and environmental concepts. Additionally, a study by Rakhmawati & Mustadi,(2022) entitled "The circumstances of literacy numeracy skill: Between notion and fact from elementary school students", It was discovered that students' numeracy literacy skills remain at a low level. The development of numeracy literacy has not been effectively

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incorporated into the School Literacy Movement (GLS), and basic literacy activities have not been properly carried out.

Building on these findings, while prior research has highlighted general issues in numeracy literacy, this study seeks to delve deeper into the specific difficulties encountered by students in solving numeracy problems, providing a more focused understanding of the barriers to effective numeracy learning. The novelty of this study lies in its focus on identifying the precise cognitive and contextual obstacles students face in solving numeracy problems, which can help tailor more effective teaching strategies and interventions for improving numeracy skills among elementary school students.

The purpose of this study is to analyze the difficulties faced by elementary school students in solving numeracy problems. To achieve this, the study addresses the following research questions: (1) How is the analysis of students' numeracy test results as a whole? (2) How is the analysis of students' numeracy test results at each level? and (3) What are the difficulties of students in solving numeracy problems?

The contribution of this study to the field of education is significant. By identifying the specific challenges that elementary school students face in solving numeracy problems, the study provides valuable insights into the gaps in students' understanding of numeracy concepts. This information can be used to develop targeted teaching strategies and interventions that address these difficulties, ultimately improving numeracy skills among elementary students. Furthermore, the findings of this study can inform the development of curriculum and assessment tools that better align with students' needs and enhance the effectiveness of numeracy education in elementary schools. Additionally, this research highlights the importance of incorporating innovative teaching methods, such as interactive learning approaches and technology-based tools, to further support students' engagement and comprehension. These insights can help educators refine instructional techniques and create more inclusive learning environments that cater to diverse learning styles and abilities.

METHODOLOGY

According to Supena et al.,(2021)qualitative descriptive research focuses on illustrating and detailing phenomena that exist, whether natural or man-made, with an emphasis on the characteristics, quality, and relationships between different activities. From this explanation, it can be concluded that qualitative descriptive research is research that aims to describe phenomena and data analysis does not require calculations.

The population in this study were all fifth grade elementary school students in Rancakalong District, Sumedang. The sampling technique used was "purposive sampling". The sample

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selected was fifth grade students in one of the elementary schools in Rancakalong District, Sumedang, totaling 50 people. This study uses a qualitative descriptive research approach, which aims to describe and explore the existing phenomena, focusing on the characteristics, quality, and interrelationships of activities. The research design does not involve calculations, as it primarily aims to provide a detailed account of the difficulties students face in solving numeracy problems.

The choice of this approach is based on the need to gain a deep understanding of the specific challenges faced by elementary students in numeracy. A qualitative approach allows for a comprehensive exploration of students' experiences and difficulties, providing rich, context-specific insights. It is particularly suitable for studying phenomena that are complex and subjective, such as the cognitive and contextual barriers to numeracy learning.

In this study, the data processing and analysis technique follows the framework proposed by Miles and Huberman (2007), which consists of three stages: data reduction, data presentation, and conclusion drawing. Each of these stages is adapted to analyze the difficulties elementary students face in solving numeracy problems. (1) Data Reduction: This first stage involves the process of selecting, focusing, and simplifying data obtained from interviews and surveys. In this study, the data reduction step will focus on extracting relevant information from the interview responses of teachers and students, as well as from the survey results, to identify key themes and patterns related to students' difficulties in solving numeracy problems. This stage helps to eliminate unnecessary information, making the data more manageable and focused on the research questions; (2) Data Presentation: After data reduction, the next step is to present the data descriptively. In this study, the results of the interviews and surveys will be organized and presented in a clear, structured manner, allowing for an in-depth understanding of the issues. This presentation will include descriptions of the specific difficulties students face at various levels of numeracy, as well as insights into the factors influencing these challenges. The data presentation will allow for an easier identification of patterns and trends in students' numeracy skills and difficulties; (3) Conclusion Drawing: The final stage is conclusion drawing, where the researcher analyzes and interprets the data to answer the research questions. In this study, this stage involves synthesizing the findings from the data reduction and presentation stages to determine the primary difficulties students face in solving numeracy problems. Based on these findings, conclusions will be drawn regarding the factors contributing to these difficulties, and potential strategies for improving numeracy education will be identified.

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By following these three stages, this study will provide a comprehensive understanding of the difficulties elementary school students encounter in solving numeracy problems, and offer insights into how these challenges can be addressed in the educational context.

In this study, the instrument used for data collection consists of interviews and surveys aimed at identifying the difficulties elementary school students face in solving numeracy problems. The data collection process involves administering these instruments to both teachers and students. To ensure the quality and trustworthiness of the instruments, validity and reliability tests are applied.

Validity is a measure that shows the levels of validity or authenticity of an instrument. The validity test on this instrument is content validity and empirical validity (product moment person). Then there are two types of instrument reliability in this study, namely: (1) Internal reliability analyzed with Cronbach alpha and (2) External reliability whose correlation coefficient uses product moment which links research results on different days using the same class (test retest)

RESULTS AND DISCUSSION

Based on the results of the analysis, it can be concluded that the average result of the numeracy ability test only reached 49.83 and the standard deviation was 15.987. From these data, the categorization of numeracy ability can be measured with the provisions according to Mardapi, (2008) based on the following conversion guidelines.

Ideal maximum score = 100

Ideal minimum score = 25

Ideal average score (Mi) = 1/2 x (max score + min score)

$$= 1/2 \times (100+25) = 62.5$$

Ideal standard deviation value (SDi) = 1/6 x (max score - min score)

$$= 1/6 \times (100-25) = 12.5$$

Table 2. Categorization of Numeracy Test Results Data

Category	Criteria	Scale Interval Limit 100	f	Percentage
Very high	$X \geq (Mi + 1.5\ SDi)$	>81.25	1	3.33%
Tall	$Mi \leq X < (Mi + 1.5\ SDi)$	62.5 – 81.25	4	13.33%
Enough	$(Mi - 1.5\ SDi) \leq X < Mi$	43.75 – 62.5	13	43.33%

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Not enough	X < (Mi – 1.5 SDi)	<43.75	1 2	40%
	Amount		3 0	99.99%

The table above shows that the majority of students' numeracy test results are in the sufficient category of 43.33%. And the average value of 49.83 is in the sufficient category. However, there are still many students who fall into the less category, namely 40%.

Next, an analysis of the results of the students' numeracy ability tests at each level was carried out. Numeracy questions based on grade level at the elementary school level consist of three levels. . Level I for grades 1-2 of elementary school, level II for grades 3-4 of elementary school, and level III for grades 5-6 of elementary school. The following are the results of the analysis of the results of the level I numeracy test

Table 3. Results of level I numeracy test

SCORE	3	4	5	6	7	8	total
f	VI	VIII	IV	V	V	II	30

From these data, the categorization of numeracy abilities can be measured according to the provisions according toThe Mardapi, (2008)based on the following conversion guidelines.

Ideal maximum score = 8

Ideal minimum score = 3

Ideal average score (Mi) = x (max score + min score)$\frac{1}{2}$

$$= x (8+3) = 5.5\frac{1}{2}$$

Ideal standard deviation value (SDi) = x (max score - min score)$\frac{1}{6}$

$$= x (8-3) = 0.8\frac{1}{6}$$

Table 4. Categorization of Level I Numeracy Test Results Data

Category	Criteria	Scale Interval Limit 100	f	Percentage
Very high	X ≥ (Mi + 1.5 SDi)	>6.7	7	23.33%
Tall	Mi ≤ X < (Mi + 1.5 SDi)	5.5 – 6.7	5	16.66%
Enough	(Mi - 1.5 SDi) ≤ X < Mi	4.3 – 5.5	4	13.33%
Not enough	X < (Mi – 1.5 SDi)	<4.3	1 4	46.66%

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Amount	3 0	99.98%

The table shows that the majority of students are in the less category, namely 46.66%. Even though the level I numeracy questions are questions for grades I and II, in reality there are still many grade V students who have not been able to solve the questions. Furthermore, an analysis of the results of the level II numeracy test was carried out. The data obtained are as follows.

Table 5. Level II numeracy test results

SCORE	1	2	3	4	5	6	7	8	9	Total
f	II	II	VIII	III	III	V	VI	-	I	30

From these data, the categorization of numeracy ability can be measured according to the provisions according to Mardapi, (2008) based on the following conversion guidelines.

Ideal maximum score = 10

Ideal minimum score = 3

Ideal average score (Mi) = 1/2 x (max score + min score)

$$= 1/2 \times (10+3) = 6.5$$

Ideal standard deviation value (SDi) = 1/6 x (max score - min score)

$$= 1/6 \times (6.5-3) = 0.583$$

Table 6. Categorization of Numeracy Test Results Data

Category	Criteria	Scale Interval Limit 100	f	Percentage
Very high	X ≥ (Mi + 1.5 SDi)	>7.37	1	3.33%
Tall	Mi ≤ X < (Mi + 1.5 SDi)	6.5 – 7.37	6	20%
Enough	(Mi - 1.5 SDi) ≤ X < Mi	5.63 – 6.5	5	16.67%
Not enough	X < (Mi – 1.5 SDi)	<5.63	1 8	60%
	Amount		3 0	100%

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In the table it can be seen that the majority of students are in the less category, namely 60%. Even though this level II numeracy question is a question for grades II and III, in reality there are still many grade V students who have not been able to solve the question.

Next, the analysis of the results of the level III numeracy test was carried out. The data obtained are as follows.

Table 7. Level III numeracy test results

SCORE	2	3	4	5	6	7	8	9	10	11	12	Total
f	III	V	IV	IX	I	I	III	II	I	-	I	30

From these data, the categorization of numeracy ability can be measured according to the provisions according to Mardapi, (2008) based on the following conversion guidelines.

Ideal maximum score = 12

Ideal minimum score = 3

Ideal average score (Mi) = 1/2 x (max score + min score)

$$= 1/2 \text{ x } (12+3) = 7.5$$

Ideal standard deviation value (SDi) = 1/6 x (max score - min score)

$$= 1/6 \text{ x } (12-3) = 1.5$$

Table 8. Categorization of Level III Numeracy Test Results Data

Category	Criteria	Scale Interval Limit 100	f	Percentage
Very high	X ≥ (Mi + 1.5 SDi)	>9.75	2	6.67%
Tall	Mi ≤ X < (Mi + 1.5 SDi)	7.5 – 9.75	5	16.66%
Enough	(Mi - 1.5 SDi) ≤ X < Mi	5.25 – 7.5	2	6.67%
Not enough	X < (Mi – 1.5 SDi)	<5.25	21	70%
	Amount		30	100%

In the table it can be seen that the majority of students fall into the less category, which is 70%. From the explanation above, it can be concluded that the majority of students' numeracy abilities at all levels fall into the less category.

Next, the students' difficulties in solving numeracy problems are analyzed as follows. Students' difficulties in solving problems are divided into 3 parts, namely difficulties in understanding concepts, difficulties in numeracy skills, and difficulties in problem solving.

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First, students have difficulty in understanding the concept. Examples of answers from students who have difficulty in understanding the concept are as follows.
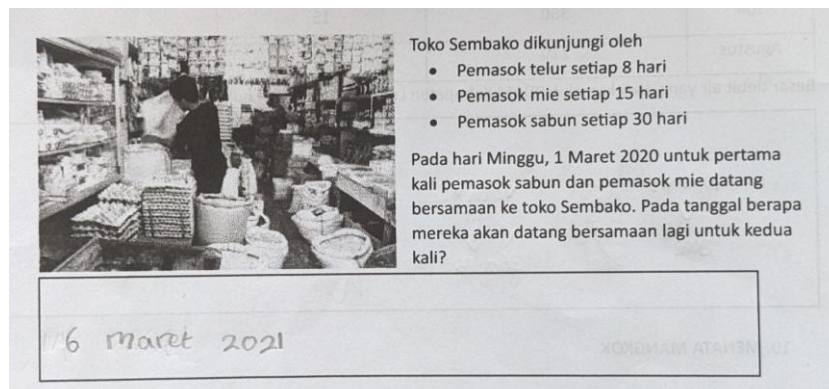

Figure 1. Example of Answers from Students Who Have Difficulty Understanding the Concept

Judging from Figure 1. it can be said that students have difficulty understanding the concept, therefore students only write down answers haphazardly. The number of students who have difficulty understanding the concept is 19 people or 63.33%. If students understand the concept, of course students will be able to conclude that the question is included in the concept of LCM, then the solution is to find the LCM of 8, 15 and 30 and then find the date they met for the second time. However, because the student has difficulty understanding the concept, the student does not write down the solution but directly writes the date without any basis.

Second, some students have difficulty in numeracy skills. Examples of answers from students who have difficulty in numeracy skills are as follows.
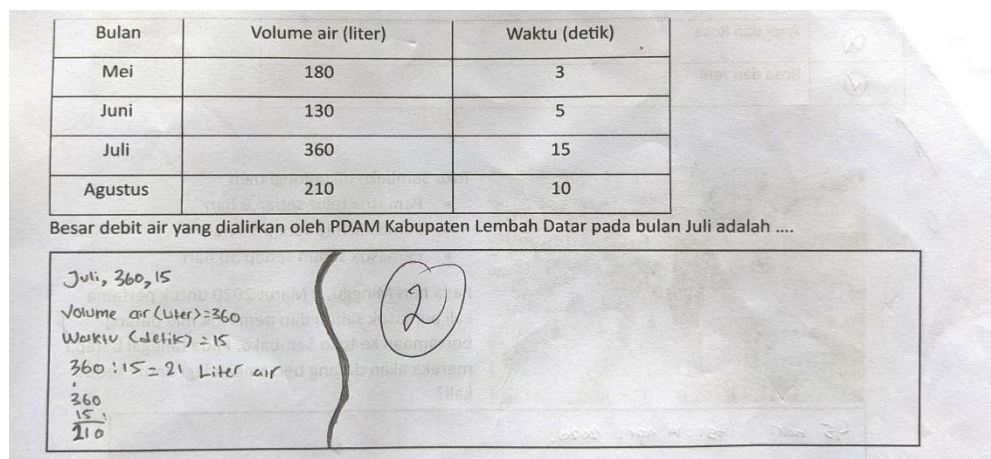

Figure 2. Example of Answers from Students Who Have Difficulty in Arithmetic Skills

Judging from Figure 2. it can be said that students have difficulty in counting. The students can understand the concept but when the counting process is carried out the students have difficulty. The use of addition, subtraction, multiplication, and division operations is a form of counting skills. The number of students who have difficulty in counting skills is 15 people or

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50%. According toRuntukahu et al., (2014)Students who have difficulty in calculating are impatient, careless, or even make mistakes in reading numbers or mathematical symbols. Third, students have difficulty in problem solving. Examples of students who experience difficulties like this are as follows.
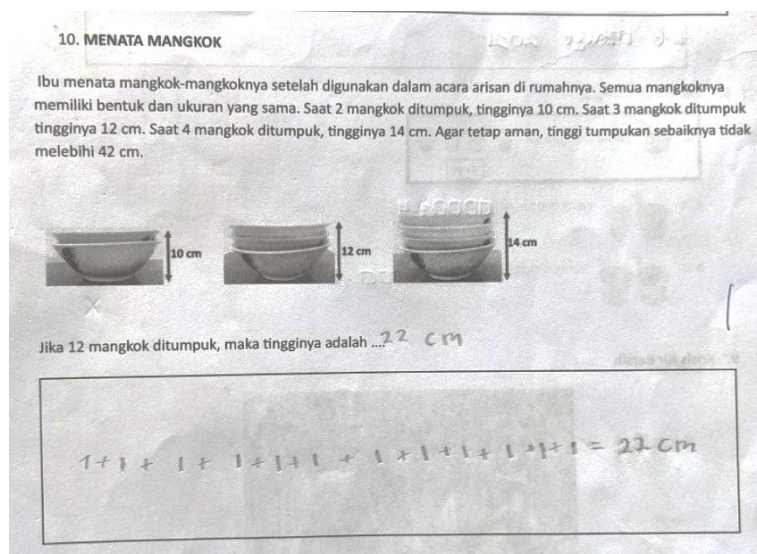

Figure 3. Examples of answers from students who have difficulty solving problems.

From figure 3. It can be said that students have difficulty in solving problems. The students have been able to understand the concept but cannot solve the problem. In figure 3. it is also seen that in addition to having difficulty solving problems, students also have difficulty in calculating. From the data collected, there are 20 people or 66.67% of students who have difficulty in solving problems.

CONCLUSION

Based on the findings of this study, the overall numeracy skills of elementary school students show that the majority of students fall into the "deficient" category, with an average score of 49.83, which is categorized as sufficient. However, a significant portion of students, about 40%, still perform below the expected standard. This highlights a concerning trend in students' numeracy abilities, which is consistent across different grade levels.

At each grade level, the analysis of students' performance on numeracy questions reveals that difficulties persist throughout. In Level I (grades 1-2), 46.66% of students fall into the "less" category. In Level II (grades 3-4), this increases to 60%, and in Level III (grades 5-6), a majority of 70% of students are categorized as "less". These findings suggest that students' numeracy skills across all levels are largely insufficient, with an increasing difficulty as they advance in grade levels.

The difficulties students face in solving numeracy problems can be categorized into three main areas: difficulties in understanding concepts, difficulties in numeracy skills, and difficulties in

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problem-solving. The study found that 63.33% of students had difficulty understanding mathematical concepts, 50% struggled with numeracy skills (such as calculation and basic operations), and 66.67% had challenges in solving numeracy problems effectively. These areas of difficulty indicate that students face substantial barriers in their learning of numeracy, ranging from foundational understanding to applying mathematical knowledge in problem-solving contexts.

Given these results, it is clear that further research is needed to explore the underlying factors contributing to these difficulties. Possible factors might include cognitive challenges, teaching methods, curriculum design, or socio-environmental influences. Identifying these factors is crucial for developing targeted interventions. Teachers can then use this information to tailor their teaching strategies to address these specific difficulties and support students in improving their numeracy skills. By understanding and addressing the root causes of these challenges, educators can better help students overcome their numeracy struggles and build a stronger foundation for future learning.

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