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Analysis of Students' Errors in Solving Ethnomathematics-Based Mathematical Literacy Problem in Moa Island

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Abstract:
This study aims to examine the mathematical literacy skills of junior high school students on Moa Island by identifying the types of errors they commonly make when solving mathematical literacy problems designed with cultural relevance. The problems were developed to reflect local contexts, following an ethnomathematics-based approach that situates learning within students' real-life experiences and community practices. This descriptive qualitative research involved 56 junior high school students from various schools on Moa Island, selected by their mathematics teachers based on academic ability. Students completed a mathematical literacy task adapted from PISA, and their written responses were analyzed for error patterns. To validate the findings, interviews were conducted with a subset of participants selected through purposive sampling to represent each type of identified error. The analysis, guided by Nolting's Theory, revealed five categories of errors. Misread directions errors occurred most frequently, affecting 53.5 percent of students. Concept errors were found in 39.2 percent, careless errors in 25 percent, and application errors in 12.5 percent. Study errors emerged in 82 percent of students, marking them as the most common issue. The findings suggest that students' difficulties stem largely from limited exposure to contextual problem-solving and a strong reliance on memorization over conceptual understanding. The study highlights the importance of incorporating culturally grounded, contextual problems into mathematics instruction to strengthen literacy skills. Future research is encouraged to further explore how ethnomathematics can be more effectively embedded into assessment and teaching practices.

Abstrak:
Penelitian ini bertujuan untuk mengkaji kemampuan literasi matematika siswa sekolah menengah pertama (SMP) di Pulau Moa dengan mengidentifikasi jenis-jenis kesalahan yang sering dilakukan saat menyelesaikan soal literasi matematika yang dirancang berdasarkan konteks budaya lokal. Soal dalam penelitian ini dikembangkan untuk mencerminkan situasi nyata yang relevan dengan kehidupan sehari-hari siswa, sebagai bagian dari pendekatan berbasis etnomatematika. Penelitian ini merupakan studi kualitatif deskriptif dengan melibatkan 56 siswa SMP dari berbagai sekolah di Pulau Moa. Para siswa dipilih oleh guru matematika masing-masing berdasarkan kemampuan akademik, khususnya dalam bidang matematika. Setelah mengerjakan

soal literasi matematika adaptasi dari PISA, peneliti melakukan analisis terhadap jawaban siswa. Validasi data diperoleh melalui wawancara dengan subjek terpilih menggunakan teknik purposive sampling, yakni siswa yang mewakili setiap jenis kesalahan yang teridentifikasi. Berdasarkan analisis menggunakan teori Nolting, ditemukan lima kategori kesalahan. Kesalahan membaca petunjuk (*misread directions errors*) terjadi pada 53,5% siswa. Kesalahan konsep (*concept errors*) ditemukan sebesar 39,2%, kesalahan ceroboh (*careless errors*) sebesar 25%, dan kesalahan penerapan (*application errors*) sebesar 12,5%. Kesalahan belajar (*study errors*) menjadi yang paling dominan, terjadi pada 82% siswa. Hasil penelitian menunjukkan bahwa kesulitan siswa sebagian besar disebabkan oleh kurangnya latihan soal kontekstual dan dominannya pendekatan hafalan dalam pembelajaran. Penelitian ini menekankan pentingnya pengintegrasian soal-soal matematika kontekstual yang berakar pada budaya lokal dalam pembelajaran untuk memperkuat keterampilan literasi matematika siswa. Penelitian lanjutan disarankan untuk mengembangkan dan mengeksplorasi lebih dalam potensi etnomatematika secara kolaboratif bersama masyarakat setempat.

Keywords:
Error, Literacy, Ethnomathematics, Nolting

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INTRODUCTION

Education is the key to both individual and societal development, fostering not only cognitive and technical competencies but also the transmission of moral and social values (Afif, Mukhtarom, Nur Qowim, & Fauziah, 2024; Astuti, Aropah, & Susilo, 2022). Grounded in Vygotsky's sociocultural theory, learning is a socially mediated process where development is shaped through cultural tools and guided interaction within the learner's environment. Education encourages personal growth, enables individuals to develop their full potential, and contributes positively to society. A high-quality education provides opportunities for every individual, regardless of their background or socio-economic status, to achieve success and positively participate in social and economic life.

The industrial era 4.0, marked by rapid advances in digital technologies such as artificial intelligence, big data, automation, and the Internet of Things, has significantly influenced the evolution of education systems worldwide. In

Indonesia, this transformation has driven curriculum changes across subjects to better align education with industrial demands, fostering a synergy between industry and academia. According to Wardina, Jalinus, and Asnur (2019) educational curricula are now being designed to cultivate students' digital literacy, problem-solving skills, and adaptability, ensuring they can thrive as competent individuals in a technology-driven future.

While the learning curriculum in schools continues to develop, the quality of human resources in Indonesia is still relatively low. According to the the literacy sk OECD (2023) ills of Indonesians aged 25 to 26 are equivalent to those of students in the second stage of primary education, which corresponds to lower secondary school in Denmark. This highlights a significant gap in foundational learning. Research by the RISE Programme in Indonesia and the SMERU Research Institute has shown that although educational access has expanded, learning outcomes are still weak (Beatty, Berkhout, Bima, Coen, Pradhan, & Suryadarma, 2018). This leads to a mismatch between formal qualifications and actual competencies. As a result, Indonesia's working-age population may find it challenging to compete in the international job market against countries with stronger education systems.

Based on the results of the academic review of the Kurikulum Merdeka, the change from the old curriculum to the new curriculum focuses on increasing literacy (Wahyudin, Subkhan, Malik, Hakim, Sudiapermana, Hapip, Amalia, & Krisna, 2024). This reform includes the application of differentiated learning, the use of formative assessments, and the integration of project-based learning. These approaches are intended to respond to students' individual needs and enhance their foundational competencies. These efforts are aligned with the broader goal of improving basic literacy skills among Indonesian students, which plays a crucial role in determining the overall quality of education in the country (Mtika & Abbott, 2025).

Indonesia's PISA results show a decline in mathematical literacy, one of the core areas assessed in the study (Kemendikbudristek, 2023). This has led to the thought that curriculum changes in Indonesia have made the quality of human resources worsen. Although various studies have examined mathematical literacy, most have focused on student competency profiles, instructional strategies, or the development of teaching materials. However, limited attention has been given to analyzing the specific types of errors students make when solving mathematical literacy problems. Identifying these errors at the classroom level is essential, as it enables educators to better understand students' misconceptions and tailor instruction accordingly. Unaddressed errors may persist and negatively affect students' long-term educational development (Kurniati, Ruslan, & Ihsan, 2018). Therefore, this study aims to fill the gap by conducting a focused analysis of students' errors as a practical step toward improving mathematical literacy through more responsive and effective teaching practices.

Literacy is a form of critical thinking. Literacy is not only used in language subjects but in all subjects. One of the literacies measured in PISA is mathematical literacy. According to Khotimah (2021) the role of mathematical literacy in the world of education in Indonesia has been recognized since 2004. Since then, mathematical literacy has become a trend in measuring the quality of education in Indonesia. The development of studies on mathematical literacy increases every year. This can be seen in the search trend for the word "mathematical literacy" for the last 5 years, according to Google Trends, shown in figure 1.

Figure 1. Trends in Searches for Mathematical Literacy Terms on Google
Source: trends.google.com

According to the OECD, mathematical literacy is an individual's capacity to reason mathematically and to formulate, employ, and interpret mathematics to solve problems in a variety of real-world contexts (OECD, 2023). Mathematics, as a discipline, has broad applications in spatial reasoning, pattern recognition, comparison, calculation, and other everyday challenges (Alisherovich, 2023). Therefore, learning mathematics should not be limited to memorizing formulas or abstract concepts. Instead, it must equip students with the ability to apply mathematical thinking as a practical tool for solving real-life problems.

On the other hand, mathematical literacy aims to enable students to understand, use, and apply mathematical concepts in real situations relevant to their lives. Ethnomathematics, as the study of the relationship between mathematics and culture, provides a concrete local cultural context in mathematics learning (D'ambrosio & Brasil, 1980). This allows students to learn mathematics through things that are familiar and meaningful to them, such as patterns, games, crafts, or traditions that exist in their environment.

The application of learning that develops the concept of mathematical literacy based on ethnomathematics is potentially applicable to schools in Southwest Maluku (Kabupaten Maluku Barat Daya). Southwest Maluku district, located in the southeastern part of the Maluku Archipelago, consists of several islands with rich local culture and traditions, such as sasi (a customary environmental conservation practice), nahuwok (a traditional ritual or belief system), motif tenun (distinctive woven textile patterns), and lutur batu (ancestral stone structures used in traditional architecture) (Dahoklory, Laurens, & Palinussa, 2023; Sairiltiata, 2023; Sugiarto, Rupilele, Kurniati, Lekitoo, Inuhan, & Dahoklory, 2024). Each island has its own uniqueness in terms of customs, arts, and daily life practices. This study applies an ethnomathematical approach by analyzing how students from Moa Island engage with mathematical literacy tasks that reflect their cultural practices. Rather than merely incorporating cultural objects into learning materials, the focus is on uncovering how students interpret and solve problems that are rooted in local knowledge systems, such as traditional weaving patterns, spatial reasoning in architecture, or customary measurement in trade.

Moa Island is one of the main islands in Southwest Maluku. The island is known for its strong communal values, traditional knowledge systems, and cultural practices that are deeply embedded in daily life. Communities on Moa engage in activities such as weaving with symbolic motifs, constructing fences using geometric reasoning, and navigating the sea by observing star positions. These practices reflect a rich foundation of indigenous mathematical thinking, making Moa Island a meaningful site for exploring the integration of ethnomathematics into mathematics education.

The application of learning that develops the concept of mathematical literacy based on ethnomathematics is very likely to be applied in schools in Southwest Maluku (Inuhan, Dahoklory, Lekitoo, Rupilele, Kurniati, & Sugiarto, 2023; Kurniati MA & Lekitoo, 2023). Besides the fact that this area has a very diverse culture, people's lives in this district are also closely related to the use of traditional mathematical concepts in their daily activities. For example, people in this district use geometric calculations in the construction of fences, both for residences or plantations, and livestock pens, and in determining the direction of the winds based on the position of the stars for sea navigation (Kurniati MA

& Lekitoo, 2023; Sugiarto, Rupilele, Kurniati, Lekitoo, Inuhan, & Dahoklory, 2024). Hence, mathematics learning integrated with local cultural values not only enriches students' understanding but also preserves the traditional culture of the community. In addition, this approach can increase students' interest and motivation in learning mathematics because they can directly observe the application of ethnomathematics in the context of their daily lives.

However, based on data from BPS Southwest Maluku, the quality of education in this district is not so good. This can be seen in the Human Development Index (HDI), which continued to be in the medium category during 2019-2023 (BPS Kabupaten Maluku Barat Daya, 2022, 2024; BPS Maluku Barat Daya, 2023). One of the indicators measured in the HDI is the average number of years of schooling in this district in 2019-2023, which ranged from 8.14 to 8.92 (BPS Kabupaten Maluku Barat Daya, 2022, 2024; BPS Maluku Barat Daya, 2023). This means that most of the population in this area spends an average of around 8-9 years in formal education. In other words, the population in Southwest Maluku generally completes their education up to junior high school level. Therefore, identifying student errors in working on ethnomathematics-based literacy problems can be done in all junior high schools on Moa Island. This island was chosen because it is considered Moa as the district capital as well as the sub-district with the largest population in Southwest Maluku (BPS Kabupaten Maluku Barat Daya, 2024).

Therefore, in this research, the research problem is described as follows: (1) What are the literacy skills of junior high school students on Moa Island? (2) What are the types of mistakes that junior high school students in Moa Island often make in working on ethnomathematics-based math literacy problems?

METHODS

This research is a qualitative study that focuses on analyzing student errors in solving PISA-like mathematical literacy questions based on ethnomathematics. The subjects of this study are 56 junior high school students from Moa Island, each representing one of the following schools: SMP Negeri 1 Tiakur, SMP Negeri 2 Tiakur, SMP TK Patti, SMP Negeri Weet, SMP Kristen Tounwawan, SMP PGRI Klis, and SMP PGRI Kaiwatu. These students were selected by their mathematics teachers based on their mathematical abilities. In this study, the students are considered subjects of ethnomathematics because their mathematical thinking is examined concerning the cultural knowledge and practices of Moa Island. Their responses to contextualized mathematical literacy tasks are analyzed to understand how local culture influences their reasoning and the types of errors they make. To explore the underlying causes of these errors, interviews were conducted with selected students using a purposive sampling technique, ensuring that each category of error was represented. The interviews followed a semi-structured format and lasted approximately 15 to 25 minutes per participant. Each session began with general questions about the student's interpretation of the problem and continued with specific prompts such as "What did you think this question was asking?" and "Why did you choose this operation?" These discussions were used to identify reasoning patterns, misconceptions, and the influence of cultural context on problem-solving. This analysis is guided by Nolting's Theory, which is considered effective in identifying errors in contextual materials such as literacy questions (Aroysi, 2018; Ulpa, Marifah, Maharani, & Ratnaningsih, 2021). The theory outlines six types of errors: misread directions errors, careless errorsu, concept errors, application errors, test taking errors, and study errors (Ulpa, Marifah, Maharani, & Ratnaningsih, 2021). Based on this framework, the indicators used in this study to identify student errors are presented in table 1.

Table 1. Indicators of Each Type of Error

No	Error Type	Code	Indicators
1.	Misread-Directions Errors	K1	• Students misinterpret the problem • Students are unable to write the known and questionable components in the problem • Students do not understand the information in the problem
2.	Careless errors	K2	Students are less careful, so they write the wrong symbols, units, or are less careful in arithmetic operations.
3.	Concept Errors	K3	Students do not master the mathematical concepts in the problem
4.	Application Errors	K4	• Students know the formula but have not been able to apply it in problem solving • Students only memorize the formula, but not the solution
5.	Test-Taking Errors	K5	• Students leave the answer blank • Students do not finish the answer until the end

No	Error Type	Code	Indicators
			• Students do the problem well, but do not find the final result • Students cannot conclude the answer
6.	Study Errors	K6	• Students do not understand the teacher's explanation • Students rarely do practice problems • Mistakes in the learning process

Source: (Ulpa, Marifah, Maharani, & Ratnaningsih, 2021; Utami, Minarti, & Bernard, 2023; Wibowo & Haerudin, 2024)

RESULTS AND DISCUSSION

Based on students' responses, only 10 out of 56 participants answered correctly on the adapted PISA level 1 comparison problem, while the remaining 46 exhibited various types of errors as classified using Nolting's Theory (see table 2). The task provided involved a contextual scenario of estimating travel time between villages on Moa Island based on local transportation times and distances—an everyday situation familiar to students and intended to reflect their cultural environment. This contextual grounding represents the ethnomathematical basis of the problem, as it draws on students' lived experiences and traditional spatial reasoning when navigating between locations. However, as follow-up interviews revealed, many students did not fully recognize the relevance of this context, indicating that the cultural elements may not have been made explicit enough. The percentage of each type of error is obtained by the following formula (1).

$$p = \frac{n}{56} \times 100\% \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

It is important to note that students do not always make only one type of error. In this study, students' wrong answers were caused by errors in 1 of 4 types of errors.

Table 2. Identification of Student Error Types

Error Type	Number of students who made the error type (n)	Percentage (p)
K1	30	53,5%
K2	14	25%
K3	22	39,2%
K4	7	12,5%
K5	-	0%
K6	46	82%

The percentage criteria, as shown in table 3, were used to classify the percentage of each error made by students.

Table 3. Criteria for Percentage of Error Types

Percentage	Category
$p \geq 55\%$	Very high
$40\% \leq p < 55\%$	High
$25\% \leq p < 40\%$	Moderately High
$10\% \leq p < 25\%$	Small
$p < 10\%$	Very small

Source: Suryani, Jufri, and Firdaus (2021)

Based on tables 2 and 3, the first type of error (K1), namely errors in interpreting the information given in the problem, is in the high category at 53.5%. The second type of error (K2), namely errors due to lack of accuracy in arithmetic operations, is in a fairly high category, with a percentage of 25%. Furthermore, the third type of error (K3), where students do not master the mathematical concepts in the problem, is in a fairly high category with a percentage of 39.2%, and the fourth type of error (K4), with a percentage of 12.5% or is in the small category. Based on the data in these two tables, no fifth type of error (K5) was found, namely Test Taking Errors caused by certain things, such as not completing the given problem. The sixth type of error (K6), namely Study Errors, which occur when students do not do enough practice problems, occurs with the largest percentage, 82%, or in a very high category.

These findings highlight varying degrees of difficulty experienced by students when engaging with contextualized mathematical literacy problems. To better understand the nature and sources of these challenges, each type of error is examined in greater detail. The following explanations aim to shed light on how these errors emerged, what they reveal about students' mathematical understanding, and how cultural context may have influenced their reasoning.

1. Misread-Directions Errors

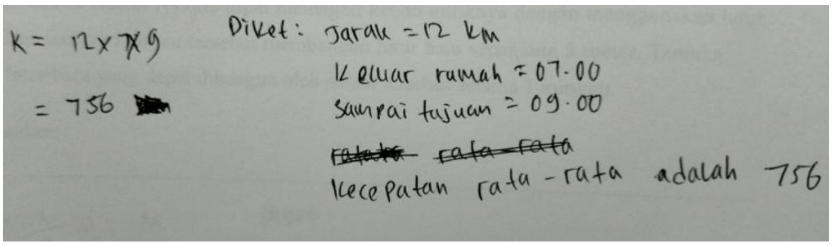

Figure 2. Student Answers That by Directly Multiplying All The Numbers in The Problem

There were 30 out of 56 students, or 53.5 percent of the total research subjects, who exhibited Misread Directions Errors. Among them, six students wrote only the final answer without identifying any information or questions from the problem. When asked for clarification, these students admitted they did not understand the context of the problem and simply guessed the answer. The problem itself was constructed using a scenario based on students' surroundings, such as estimating travel time between nearby villages using local transportation references, aiming to reflect daily experiences relevant to their community. However, some students still felt disconnected from the context, suggesting that the cultural grounding in the problem may not have been perceived as meaningful or familiar enough to activate their prior knowledge. Eight other students, for example, wrote down some key information but proceeded to multiply all the numbers in the problem without considering their meaning. As shown in figure 2, many students arrived at the answer 756 by multiplying 12, 7.00, and 9.00, even though 12 represented distance and the other two indicated time. When asked, Subject 1 (S1) and Subject 2 (S2) explained that they did not understand the purpose of the question. This highlights the importance of ensuring that problems designed with ethnomathematical elements are not only culturally inspired but also aligned with the lived realities and experiences of the students.

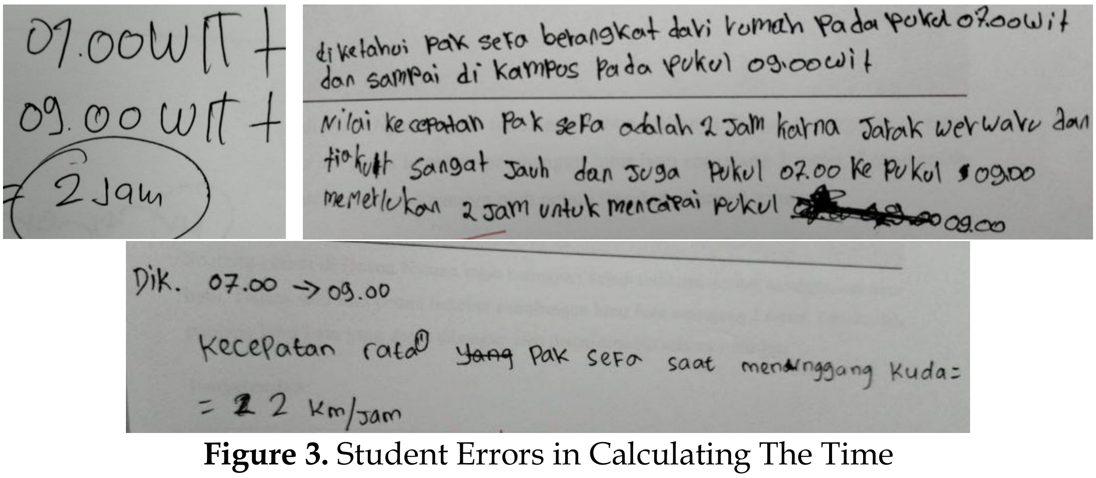

Figure 3. Student Errors in Calculating The Time

In addition, 9 students were only able to write down the time duration they obtained from the problem. According to S3, if leaving at 7:00 and arriving at 9:00, then the time used during the trip is 2 hours. According to him, there was no more important information in the problem, so the nine students were unable to continue the solution; some of them even wrote 2 km/hour as the final answer. During the interview session, subject 3 (S3) explained that the question in the problem was speed. According to him, the unit of speed is km/hour, so he concluded that the final result of solving this problem was 2 km/hour.

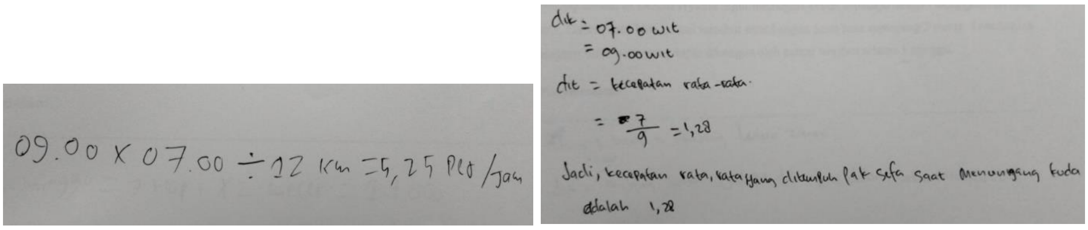

Figure 4. Students are Unable to Write The Correct Mathematical Operations

Furthermore, the other 5 students who also experienced this type of error had difficulty in interpreting the information in the problem and were unable to write the mathematical operations used appropriately, as shown in figure 4. According to the results of the interview with S4, this error occurred because they were confused by all the information given in the problem.

The remaining 10 students mentioned similar reasons when asked why they gave answers by writing the final answer directly on their answer sheets. According to S5, the answers written down were random numbers that popped into their heads because they did not want to return the blank answer sheet. When confirmed, S5 and S6, who were the subjects with the answers shown in figure 4, were also unable to explain where they got the numbers from and why they used the units.

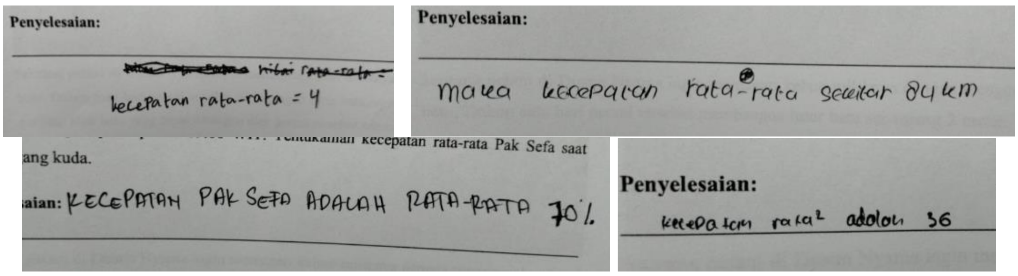

Figure 5. The Answers of The Students Who Wrote The Random Numbers

According to several studies, one of the most dominant errors that students often encounter is misread-direction errors (Aroysi, 2018; Ulpa, Marifah, Maharani, & Ratnaningsih, 2021). This type of error arises because of students' low reasoning, their weak ability to identify information into mathematical concepts, and the lack of practice problems, especially contextual problems. To minimize this type of error, teachers need to increase non-routine problem practice and relate the problems given to situations that are close to students. This can be done by giving examples of problems related to the situation of people's lives in Southwest Maluku or about the culture and traditions in this district.

2. Careless Errors

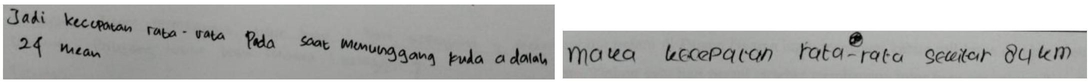

Figure 6. The Answer of The Student Who Wrote The Average Speed in Km And The Mean

Careless errors can be seen from the lack of accuracy of students, so that they write the wrong symbols, units, or calculation operations. In this problem, there were 6 students who wrote the wrong units. For example, the average speed was written in km and mean, as shown in figure 6, and the speed was written in hours (figure 7). The other 8 students did not write the unit in their final answer because they did not know the correct unit for their answer.

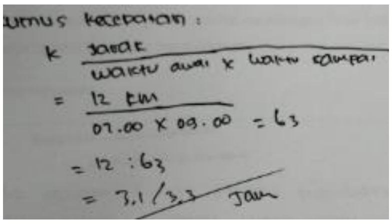

Figure 7. A student's Answer Who Assumes That The Speed is in Hours

However, after being confirmed randomly in the interview session, S1 and S2 admitted that the error was due to rushing in answering the question. Some of them also felt that the units in the final result were not important enough to pay attention to. This type of error was also identified in similar studies (Ulpa, Marifah, Maharani, & Ratnaningsih, 2021; Utami, Minarti, & Bernard, 2023). In these studies, many children were wrong in completing simple calculations due to the rush factor in doing the problem.

3. Concept Errors

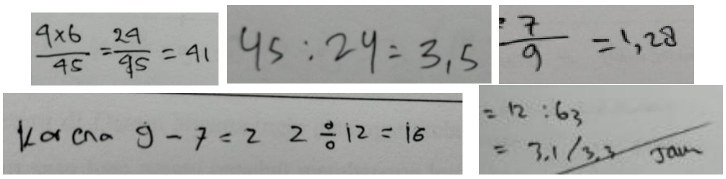

Figure 8. Students Were Found to Be Incorrect in Completing Simple Arithmetic Operations

Concept errors are where students do not master the mathematical concepts applied in the problem. In this problem, 15 students were detected to be incorrect in completing simple arithmetic operations, as shown in figure 8, where students did not seem to master the concept of division well. When confirmed, it was indeed that their ability to solve division problems was still not optimal, not because they were in a hurry or under time constraints, but they made mistakes in answering. In this case, the error in solving division problems encountered is that students divide the largest number by the smallest number in the fraction, without paying attention to the position of the number as a numerator or denominator. For example, in figure 8, students wrote 7/9=1.28, whereas 1.28 is the result of 9/7. This indicates a misconception about the structure of fractions and the meaning of division, not just a slip in calculation (Kurniati, Ruslan, & Ihsan, 2018).

Similar results have also often been found in several previous studies, which state that students' abilities are still relatively low in completing division operations (Diyah, Aysah, Fadhilla, Serly, & Darmadi, 2021; Hanik & Liansari, 2023; Sari, Susanti, & Rahayu, 2018). Based on these results, errors in solving division problems can be caused by calculation errors or strategy errors in determining the number being divided.

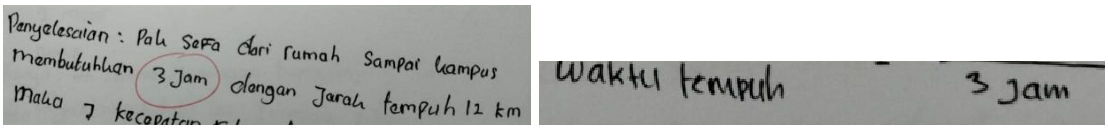

Figure 9. Students' Errors in Calculating The Duration of Time

This type of error can also be seen when students calculate the duration of travel time if they depart at 07.00 and arrive at 09.00. As shown in figure 9, 2 students stated that the duration of time used during the trip was 3 hours. In the interview session, one of the students identified as making this kind of error (S3) mentioned the reason for answering so because they calculated the length of travel time starting from 7:00, 8:00, and 9:00, so that the total travel time was 3 hours. Similar errors were also found in several studies (Kurniati, Ruslan, & Ihsan, 2018; Sari, Susanti, & Rahayu, 2018). Which mentioned many students who experienced errors in performing simple subtraction operations. In story problems, errors can also be caused by students' lack of understanding of the problems given.

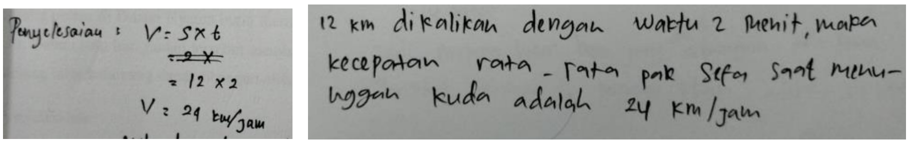

Figure 10. Students' Misunderstanding of The Basic Concept of Speed

This type of conceptual error was also found in students' problem solving, where they stated that to determine speed, they needed to multiply the known distance and time, as shown in figure 10. This answer shows a misunderstanding of the basic concept of speed, which should be determined by dividing the distance by time, not multiplying them. This error could be caused by several factors, such as a lack of understanding of basic mathematical concepts or errors in teaching.

Conceptual errors in mathematics, as analyzed in this study, are not a new issue. Other studies have also found that students often experience confusion and errors in understanding basic mathematical concepts (Nurmahdiyah & Arliani, 2023). These errors may stem from ineffective teaching methods, limited emphasis on conceptual understanding, and a lack of contextualized practice. To address this, several targeted improvements are recommended. First, teachers should incorporate visual and concrete representations, such as fraction strips, number lines, or culturally relevant objects, to help students internalize abstract concepts. Second, ethnomathematics-based learning materials should be developed that connect mathematical ideas to students' daily experiences, such as using local trade practices or traditional measurements in problem-solving tasks. Third, classroom instruction should include structured error analysis activities, where students examine and discuss common mistakes to deepen their understanding. Finally, professional development programs for teachers should focus on strategies for diagnosing conceptual misunderstandings and designing lessons that promote reasoning rather than rote procedures. These specific efforts can help reduce conceptual errors and support more meaningful and lasting mathematical learning (Kurniati, Ruslan, & Ihsan, 2018).

4. Application Errors

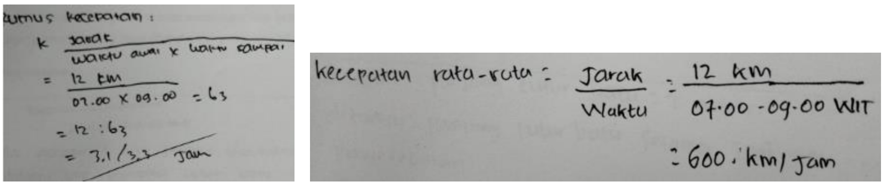

Figure 11. Students Know The Formula but Cannot Apply it

One indicator of application errors is when students know the formula but cannot apply it to solve the problem. As shown in figure 11, there are 7 students who are able to write the formula correctly but do not know the number that should replace the formula. This type of error is also quite dominant among students (Nurmahdiyah & Arliani, 2023; Suryani, Jufri, & Firdaus, 2021; Ulpa, Marifah, Maharani, & Ratnaningsih, 2021).

The inability to substitute the correct variable indicates that although the theoretical understanding of the formula is established, its practical application remains a problem. This could be the result of several factors, including a lack of contextual exercises, teaching approaches that focus more on memorization than understanding, and limitations in independent problem solving.

In addition, this study also revealed that students often feel rushed to work on problems, which can result in application errors. To resolve this issue, more interactive and supportive teaching methods are needed, such as project-based learning or case studies that allow students to apply formulas in real situations (Azizah & Widjajanti, 2019).

It is important for educators to not only teach formulas but also provide concrete application examples and engage students in varied exercises. By doing so, students can build stronger skills in applying math concepts appropriately and effectively.

5. Test-Taking Errors

Test-taking errors can be identified by the indicators, such as students leaving the answer blank, not completing the answer, not finding the final result, or not being able to conclude, but working on the problem properly. In the questions given, this type of error was not found in students who became subjects in this study. Some of the research subjects did leave the answer blank, but when confirmed back in the interview session, they mentioned that they did not know what to write because they did not understand the meaning of the problem.

6. Study Errors

Indicators of study errors are students not understanding the teacher's explanation, students rarely doing practice problems, or students experiencing confusion during the learning process. In this study, almost all students interviewed stated that it was very rare to solve problems in the form of story problems. They argued that it would be easier if the problem were in the form of routine problems, such as solving problems that were directly faced with numbers. Too much information in story problems, according to them, makes it very difficult to solve the problem. These results were also confirmed from the questionnaire distributed after the test was completed.

Based on the results of the analysis of student errors and their causes described previously, the researcher offers several solutions to overcome this problem, which are:

a) The solution to minimize misread-direction errors is that teachers need to increase contextual problem exercises. For students on islands, such as on Moa Island, teachers need to apply more ethnomathematics-based problems so that students feel that the problems given are real and close to their student culture. In addition, teachers also need to invite students more often to think about the information given in a story. This task is certainly not an individual task, but a task that involves the three centers of education, namely school, family, and community.
b) The solution to minimize careless errors is that students must be familiarized with checking their answers again and need to learn to manage time so as not to rush in working on problems.
c) The solution to minimize concept errors is that teachers need to ensure students' basic mathematics skills, especially in simple operations such as division and subtraction. Student concept errors in these basic operations are very important because they can cause many problems that will have a long-term impact.
d) The solution to minimize application errors is that teachers and students need to collaborate to reduce learning methods that focus on memorization.
e) The solution to minimize study errors is that students need to be aware of the importance of learning and practicing problems, especially questions that are contextual or ethnomathematics-based.

CONCLUSION

Based on the results of the analysis of junior high school students' errors on Moa Island in solving mathematical literacy problems, it was found that the first type of error (K1), Misread Directions Errors, was in the high category at 53.5 percent. This was due to students' limited reasoning skills and difficulty in analyzing the information presented in the problem. This may be influenced by the lack of contextual problem exposure in classroom instruction. Some students also stated that they found story-based problems more difficult than direct numerical questions. The second type of error (K2), Careless Errors, was in the moderately high category at 25 percent, often caused by students rushing through the task and overlooking important details such as units in their final answers.

The third type of error (K3), Concept Errors, was found in 39.2 percent of students and was also categorized as moderately high. These errors were primarily due to students' incomplete understanding of division and fractions. For example, some students reversed numerators and denominators, believing that 7 divided by 9 was the same as 9 divided by 7. Errors in calculating time duration also indicated a lack of conceptual understanding of subtraction in contextual settings. The fourth type of error (K4), Application Errors, occurred in 12.5 percent of students and was categorized as low. These were linked to limited experience with contextual problems, a focus on memorization in teaching, and a lack of independent problem-solving practice. Finally, Study Errors (K6) were found in 82 percent of students, the highest among all categories, indicating that most students had not practiced enough with contextual or culturally relevant problems.

This study contributes new insight to the academic field by focusing on student errors in a culturally specific setting, in Moa Island, where mathematical literacy tasks were designed to reflect local contexts such as travel between villages, time estimation, and measurement practices familiar to the community. While many previous studies have categorized student errors, this research adds value by examining how students from a distinct cultural background interpret and respond to problems that are intended to be relevant to their lived experiences. The findings suggest that even when problems are designed with local context in mind, students may still struggle to recognize their relevance, highlighting the need for more explicit integration of cultural elements in both instruction and assessment.

Although the problems used in this study were inspired by everyday situations in Moa Island, the connection to ethnomathematics could be strengthened in future research. A deeper ethnographic exploration of local mathematical practices, such as traditional navigation, trade, or construction, could be used to design tasks that more clearly reflect the mathematical thinking embedded in the community. This would ensure that the problems are not only contextually familiar but also authentically grounded in the cultural logic of the students. Future studies are encouraged to collaborate with local communities to co-develop problem contexts and to explore how students' cultural knowledge can be more effectively activated in mathematical reasoning.

This study is limited by its focus on a single region and topic, analyzing only one type of problem related to comparison. The depth of analysis was also constrained by the number of interview participants, and the tasks, although culturally contextualized, may not fully capture the diversity of mathematical thinking present in all traditional practices.

Future research could expand the scope by involving multiple types of mathematical literacy problems across different levels of complexity and topics. Further studies might also explore comparative results between students exposed to ethnomathematics-based instruction and those receiving conventional mathematics education. In addition, collaboration with local communities to design culturally grounded assessments could enrich both the research process and the educational outcomes.

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