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Analysis of numeration literacy ability in solving hots questions on two-dimensional figure material fifth-grade students

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Abstract

Students' low numeracy literacy skills in connecting mathematics with real-life applications and solving HOTS questions effectively. This research aims to find out how the numeracy literacy skills of class V students are in flat plane material. This research uses a qualitative case study type method with the Miles and Huberman model. The research results show that the numeracy literacy skills of class V students at SDI Sultan Agung 1.3 Semarang are still quite low. Of the 22 students, 14 students had low numeracy abilities, 5 students had medium numeracy abilities, and 3 students had high numeracy abilities. These findings also show that the majority of students have difficulty with word problems that require in-depth understanding of the context, indicating a lack of students' skills in working on HOTS-based questions and a lack of exposure to numeracy literacy activities. The findings of this research can be a basis for teachers to develop more effective learning strategies in improving students' numeracy literacy skills. This research provides a new view on how numeracy literacy can



influence students' abilities in solving HOTS questions, especially on the topic of plane figures.

INTRODUCTION

Background of the Study

In this modern era, literacy is the main basis for changing a person's paradigm of knowledge, attitudes, and skills. Amid the rapid development of science and technology, humans are required to continue learning and mastering various scientific and technological disciplines quickly so as not to be left behind and lost in competition (Paramitha Baiq & Mustari Mohamad, [2023](#)). Literacy and numeracy skills have been proven to be able to improve 21st-century learning competencies such as creativity, communication skills, teamwork, as well as critical thinking, and problem-solving (Hikmawati, [2022](#)).

Numeracy literacy skills are not only academic skills but are also a prerequisite for life skills that make it easier for people to carry out their activities. Someone who has good numeracy literacy skills can solve problems while thinking critically and providing solutions to problems encountered in everyday life. In everyday life, activities such as shopping, planning a holiday, borrowing money for a business, or building a house require numeracy skills (Safitri et al., [2020](#)).

Learning mathematics is not enough just to knowing the concepts, but you also have to be able to use these concepts to solve problems related to mathematics and everyday life. Unfortunately, for most students, mathematics is considered a subject that is difficult to understand because their numeracy literacy skills are still low (Megawati & Sutarto, [2021](#)). To date, Western societies have produced the majority of studies and frameworks that help understand the literacy and numeracy environment in the home, however, relatively little research highlights the importance of culture in influencing children's development and living situations at home (Cheung et al., [2021](#)).

As part of efforts to improve literacy and numeracy skills, Higher-Order Thinking Skills (HOTS) based learning is the main focus in implementing learning (Patriana et al., [2021](#)). Numeracy literacy skills can be improved by presenting mathematical problems in learning that relate to real life. Students need to combine facts and ideas in the process of synthesizing, generalizing, explaining, hypothesizing, and analyzing to conclude. HOTS involves the ability to connect and process information critically to solve problems, make decisions, and generate

creative thinking (Panglipur & Febriansyah, [2023](#)). HOTS-based learning has been widely integrated into various subjects in Indonesia (Ishartono et al., [2021](#)).

Problem of The Study

Students' skills in solving HOTS questions, especially those related to problem solving aspects, are very useful in everyday life. However, learning to answer HOTS questions is still a challenge for students in Indonesia (Martha et al., [2022](#)). Based on a preliminary study at SDI Sultan Agung 1.3, it was found that many students were not able to connect mathematics with real life. Teachers at this school have attended workshops or seminars regarding the development of HOTS questions and assessments, but the implementation has not been fully optimal. Daily test questions or grade promotion assessment questions are still in the LOTS (Lower Order Thinking Skill) realm. Observations show that students are not used to working on HOTS-based questions, which can have an impact on students' low abilities in the cognitive domains of analysis, evaluation, and creation (Tulljanah & Amini, [2021](#)). For students' HOTS to develop well, students need to be accustomed to practicing questions that include understanding, application, and reasoning (Hadi et al., [2021](#)). Apart from that, interest in reading stories that are too long is also an obstacle.

Research's State of the Art

The practice of numeracy literacy in elementary schools certainly still has its challenges. Considering the differentiation of characteristics possessed by students, this of course results in unevenness in these abilities. There are still some students who have not fully mastered numeracy literacy skills in mathematics learning. Other research showing the need for additional efforts to improve their understanding of mathematical concepts found that numeracy skills had a positive and significant effect on student learning achievement. This research is in line with research (Sari & Fadieny, [2024](#)). regarding the analysis of numeracy literacy skills in grade 5 elementary school students, which shows that student's literacy skills are relatively low while students' numeracy skills are classified as moderate. Fauzanah found that numeracy literacy in solving questions in class V elementary school students was in the medium category at 33.33% and sufficient at 53.34% (Fauzanah et al., [2022](#)). Lestari & Effendi found that of the 4 mathematical literacy questions given, only 1 student was able to meet the mathematical literacy indicators (Lestari & Effendi, [2022](#)).

Novelty, Research Gap, & Objective

This research is a novelty in nature by combining analysis of numeracy literacy and the ability to solve HOTS questions on grade 5 students' flat figure material. Even though numeracy literacy and HOTS have been widely studied, this research is a novelty in nature by combining analysis of numeracy literacy and the ability to solve HOTS questions on grade 5 grade student material. 5. Although numeracy literacy and HOTS have been widely researched, combining these two concepts in the context of learning plane mathematics at the 5th-grade level is an approach that has not been studied in depth. This research provides a new view on how numeracy literacy can influence students' abilities in solving HOTS questions, especially on the topic of plane figures.

In addition, this study differs from previous studies in terms of year and place of research. Even though there has been a lot of research on numeracy literacy and its application in basic education, as well as studies of HOTS questions in the mathematics curriculum, there is still a gap in the literature that connects this concept specifically to the material of plane shapes in grade 5. Most previous research focuses on numeracy literacy in general. General or at a higher level of education. There is a need to explore how Grade 5 students develop their numeracy literacy and how this influences their ability to solve HOTS questions on specific topics such as plane shapes. The aims of this research were to 1) measure students' numeracy literacy levels, and 2) analyze HOTS problem-solving abilities.

METHOD

Type and Design

The research method used is qualitative with a case study approach. Qualitative research aims to understand phenomena based on participants' views without using statistical procedures or other forms of calculation. A case study approach was applied to explore in depth the numeracy literacy abilities of class V students in solving HOTS questions on plane figures at Sultan Agung 1.3 Islamic Elementary School, Semarang. According to Harahap, qualitative research refers to non-mathematical data analysis (Harahap et al., [2022](#)).

Data and Data Source

The data used in this research is primary data. The data used in this research is primary data. This data is in the form of written data originating from the results

of students' work in solving HOTS-type questions on plane figures and the results of interviews with students at each level of numeracy literacy that the researcher chose to be used as research subjects. This research was conducted at SDI Sultan Agung 3 with a total of 22 students. The sampling technique used was snowball sampling. Snowball sampling is a method of sampling data sources that are initially small, but over time become large (Trinaldi et al., [2022](#)).

Data Collection Technique

Data collection techniques in this research include tests and interviews. The test given is a test of mathematical numeracy literacy skills in solving HOTS type questions on flat shape material.

1. Test

This test is used to measure students' numeracy literacy levels and how many students meet the numeracy literacy indicators. The question grid in this research is as follows:

Table 1. Question grid

No.	Numeracy literacy indicators	Sub indicators	Question number	Number of questions
1	Using various numbers and symbols related to basic mathematics to solve problems in various contexts of everyday life	Students can solve problems with various kinds of numbers and symbols in the context of everyday life	1,3	2
2	Analyze information displayed in various forms (graphs, tables, sections, diagrams, and so on).	Students can analyze information displayed in various shapes	2,4	2
3	Menafsirkan hasil analisis tersebut untuk memprediksi dan mengambil keputusan	Interpret the results of the analysis to predict and make decisions	5	1

2. Interview

Structured interviews with instruments containing questions related to students' numeracy literacy skills in working on HOTS questions on flat shapes. Interviews were conducted to dig deeper into students' understanding of the material provided.

Table 2. Interview grid

No.	Indicator	Number of questions
1	Level of student understanding	2
2	Student's difficulties in working on questions	5
3	Student completion steps given to students	3

Data Analysis

According to Adi Trinaldi, Miles and Huberman's data analysis techniques are activities in data analysis, namely data reduction, data presentation, and concluding/verification (Trinaldi et al., 2022). Data analysis techniques in research are presented in the following flow:

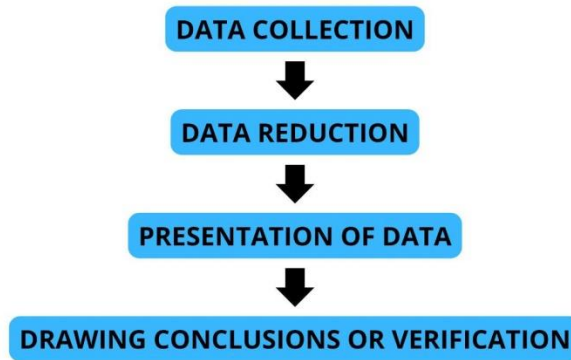


Figure 1. Data analysis flow

The flow above explains that after the data is collected, the data will be reduced. Data reduction is the process of selecting, focusing, simplifying, abstracting, and transforming rough data that emerges from written notes in the field. Then, present the data. Presentation of data in the form of a matrix, graph, or diagram to make it easier to conclude. The last one is concluding. Concluding or verification is drawing meaning from data that has been analyzed and verified to ensure the validity of the data.

RESULTS

After carrying out the research process and data collection using various techniques in the field, such as interviews and numeracy literacy skills tests on students, testing was carried out according to the grid that had been prepared. The test consists of 5 HOTS questions that correspond to the numeracy literacy

indicators. The collected data will be analyzed in detail and critically to obtain clear and accurate results. Interviews and tests for class V students are planned to be held on May 14, 2024.

First, students will be given test questions containing numeracy literacy questions following the shape material. This test is designed to measure students' higher-order thinking abilities (HOTS) in the context of numeracy literacy. The data collected from this test is then analyzed to provide an overview of the student's level of ability. The following are the results of the scores from the numeracy literacy test that was carried out:

Table 3. Student Test Form Results

No.	Name	Score/Question					Total score/value	Numeracy level
		1	2	3	4	5		
1	AAS	10	5	10	10	20	55	LOW
2	AAN	10	15	10	10	10	55	LOW
3	AFH	20	10	0	0	5	35	LOW
4	ASJ	20	10	10	10	10	60	LOW
5	AHK	20	20	10	10	10	60	LOW
6	CCA	20	10	10	10	5	55	LOW
7	FMAF	20	15	10	10	5	60	LOW
8	IYJ	20	20	20	20	10	90	HIGH
9	KAPW	20	15	10	10	10	65	MIDDLE
10	KA	20	10	10	10	10	60	LOW
11	KNS	20	10	10	10	20	70	MIDDLE
12	LSF	20	10	10	10	10	60	LOW
13	MFZ	10	10	10	0	20	50	LOW
14	MAA	10	10	10	10	10	50	LOW
15	MAK	20	15	10	10	5	65	LOW
16	MRM	20	20	10	10	10	70	MIDDLE
17	MRO	20	20	20	15	10	85	HIGH
18	NZM	15	15	20	10	10	70	MIDDLE
19	RCI	10	10	10	15	15	60	LOW
20	RRMR	20	15	10	10	5	60	MIDDLE
21	ZAEG	20	15	20	20	10	85	HIGH
22	ZAA	10	20	10	10	10	60	LOW

Based on the table above, class V students at SDI Sultan Agung 1.3 have a LOW level of literacy with 14 children, a MEDIUM level with 5 children, and a HIGH level with 3 children. Thus, the majority of students have a high numeracy literacy level.

Furthermore, from the HOTS test scores, the percentage of students' numeracy ability level will be known based on the category table used as a reference, so that the percentage of literacy and numeracy ability level is obtained as follows:

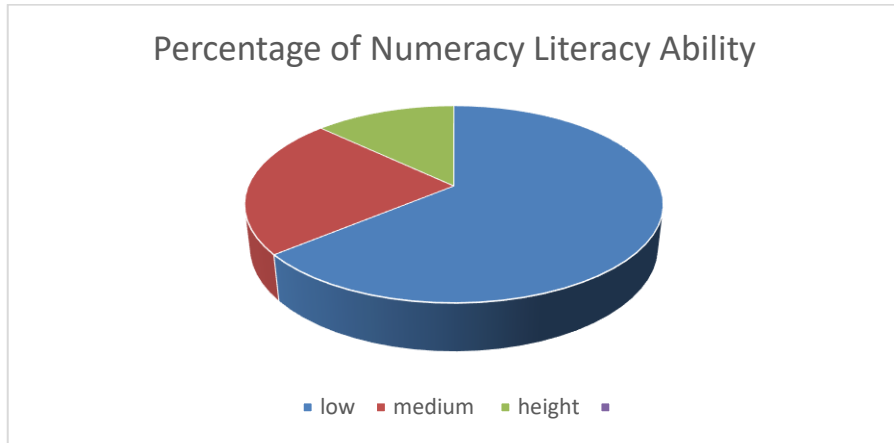


Figure 2. Numeracy Ability Diagram

From the table above, it can be seen that the percentage of students with HOTS or high ability obtained the lowest score compared to other levels with a percentage value of 13%, followed by students at MOTS or medium level with a percentage of 23%, and students with LOTS or low level dominated the class with percentage value 64%.

Using the Snowball sampling technique, with this method the data sources are initially small, but over time they become large. In this study, the researcher took 3 students to be interviewed, namely 1 student at the LOTS level, 1 student at the MOTS level, and 1 student at the HOTS level.

Table 4. Interview Result

No	Question	LOTS	MOTS	HOTS
1	Do you understand the questions given?	I don't like reading too long so I don't understand the problem	I understand a little because I have already worked on a similar problem	Understand the story so it's fun to do it
2	Did you find a way to solve the problem? If not, did you try to find another way?	Find another, easier way	Don't look for other ways, just do it straight away	Find another way

No	Question	LOTS	MOTS	HOTS
3	If you find the answer, do you double-check the correctness of the answer?	If you still have time, check again	Sometimes checked	Sometimes checked
4	When solving problems, do you try hard to complete calculations until you find the answer?	No, if you don't understand, you usually ask the questions carelessly	Yes, try hard	It depends on the material, if you understand it, search until you find the answer.
5	What do you do if you have difficulty working on a question?	Ask the teacher	Ask a friend	Ask the teacher and friends next door
6	What difficulties did you encounter in question number 1?	Because in the question there is a word that there is a 1m road around the pool	I understand question number 1 but it takes a long time to read and understand the question.	Can't find the ceramic area
7	What difficulties did you encounter in question number 2?	Can't find the result of the X	I understand but have to find some way	looking for x
8	What difficulties did you find in question number 3?	Do not know how	I understand what is meant but don't know how to do it	No difficulties
9	What difficulties did you find in question number 4?	Don't understand compound shapes	Difficulty finding the length and width of the building	Don't understand compound construction yet
10	What difficulties did you find in question number 5?	Can't find 4 possible fence sizes	Because the question is long, I didn't read it	I don't know how because I don't know the formula

After analyzing the test and interview results, several important findings were obtained regarding the numeracy literacy abilities of class V students at SDI Sultan Agung 1.3. The results show that students with low-level thinking abilities (LOTS) have difficulty understanding and solving the questions given. Many of them filled in answers carelessly because they had difficulty understanding the long text in the HOTS questions. Students in this category also admitted that they did not like story questions, which required them to read and understand the context first. On the other hand, students with intermediate (MOTS) and high-level (HOTS) thinking abilities show better understanding and are more independent in solving problems. Students in the HOTS category even enjoy the challenges provided by HOTS questions and actively look for alternative solutions.

Therefore, it can be concluded that students' numeracy literacy abilities still vary based on their level of thinking ability. Students with low abilities need continuous practice to get used to HOTS questions and can connect the mathematical concepts studied with problems in everyday contexts. Teachers are expected to be able to develop more effective teaching strategies to help students improve their numeracy literacy skills.

Based on test results and interviews with students at lower levels, it is known that students have not been able to understand and solve the questions given. Students said that they had a little difficulty understanding the questions so they chose to fill in the answers carelessly. Apart from that, AAN students also said that they did not like reading questions that were too long. Meanwhile, HOTS questions generally have story questions that require students to read. Students do not understand the meaning of the problem and do not try to find steps to solve the problem so even though the problem given is related to everyday life, they still have difficulty connecting the mathematical concepts they are studying with the problem given. Therefore, it can be concluded that students are not yet able to use various numbers to solve problems in everyday contexts. Students with low abilities need continuous practice to familiarize themselves with HOTS questions. Like research conducted by (Ully & Hakim, [2022](#)), Improving students' numeracy literacy skills requires continuous and consistent practice. Through consistent practice, numeracy can become second nature for students. Numeracy literacy is an ability that should be instilled from an early age. Every student has the potential and ability to improve their literacy and numeracy skills.

From the test results and interviews of students with moderate abilities, it is known that the numeracy literacy abilities of students with medium levels are quite good because they can understand and access information and can apply this information to solve problems. Students with moderate abilities said that they understood the questions and did not experience too much difficulty when working on HOTS questions. According to them, HOTS questions can be thought about logically without having to focus on the learning material. However, RMR students also said that there were some questions that they had to know how to do, such as the fifth question where they had to think about the possible outcomes of the problem. Students stated that there were difficulties in working on the story problems given, but students were able to connect them with mathematical concepts because they had encountered problems like that before.

From the test results and interviews of students with high abilities, it is known that the students' numeracy literacy skills are good, this is proven by the test results of students who have answered correctly. According to (Kusuma & Nurawanti, [2023](#)) the development of HOTS-based numeracy literacy questions for elementary school students is also in line with the research conducted (Nuringtyas & Setyaningsih, [2023](#)) regarding HOTS-based analysis of mathematical literacy skills in terms of numeracy abilities. The research results show that students with high numeracy abilities can achieve all indicators of mathematical literacy. Students with high levels said that working on HOTS-based questions was very interesting, like facing real problems in everyday life. However, they admitted that they experienced difficulties when working on questions that had tricky questions such as the fifth type of question because they had to find reasons for the answers. IYJ students said that working on HOTS questions required seriousness and calm in order to more quickly understand the information given in the questions. The ability to calculate with numerical ability, accuracy, thoroughness, and calmness is essential.

The existing difficulties can be caused by students' lack of familiarity with working on HOTS-based questions. The scores obtained by the researchers showed that of the five questions given, there were still many students who were in the LOTS or low category, meaning that most of the students' numeracy literacy skills were still low. With the results that have been analyzed by researchers, most students do not understand the wording of the questions, change the word problems

into mathematical sentences, and make conclusions or explain relevant reasons for the answers. Research conducted by Takaria regarding the mathematical literacy abilities of class VIII students at MTs Darun Najah in solving HOTS model questions is supported by research regarding the analysis of students' numeracy literacy abilities in solving story problems in terms of initial mathematical abilities (Takaria et al., [2022](#)). The results of this research show the need for innovation through the use of creative learning models, strategies, and methods with contextual nuances.

DISCUSSION

While some students can find solutions to problems, another factor that causes low levels of numeracy literacy is students' unfamiliarity with numeracy literacy activities at school (Komala Putri et al., [2024](#)). Educators need to be familiar with the idea planning stage to achieve numeracy literacy skills, such as using operational verbs in Bloom's taxonomy and implementing appropriate learning models. The lack of a culture of literacy and numeracy causes students' literacy and numeracy skills to decline, with a significant impact on learning outcomes due to teachers' habits in composing and giving questions that support literacy and numeracy (Maharani et al., [2024](#)). The development of a culture of literacy and numeracy can be implemented through related programs, such as Literacy Trail and others (Bahrony, [2023](#)). Another factor is the lack of encouragement and supervision from parents, where at night children are encouraged to study with the help of parents so that parents can monitor their understanding of the material taught by the teacher (Salfadilah et al., [2023](#)). The study, supported by research in Jyväskylä, Finland, shows that parental reading and mathematics difficulties, parental education, and the home learning environment contribute to a complex pattern of relationships with children's literacy and numeracy skills starting in the toddler years (Salminen et al., [2021](#)).

Correlation between all aspects needs special attention to improve literacy and numeracy skills. Numeracy literacy has a crucial role in preparing students to face the challenges of everyday life, with benefits that include improving students' problem-solving abilities and financial literacy, as well as supporting the development of inclusive and effective education policies (Grotlüschen et al., [2020](#)). Siswa yang memiliki kemampuan berhitung dan pemecahan masalah yang baik cenderung memiliki literasi keuangan yang kuat, menyoroti pentingnya literasi

numerasi dalam berbagai aspek kehidupan (Indefenso & Yazon, 2020). In addition, the importance of numeracy skills not only in the world of work but also in everyday life is increasingly receiving attention, because literacy and numeracy are considered crucial globally to support a modern knowledge-based economy (Laxman, 2024).

CONCLUSION

This research concludes that the numeracy literacy skills of class V students at SDI Sultan Agung 1.3 still show a fairly low level. Students with high abilities can relate numbers and mathematical forms in everyday contexts and can predict and make good decisions. On the other hand, students with moderate abilities are only able to relate these concepts to everyday life but are still lacking in predicting and making decisions. Meanwhile, students with low abilities tend to have difficulty connecting mathematical concepts with practical everyday situations, as well as in predicting and making decisions. These findings also show that the majority of students have difficulty with word problems that require an in-depth understanding of the context, indicating a lack of students' skills in working on HOTS-based questions and a lack of exposure to numeracy literacy activities.

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