

Analysis of Third-Grade Students' Learning Difficulties with Whole Number Operations Based on the Newman Method at SD Negeri 1 Ternate City

Solehatun¹, Darmawat Hadi², Dwi Widyastuti Nurharyanto³

¹²³⁴ Unkhair, Indonesia

* Correspondence e-mail; solehatun824@gmail.com; watihady76@gmail.com;
dwi.widyastuti@unkhair.ac.id

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Abstract

The purpose of this research is to describe students' learning difficulties in solving problems on natural number material based on the Newman method. The type of this research is descriptive qualitative with data collection techniques including written tests, interviews, and documentation. The subjects in this study are 34 third-grade students from SD Negeri 1 Kota Ternate for the 2025/2026 academic year. Data analysis was conducted through the stages of data collection, data reduction, data presentation, and conclusion drawing. The research results show that the percentage of errors made by students in solving story problems includes: encoding errors at 44.31%, comprehension errors at 28.80%, transformation errors at 12.41%, process skill errors at 10.93%, and reading errors at 3.55%. Thus, it can be concluded that the most dominant learning difficulty faced by students lies in the final answer writing stage (encoding error), where students tend to directly write down the calculated numbers without systematically including a concluding sentence

Keywords

Learning Difficulties, Natural Number, Newman Method



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INTRODUCTION

Education plays a crucial role in improving human well-being by providing lifelong learning experiences, whether formal, non-formal, or informal. Education serves to develop individual potential so they can contribute to life with dignity and worth (Triwiyanto, 2017). One way to assess educational success is by examining student learning outcomes, which reflect mastery of the material and success in the learning process, which plays a crucial role in the implementation of education at the elementary school level. This subject not only focuses on mastering arithmetic operations and various formulas but also plays a role in developing conceptual understanding, logical thinking skills, and problem-solving skills, which are essential for students' intellectual development (Rosidah et al., 2022). Therefore, mastery of

mathematical concepts from an early age is a vital foundation for educational success at subsequent levels, making effective learning in schools a key factor in maximizing students' cognitive potential.

However, mathematics is often perceived as a difficult, intimidating, and uninteresting subject for students. This perception can create various obstacles in the learning process. Learning difficulties are conditions in which students encounter obstacles that prevent them from optimally participating in the learning process. This condition is influenced by various factors or disorders that affect brain function in receiving, processing, and analyzing information (Rofiqi, 2020). Difficulty understanding mathematics is a problem experienced by children, influenced by factors originating from both within and outside themselves. This makes it difficult for them to function optimally in the learning process, especially in receiving, processing, and analyzing the information they receive during mathematics lessons (Yeni, 2015). Students who experience this problem typically have difficulty understanding abstract concepts, recognizing numbers or mathematical symbols, applying procedures and formulas correctly, and frequently make errors caused by carelessness. These obstacles are generally influenced by two main factors: internal factors including intelligence quotient (IQ), negative attitudes toward learning, low motivation, and poor health; and external factors originating from the family, school, and community environment (Wiyartimi in Auliah, 2023). To address this issue and accurately identify the location and causes of students' difficulties in solving problems, particularly word problems, educators can use the Newman error analysis method, introduced by Anne Newman in 1977 (Sari, 2021). This method effectively identifies the sources of learning difficulties through five sequential evaluation stages: errors in reading problems, errors in understanding problems, errors in converting problems into mathematical models, errors in arithmetic process skills, and errors in drawing conclusions or writing final answers. Initial observations and interviews at SD Negeri 1 Ternate City showed that third-grade students still experienced significant difficulties in understanding whole number operations with the number range 1–100. The low student learning outcomes in this material are thought to be related to the application of conventional learning methods and the use of less engaging learning media. This condition affects students' ability to solve problems related to the material being studied.

Conceptually, the analysis of whole numbers is carried out because whole numbers are symbols used to describe elements or quantities of a set starting from zero and so on. At the third grade level of elementary school, understanding this

material includes multiplication operations which are explained theoretically as repeated addition, where a number is added repeatedly depending on the multiplier. In addition to multiplication, students also need to master the division process which is the inverse of the multiplication operation, or can be interpreted as a repeated subtraction by the divisor from the dividend until the subtraction results in a value of zero. By integrating this theory, the application of the Newman method has proven to be very helpful and important in determining the location of learning difficulties in third grade students through error analysis in the five categories. Seeing the explanation above regarding the importance of mathematics and the gap in learning outcomes in the field, the author felt compelled to conduct research with the title "Analysis of Learning Difficulties of Third Grade Students in Whole Number Operations Based on the Newman Method at SD Negeri 1 Kota Ternate

METHODS

The type of research conducted was a qualitative approach with a descriptive method. A qualitative approach was chosen to understand a meaning, analyze, understand the uniqueness of a phenomenon and formulate a hypothesis (Sugiyono, 2021). This research was conducted at SD Negeri 1 Ternate City in the even semester of the 2025/2026 academic year. The subjects in this study consisted of 34 third-grade students at SD Negeri 1 Ternate City. For data analysis from in-depth interviews, 10 students were selected as the focus subjects. The selection of these focus subjects was based on the stages of error according to Newman's data analysis model. According to Nurharyanto (2020), this model categorizes student errors into five parts, namely: (1) Reading; (2) Comprehension; (3) Transformation; (4) Process Skills; (5) Final Answer (Encoding). To measure and identify these five stages of error measurably.

FINDINGS AND DISCUSSION

This study aimed to describe the difficulties experienced by third-grade students of SD Negeri 1 Kota Ternate in solving multiplication and division word problems involving whole numbers by using the Newman Error Analysis procedure. The research subjects consisted of 34 students in the 2025/2026 academic year. The primary data were collected through a time triangulation technique by administering two parallel written tests consisting of 10 mathematical word problems, followed by interviews based on the Newman stages to explore the underlying causes of the students' errors.

Overall, the recapitulation of the types of errors made by all students based on the Newman Error Analysis procedure is presented as follows.

Table 2. Recapitulation of Students' Errors Based on the Newman Error Analysis Method

No.	Type of Error	Frequency	Percentage
1	Reading Error	24	3.55%
2	Comprehension Error	195	28.80%
3	Transformation Error	84	12.41%
4	Process Skill Error	74	10.93%
5	Encoding Error	300	44.31%

Based on Table 2, the type of error most frequently made by the students occurred at the encoding stage (encoding error), accounting for 44.31% of the total errors. Furthermore, errors at the comprehension stage (comprehension error) ranked second, with a percentage of 28.80%. On the other hand, reading errors (reading error) were the least common category, representing only 3.55% of the total errors.

DISCUSSION

Reading Error

The percentage of errors at the reading stage was very low, accounting for only 3.55%. The findings indicate that most third-grade students at SD Negeri 1 Kota Ternate had successfully passed the basic literacy development stage and were able to read the mathematical word problems fluently. The few reading errors identified were generally technical in nature, resulting from students working too quickly and consequently misreading or mispronouncing numerical values. According to Newman, the reading stage serves as the initial gateway for recognizing written symbols, and any difficulty at this stage interrupts the problem-solving process before students can proceed to the subsequent stages. These findings are consistent with the theory proposed by Abdurrahman (2012), which states that mathematical learning difficulties are not always directly associated with intelligence levels or basic reading abilities. In this study, the students demonstrated adequate reading fluency but still encountered difficulties in interpreting the mathematical meaning embedded in the problems.

Comprehension Error

At the comprehension stage, the percentage of errors increased substantially to 28.80%. Theoretically, Newman explains that comprehension errors occur when

students are able to read the problem correctly but fail to understand its meaning or identify the essential information required to solve it. The findings revealed that many students could read the problem text fluently but were unable to determine what the question actually required, as illustrated in Figure 1.

As presented in Figure 1, the student immediately wrote numerical operations randomly (10×4 and 6×7) without following a clear problem-solving structure. Interview confirmation indicated that although the student could verbally mention the numerical information provided in the problem, they were unable to organize it into the "known" and "asked" components required for systematic problem solving. Furthermore, when asked to restate the problem using their own words, the student simply reread the original text without demonstrating conceptual understanding. These findings reinforce the argument of Astuty (as cited in Wulandari, 2024), who suggested that students often become trapped in identifying numerical information mechanically without understanding the contextual meaning of the mathematical problem.

Transformation Error

Transformation errors accounted for 12.41% of the total errors. At this stage, students experienced difficulty in converting the information they had understood into an appropriate mathematical model or symbolic representation.

Figure 2 illustrates a specific cognitive disconnect. The student wrote the division symbol ($15 \div 5$), yet the resulting answer provided was 75, which is actually the product of a multiplication operation. Interview findings revealed an interesting phenomenon: verbally, the student understood that the problem should be solved using multiplication, yet failed to represent that reasoning with the correct mathematical symbol ($\div$ versus $\times$). This conceptual obstacle is consistent with the findings of Adinda (2020), who argued that selecting an inappropriate mathematical symbol automatically prevents students from carrying out the subsequent stages of problem solving correctly.

Process Skill Error

The percentage of process skill errors reached 10.93%. The characteristics of errors at this stage indicate that students were not necessarily unable to perform calculations but rather failed to follow the correct and systematic computational procedures. As shown in Figure 3, the student was required to solve the division operation $48 \div 4$. Instead of applying the standard long-division algorithm as instructed, the student used a self-developed calculation strategy, resulting in the incorrect answer of 20. Additional interview findings from another division problem

$(32 \div 8)$ showed that one student simply rewrote the number 32 as the final answer without performing the required calculation. These findings support the argument of Rasid et al. (2023), who concluded that ignoring standard computational procedures and performing calculations in an unsystematic manner increases students' susceptibility to calculation errors.

Encoding Error

At the encoding stage, the percentage of errors was the highest among all Newman error categories, reaching 44.31%. According to Newman, encoding errors occur when students are unable to present the final answer appropriately or in accordance with the requirements of the question. This condition is evident in the students' work presented in Figure 4. Although the students completed the calculation process correctly, their responses lacked a complete concluding statement; therefore, the problem-solving process was not fully completed. Based on Figure 4, the student had actually completed all the essential stages successfully: identifying the known and unknown information, selecting the correct division operation, and calculating the correct answer ($32 \div 8 = 4$). However, the student stopped immediately after obtaining the numerical result and did not write the final concluding statement, such as, *"Therefore, each group consists of 4 students."* During the in-depth interview, the student explained that they had simply "forgotten" and believed that the task was finished once the numerical answer had been obtained. This cognitive phenomenon is consistent with the findings of Labibah (2021), who reported that elementary school students tend to exhibit procedural bias, focusing primarily on numerical calculations while considering the written concluding statement as an optional rather than an essential component of mathematical problem solving.

CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that third-grade students of SD Negeri 1 Kota Ternate still experience various difficulties in completing whole number operations when viewed using the Newman method. The most dominant type of error occurs at the final answer writing stage (encoding) with a percentage of 44.31%. At this stage, students generally only write the calculation results in numerical form without including the conclusion sentence or the units requested in the problem. Furthermore, errors at the problem understanding stage (comprehension) reached 28.80%, while transformation errors were 12.41%. On the other hand, the percentage of errors at the process skills stage was relatively lower, at 10.93%, and reading errors were the fewest, at 3.55%. These

various difficulties indicate that students' low accuracy and lack of habituation in solving mathematical problems systematically are still factors influencing the emergence of errors at each stage of problem solving..

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