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Analysis of Students' Abilities in Solving Numeracy Literacy Problems in Mathematics Learning at the Junior High School/ MTS Muhammadiyah in Sorong Regency

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Abstract

Numeracy literacy is the ability to understand, reason, and apply basic mathematical concepts in everyday life. The relationship between numeracy and mathematics is that numeracy requires mathematical knowledge learned in the curriculum; however, mathematics learning does not necessarily develop students' numeracy skills. An indicator of educational achievement across countries that Indonesia participates in is the Programme for International Student Assessment (PISA) score, where Indonesia ranks 63rd out of 81 countries in mathematics. This study aims to describe students' abilities in solving numeracy literacy problems in mathematics learning at the junior high school (MTS) Muhammadiyah in Sorong Regency. The research was conducted at SMP UNIMUDA Pulau Arar, SMP Muhammadiyah 2 Mariyai, and SMP Muhammadiyah Aimas. The type of research is qualitative descriptive. The results show that out of 44 students who completed the questions, five students fell into the high category, 31 students into the medium category, and eight students into the low category. Student responses varied for each answer in meeting the indicators of numeracy literacy ability.

INTRODUCTION

In this era, education is the most important thing and has a significant influence in various aspects of life, education is a form of effort to provide information on the teaching and learning process carried out by educators or teachers to students, to develop all potential in themselves (individuals or organizations) both intellectually, emotionally, spiritually, behaviorally, and hard skills and soft skills needed in the community environment. the more superior the quality of education of a country, it can be concluded that the country's human resources are increasingly superior, conversely if the human resources of a nation are very low, the quality of education in that country is also low, so it can be said that education can be a benchmark for the progress of a nation.

Numeracy literacy skills in mathematics learning enable students to understand and reason with each symbol, and apply or implement basic mathematical concepts in everyday real life. Numeracy literacy can also help students understand the role of mathematics in solving problems related to everyday life. The benchmark in the world of education, followed by Indonesia, is the Programme for International Student Assessment

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(PISA) Score, which is used by several countries to test and measure the extent of student achievement worldwide. The student's abilities to be measured (reading, science, and mathematics), the level of PISA scores in 2022 Indonesia ranks worryingly not much different from the results of PISA in 2018, so that in the world of education, it deserves attention from the Indonesian government in improving superior and intelligent human resources (HR). Additionally, Indonesia's PISA scores do not meet the standard score level of OECD countries (OECD, 2023).

Table 1. Differences in Numeracy Literacy Scores According to PISA

No.	Subject	PISA Score 2018	PISA Score 2022
1.	Reading	371	359
2.	Science	396	383
3.	Mathematics	379	366
	Ranking	73 out of 78 countries	63 out of 81 countries

The literacy emergency has also become increasingly concerning for the provinces of West Papua and Papua, as they rank among the lowest in the 34 Indonesian provinces (Solihin, 2019). The significant relationship between reading literacy and numeracy is powerful and unidirectional; of course, numeracy literacy skills are highly dependent on students' reading literacy skills. Students cannot solve math problems if they are unable to understand the issues given (Aziz & Septriyanti, 2023). This study aims to describe students' abilities in solving numeracy literacy problems in mathematics learning at Muhammadiyah Junior High Schools/Islamic Junior High Schools in Sorong Regency on predetermined criteria (low, medium, and high) and the benefits of this study are theoretically and practically, theoretically sound for the world of education to analyze problems regarding students' abilities to solve numeracy literacy problems in mathematics learning or as a reference for related learning while practically practical for educators, researchers, students, institutions/schools and students/learners.

METHOD

The type of research employed in this study is descriptive, with a qualitative approach. The research subjects were selected using a purposive sampling technique, where students were chosen based on specific considerations and objectives (Sugiono, 2016). Therefore, the research subjects are informants or sources of the problems to be studied by the researcher. The subjects in this study were eighth-grade students from 3 Muhammadiyah Junior High Schools/Islamic Junior High Schools in Sorong Regency, categorised as having high, medium, and low abilities. One subject was selected from each category to represent the 44 students who were studied. The research instruments used in the study were test questions and interviews. They were analysed using the Miles & Huberman model (Sugiono, 2022), specifically through the stages of data collection, data reduction, data presentation, and conclusion. The analysis was conducted based on the indicators outlined in the Numeracy Literacy Movement book (Weilin et al., 2017).

RESULTS

Subject: High Numeracy Literacy Ability Category

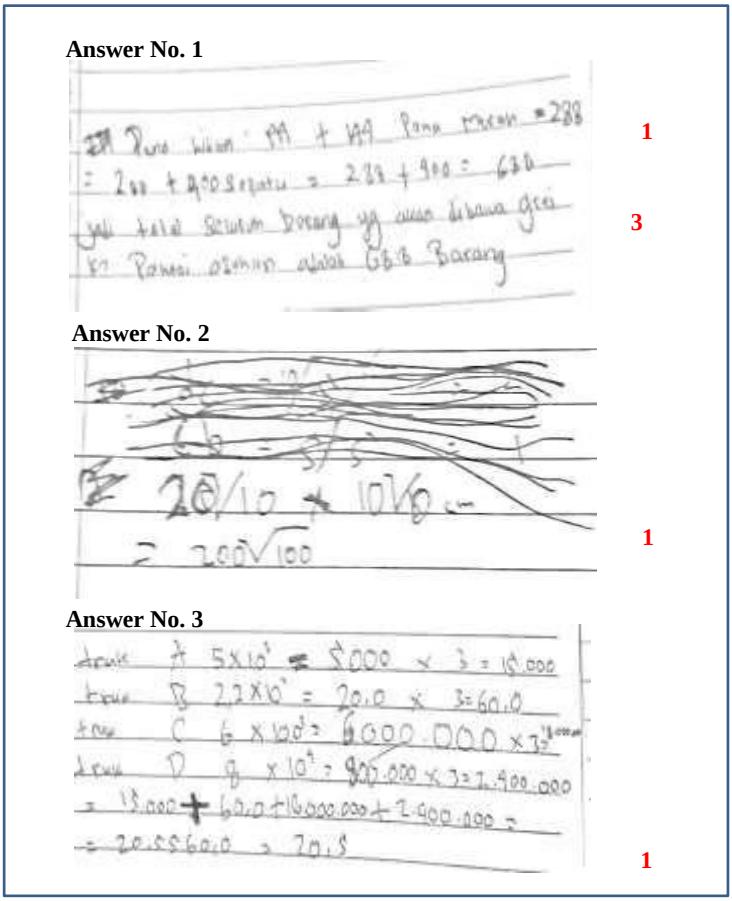

Figure 1. Subject Answer High Category

Based on the results of the answers to the high category subjects in each question, they did not fulfill indicator 2, namely Analyzing information and incompleteness of the calculation of answers to questions 2 and 3 in indicator 1, namely using numbers and indicator 3, namely not using conclusions in questions 2 and 3, reinforced by the results of the interviews that have been conducted, namely as follows:

R : *"In the answer you have written, why don't you write what is known and what is asked in the question?"*

K : *"I'll just go straight to the calculations so that I can get the results quickly."*

R : *"There is text between numbers 1, 2, and 3, so it's easier for you to understand the calculation questions?"*

K : *"Questions 1 and 3 are not too difficult, but only number 2 is difficult, so I can't do it because I don't understand how to complete the calculation."*

R : *"Between numbers 1, 2, and 3, there is text, which one is easier for you to understand so you can get the final results?"*

K : *"Regarding text number 1, it was easier, so I got the result, whereas for number 2, I still don't understand how to do it, so I don't know the final result, for number 3, I already feel the answer is correct."*

The interview results showed that the high category subjects did not record the analysis results as known and asked for in the question because they proceeded directly to the calculation process, failing to achieve indicator 2 of information analysis in all answers. Answer number 2 the subject wrote incorrectly based on the interview, this was due to a lack of understanding of the material of the problem being worked on, likewise in number 3 there was a calculation error so that indicator 1 was not appropriately achieved, this is also related to indicator 3, namely interpreting conclusions where the lack of understanding caused the subject to not write it.

Therefore, it can be concluded based on the results of the answers and interviews that have been conducted, the high category subjects can fulfill two indicators with the results: indicator one can use various numbers and symbols related to basic mathematics to solve practical problems in multiple contexts of everyday life and indicator two can interpret the results of the analysis that has been done to predict and draw conclusions.

Subject: High Numeracy Literacy Ability Category

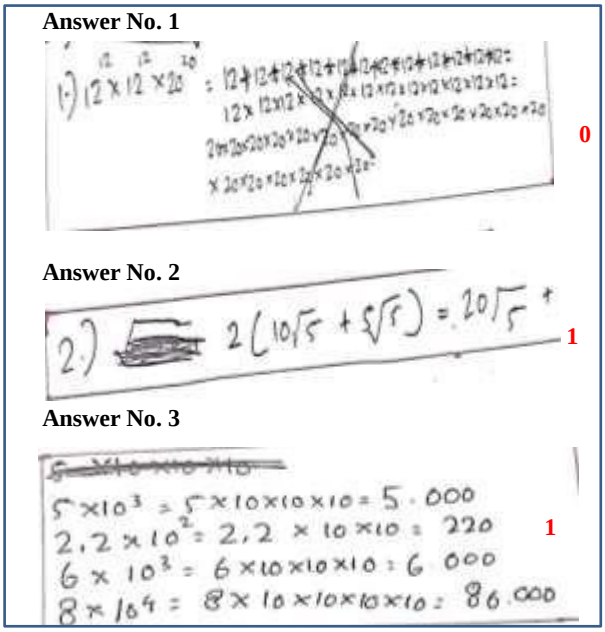

Figure 2. Subject Answers Category Medium

Based on the results of the answers to the subjects in the medium category, each question did not fulfil indicator 2, namely analysing information, and indicator 3, namely interpreting conclusions, which was reinforced by the results of the interviews that had been conducted, namely as follows:

R : *"Numbers 1, 2, and 3, do you have difficulty analysing the questions, or can you explain the meaning of the questions?"*
KDR : *"Can't"*
R : "Between numbers 1, 2, and 3, which question is the most difficult?"
KDR : *"Number 1, because its exponents calculate it"*
R : *"Then, can you explain your answers to numbers 2 and 3?"*

KDR : *"For example, 5 times 10 to the power of 3, 5 is multiplied by 1 and 10 is multiplied by 3, so 5 times 10 times 10 times 10 is equal to 5,000 and so on. The length is 10√5 while the width is 5√5, so to determine the circumference, use the circumference formula."*

R : *"Number 2 and 3, are you sure about your answers, and can you explain why you didn't write down the final results?"*

KDR : *"I am sure because I think my answer is correct, I wrote the final result in the form of a calculation."*

Interview results showed that subjects in the moderate category did not write down the analysis results as they were known and asked for by the questions, because they were directly involved in the calculation process. Therefore, indicator 2 of information analysis was not achieved in all answers. In Indicator 1, using mathematical numbers, subjects in the moderate category were able to use numbers to solve mathematical problems correctly and explain them, although with some incorrect answers. Similarly, in indicator 3, interpreting conclusions, subjects in the moderate category did not write or explain them.

Therefore, based on the answers and interviews, it can be concluded that subjects in the moderate category only met one indicator: the ability to use various numbers and symbols related to basic mathematics to solve practical problems in different everyday life contexts.

Subject: Low Numeracy Literacy Ability Category

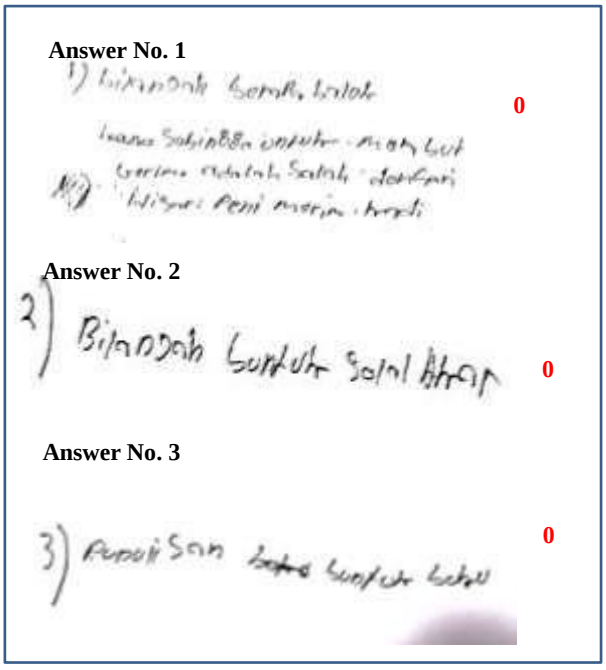

Figure 3. Subject Answers Category Medium

Based on the results of the answers to the low category subjects, each question did not fulfil all the indicators, namely, analysing information, using numbers, and

interpreting conclusions, reinforced by the results of the interviews that had been conducted, namely, as follows:

R : *"Numbers 1, 2 and 3, can you explain the meaning of these questions?"*
KDR : *"Can't"*
R : *"Do you find it difficult to count? In addition, subtraction, multiplication?"*
Eb : *"Yes, there is"*
R : *"Based on your answers to numbers 1, 2, and 3, what are the conclusions?"*
Eb : *"Don't know"*

Interview results revealed that low-competency subjects were unable to explain their written answers and had difficulty with calculations. This aligns with the test results they completed.

Therefore, it can be concluded that, based on the answers and interview results, low-competency subjects did not meet the three indicators of using numbers, analysing information, and interpreting conclusions.

DISCUSSION

The results of the numeracy literacy ability test in mathematics learning on the power number material based on three sub-materials raised, namely whole power numbers, root numbers and standard form writing which are the initial materials for mathematics learning, and the results of interviews that have been carried out have different answers/variations for each student and each group of numeracy literacy ability categories between high, medium and low at the Muhammadiyah Junior High School/MTS level in Sorong Regency. Students with high, medium, and low numeracy literacy abilities exhibit different responses when answering a test containing three questions.

Based on the interview results obtained, students prefer pictorial questions; they admitted that the presence of pictures in the questions helps them understand and work on the questions better. However, in contrast to what is written in the answers, some students, despite the questions being in the form of pictures, are unable to write the results of the answers or analyse the information they receive. Additionally, some students struggle to explain and perform arithmetic operations. Similarly, subjects were categorised into low, medium, and high groups based on their interview results and recognition of symbols. One of the three categories knows mathematical symbols. In contrast, subjects in the other categories do not understand what the symbol means after being asked by the researcher, and they are even unable to show the researcher the symbol. Therefore, the lack of knowledge of mathematical symbols that the students have answered is inversely proportional to the understanding of numeracy literacy with the opinion that numeracy literacy is the knowledge and skills to use various numbers and symbols related to basic mathematics to be able to solve real problems in different everyday life situations, to be able to provide information in other formats, be it graphs, tables, or charts, then use the interpretation of the results of the analysis for decision making (Nayla et.al., 2022).

In the first indicator, students can use various numbers and symbols related to basic mathematics to solve practical problems in different everyday life contexts. In the high category subject, in the first indicator on test question number 1, the subject performed the calculation process using numbers and symbols correctly. However, in the following test questions, namely 2 and 3, the subject miswrote the calculation. In test question number 2, the subject used the correct numbers but misused the calculation symbols, resulting in a wrong or inaccurate answer.

Finally, in question number 3, the subject also performed calculations with numbers and provided correct final answers for several types of trucks; however, others contained errors in the final answers for other types of trucks. Subjects in the medium category in test question number 1 miswrote the calculation operation, with errors in numbers and mathematical symbols. It did not have a final result score. Test question number 2: The subject was writing the calculation operation correctly and using the correct formula, but the final result obtained was wrong. Test question number 3 in the medium subject, the subject wrote the correct initial calculation operation, but did not continue to the end. This was very different from the low category subjects, who, in each test item, questions 1, 2, and 3 in the first indicator, either did not perform the calculation operation or did not provide an answer according to what was asked in the question.

Indicator 2 is the ability to analyse information presented in various forms (graphs, tables, charts). For high-skilled subjects, in test questions 1, 2, and 3, the subjects did not provide answers explaining how they analysed what was known, asked, or intended by the test questions. This also occurred in every medium and low-skilled subject. This finding aligns with previous research that indicates students struggle to recall information about what is known, asked, or intended by the test questions (Lede, 2022). Indicator 3 is the ability to interpret the results of the analysis to predict and draw conclusions. In test question 1, the high-skilled subject correctly drew a conclusion based on the answer they believed, whereas in subsequent test questions 2 and 3, the subject did not record it. In contrast, the medium and low-skilled subjects did not write conclusions about the answers they believed in for test questions 1, 2, and 3.

Judging from the overall answers from the high category subject group, this category can fulfil two indicators in one question. In comparison, the medium category group can fulfil one to two indicators within a single question. In contrast, the low category group does not achieve any indicators in 1 question, with different scores for each subject. The results of interviews with representatives of each subject indicate that students are confident in their answers, with no doubts and no intention of revising their responses. If seen from the answers of Muhammadiyah Junior High School (MTS) students in Sorong Regency, they experience difficulties in several areas, namely, first, they are incorrect in adding or calculating mathematics when completing test questions from the numeracy literacy ability test numbers 1, 2, or 3. Many answers found by researchers, students have written the arithmetic operation correctly at the beginning, but as they continue, they will see errors or mistakes in carrying out arithmetic operations, thus their final results are not correct, or because students are less proficient in using formulas and mathematical

symbols, errors occur from the beginning about how to solve them.

Second, it was found that many students' answers did not thoroughly analyse the questions, such as what was asked and known, or what the questions meant. As a result, many students obtained incorrect results because their understanding of the questions was not accurate. This was also supported by the opinion found in previous research regarding students' minimal literacy abilities which could result in story questions or in the form of reading in the numeracy literacy ability test questions being very poorly understood by students (Lede, 2022), which in fact is that literacy and numeracy are essential to one another (Aziz & Septriyanti, 2023).

Third, from the students' answers, it is also evident that many still do not record their conclusions at the end of their mathematical calculations based on the numeracy literacy test questions provided. So the answers from students in working on the numeracy literacy test questions at Muhammadiyah Junior High Schools/Islamic Junior High Schools in Sorong Regency are the same as the results found by previous studies which also said that the failure to fulfill the indicators from students is due to the students' own mistakes such as errors in performing arithmetic operations, not being able to analyze information and not writing conclusions (Nayla et. al., 2022). Numeracy literacy skills are crucial for students to know and apply in their daily lives, aligning with the opinion that three skills are essential in this era: character quality, competence, and literacy. Achieving these skills requires thinking and reasoning skills, where the most inherent reasoning ability is numeracy literacy skills (Lede, 2022).

CONCLUSION

Students in the high category were able to obtain two indicators in one question with a high score, although they did not achieve many other indicators. As seen from the answers, the ability of high category students in solving questions, their responses, and their suitability in the interview. Meanwhile, students in the category of moderate numeracy literacy ability fall between high and medium ability, achieving at least 1 or 2 indicators with varying scores. Students in the low numeracy literacy category are unable to explain the answer or even the meaning of the question, and do not provide answers in the form of calculation operations. Low subjects do not meet any indicators and therefore do not receive a score for each question.

Therefore, there is still much that needs to be addressed by various parties to improve students' numeracy literacy skills. Remembering how vital numeracy literacy skills are in everyday life where they are applied in multiple things

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