

ANALYSIS OF STUDENTS' ERRORS IN PROBLEM-SOLVING ON THE ARITHMATICS ROWS IN CLASS VIII MTS SYEKH LOKIYA TOWALE

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Abstract

This study aims to describe the types of errors made by eighth grade students of MTs Syekh Lokiya Towale in solving mathematics-problems based on *Newman's Error Analysis*. This type of research is qualitative research with a descriptive approach. Data collection techniques in this study were written tests and interviews in the form of 2 essay questions and interview guidelines. The interview technique used was semi-structured which was conducted with selected students to ascertain the types of errors made in solving the problem. The subjects in this study were selected based on gender differences, namely one male student and one female student with the consideration of students who made the most mistakes, were able to communicate well and recommendations from mathematics teachers. The results of this study show that the errors made by male subjects (SL) are errors in *comprehension (comprehension error)*, errors in *process skills (process skill error)* and errors in writing the final answer (*encoding error*). Errors made by female subjects (SP) are errors in process skills (*process skill errors*) and errors in writing the final answer (*encoding errors*).

Keywords: errors, newman's error analysis, aritmetics rows.

Abstrak

Penelitian ini bertujuan untuk mendeskripsikan jenis-jenis kesalahan siswa kelas VIII MTs Syekh Lokiya Towale dalam menyelesaikan soal matematika materi barisan aritmatika berdasarkan *Newman's Error Analysis*. Jenis penelitian ini adalah penelitian kualitatif dengan pendekatan deskriptif. Teknik pengumpulan data dalam penelitian ini adalah tes tertulis dan wawancara berupa 2 soal essay dan pedoman wawancara. Teknik wawancara yang digunakan adalah semi terstruktur yang dilakukan dengan siswa yang terpilih guna memastikan jenis kesalahan yang dilakukan dalam menyelesaikan soal. Subjek dalam penelitian ini dipilih berdasarkan perbedaan jenis kelamin yakni satu orang siswa laki-laki dan satu orang siswa perempuan dengan pertimbangan siswa yang melakukan kesalahan terbanyak, mampu berkomunikasi dengan baik serta rekomendasi dari guru matematika. Hasil penelitian ini menunjukkan bahwa kesalahan yang dilakukan subjek laki-laki (SL) yaitu kesalahan dalam memahami (*comprehension error*), kesalahan dalam keterampilan proses (*process skill error*) dan kesalahan dalam penulisan menuliskan jawaban akhir (*encoding error*). Kesalahan yang dilakukan subjek Perempuan (SP) yaitu kesalahan dalam keterampilan proses (*process skill error*) dan kesalahan dalam penulisan menuliskan jawaban akhir (*encoding error*).

Kata Kunci : kesalahan, newman's error analysis, barisan aritmatika.

INTRODUCTION

Mathematics is a basic science that continues to develop, both in terms of theory and application. Therefore, in the world of education, mathematics is studied by all students starting from elementary school level to college level. This is reinforced by the opinion of Rusmana (2019) who argues that mathematics is an important tool for students as they face problems and challenges in personal, work, community and scientific aspects of their lives.

Thus, it is important to teach students how to solve problems correctly, especially those that require the application of mathematics.

Advances in science, technology, information and communication affect life today. The development of science and technology is influenced by the role of mathematics which is the basis for other sciences (Lucas et al., 2017). However, mathematics is still considered a difficult and uninteresting subject, so students have difficulty learning mathematics (Kunwar, 2020). As a problem-solving tool, Indonesian students' mathematics skills are still low (Tasya, 2018).

Mathematics learning is also considered boring so that student interest decreases. As a result, many students make mistakes when solving math problems (Tan et al., 2019). Even though mathematics is very useful in everyday life and supports other fields of science so that mathematics is said to be the queen of all sciences.

The number of errors made by students in solving mathematics problems needs to be a concern, errors are often made in solving mathematical story problems such as research conducted by Rismawati & Asnayani (2019) which wrote that errors in solving story problems include errors in reading problem commands, students do not understand the problem, students have difficulty converting problems into mathematical sentences, students make mistakes in arithmetic operations so that students' answers are wrong, students make mistakes in converting the final results into contextual mathematical sentences or making conclusions.

Errors made by students in solving mathematics problems are caused by several factors. Ishak and Warji argue that the factors that can cause students to make mistakes in solving problems are internal factors and external factors (Nurianti, 2015) Factors that come from within students, one of which is the ability to understand mathematical concepts. The ability to understand mathematical concepts is the basic capital that students must have in learning mathematics. According to Lediana (2018) students' concept understanding is still low. The results of research (Rismawati, 2018) show that the ability to understand mathematical concepts is still low.

Arithmetic series and sequence material is one of the materials that are widely used in everyday life. For example, we can use arithmetic series in calculating the amount of savings in a few years if saving in a bank with a fixed difference in the nominal increase saved

each month. Therefore, it is very important for students to understand and master the arithmetic sequence material (Annisa R, 2021).

The process of learning activities in the classroom involves many students, both male and female students. Gender is an identity related to humans consisting of two types, male and female (Hidayah, 2012). The pattern of solving mathematical problems in each individual has different characteristics and ways of thinking, especially when viewed from gender differences (Riadi et al., 2022). Between men and women have different abilities in terms of absorbing material, especially mathematics (Khotimah et al., 2022). The contributing factor is that the daily activities of male and female students are different (Sudirman et al., 2018). In addition, it is also due to differences in the level of emotions, thoughts and also points of view. Of course, male and female students have made mistakes when solving story problems (Wulandari et al., 2019).

The reality in the field is that there are still many students who have difficulty solving arithmetic rows and series problems. As by (Septiahani et al., 2020) whose research results show that in working on the question of the rows and series of SMK is still relatively low. Therefore, it is necessary to look deeper into what mistakes these students make. Research that focuses on error diagnosis is not the first thing (Ekayanti, 2017), there have been several studies with similar topics, such as (Nur et al., 2018) who have conducted research on analyzing student errors in story problems on arithmetic series and sequence material where the results of their research show the cause of errors made by students in solving story problems on arithmetic series and sequence material, namely students' lack of understanding of symbols and formulas in arithmetic series and sequence material.

Based on the observations of researchers at MTs Syekh Lokiya, it is known that students still make mistakes when solving problems, especially in the material of *aritmatics rows*. Errors made by students such as errors in determining formulas, errors in what is known and what is asked, and errors in determining the concepts that must be used in solving problems. Therefore, to find out the causes that cause errors in understanding the material of *aritmatics rows*, it is necessary to analyze student errors in solving problems, it is necessary to analyze student errors when processing problems.

Based on these problems, the researcher feels the need to conduct research to analyze student errors in solving row and sequence problems. In this study, error analysis will be

carried out based on *Newman's Error Analysis* (NEA). *Newman's Error Analysis* (NEA) is one method designed as a simple diagnostic procedure in solving mathematical story problems. Cahrianto (2019) wrote that the types of errors made are (1) *reading errors*, including not being able to read the words proposed in the problem. (2) *comprehension errors*, including incorrectly writing what is known from the problem, writing what is known and asked but missing important information, unable to further process the solution to the problem. (3) *transformation errors* include failing to understand the problems to be converted into correct mathematical sentences. (4) *process skill errors* include incorrect calculations, unable to continue the answer. (5) *encoding errors* include errors in writing the final answer, errors in using notation, and not writing the final answer.

The purpose of this study is to describe what mistakes students make in solving questions about *aritmatics rows* based on *Newman's Error Analysis* (NEA) in class VIII MTs Syekh Lokiya Towale.

METHODS

This type of research is classified as descriptive qualitative research which aims to describe student errors in solving mathematics problems. This research data is in the form of written and oral answers obtained from written tests and interviews. The subjects of this study were 2 students of class VIII MTs Sheikh Lokiya Towale consisting of 1 male student and one female student.

The instruments used in this research are written tests and interview guidelines. The questions were given in the form of descriptions, while the interview guidelines contained a list of questions that would be asked to the research subjects during the interview.

The following error analysis indicators based on Newman's Error Analysis are presented in Table 1.

Table 1. Indicators of error analysis based on Newman's Error Analysis

Newman's Error Analysis	Error Indicator
<i>Reading Error</i>	a. Students cannot read or recognize symbols or keywords in the problem. b. Students cannot interpret the meaning of each word, term or symbol in the problem
<i>Comprehension Error</i>	a. Students do not write the information in the problem in the form of what is known and cannot explain what is implied in the problem. b. Students do not include important information in the problem such as what is asked because students cannot explain the meaning of the question.
<i>Transformation Error</i>	a. Students do not know what formulas to use in solving the problem b. Students convert the information contained in the problem into a mathematical model but inaccurately
<i>Process Skill Error</i> (Error in process performance)	a. Students do not know the procedures or steps to be used in solving the problem. b. Students cannot explain the procedure or steps to be used. c. Students are wrong in choosing the operation used to solve the problem
<i>Encoding Error</i> (Error in writing the answer)	a. Students cannot show the final answer to the problem. b. Students cannot write the final answer in accordance with the conclusion referred to in the question.

Source: Modification of Fatahillah et al. (2017)

RESULTS AND DISCUSSION

Researchers analyzed students' answers after the questions were given to find out what mistakes students made based on *Newman's Error Analysis*.

1. SL Error Analysis Based on *Newman's Error Analysis*

SLT1-06

① $u_1 = a = 9, u_2 = 12, u_3 = 14$
 $b = u_2 - u_1 = 12 - 9 = 3$
 $u_n = 0$
 ditanya = berapa banyak kursi: 99 di gratiskan?
 $u_n = a + (n-1)b$
 $0 = 9 + (n-1)3$
 $0 = 9 + 3n - 3$
 $2n = 2 - 2$
 $2n = 0$
 $n = 0$
 jadi, kursi: 99 di: gratiskan ada 2.

SLT1-11

Figure 1. Results of Student SL's answer

Comprehension Error

Based on Figure 1. in solving the SL can write what is known and what is asked in the problem but it is not complete. SL only writes what is known in the row of chairs, but SL does not write what is known in the row of chair prices such as u_1 and b (difference), so SL is wrong in entering the value of b (difference). This is in line with research conducted by (Darmawan et al., 2018) that understanding errors occur because students cannot mention what is known completely. He did not identify what was known correctly so that it caused misinterpretation

and did not read the problem carefully so that there was information about the problem that was missed, did not understand the overall meaning of the problem well so that it was inconsistent in identifying what was known, unable to explain the information contained in the problem correctly.

Process Skill Error

Based on Figure 1. in the SL solution, it is wrong in determining the steps used in solving mathematics problems, SL should first find the lineup to what ticket price is free. Then find how many seats are free. SL also incorrectly entered the value of a which should be 10 but SL wrote 2 [SLT1-06] so that the results obtained were not correct. This is in line with what was revealed (Haryati et al., 2016) which states that process skills are errors in applying planned procedures, errors in performing calculations, such as less operations becoming add operations and errors in performing algebraic operations.

Encoding Error (Final Answer Writing Error)

SL was wrong in writing what was asked in the problem and also SL was wrong in determining the procedure or steps in solving the problem, so SL could not write the final answer correctly [SLT1-11] as the question wanted. This is in line with what is revealed by (Sudiono, 2017) that it is said that students make final answer errors if students have been able to do the solution correctly but do not write the final answer or not in accordance with the context of the problem. Furthermore (Santoso et al., 2017) regretted the final answer writing error because students had successfully reached the data management stage but failed to write the final solution.

2. SP Error Analysis Based on Newman's Error Analysis

Dik

a Barisan kursi gratis

$$u_{10} = 10 \quad b = a_2 - u_1 = 12 - 10 = 2$$

$$u_2 = 12$$

$$u_3 = 14$$

b Barisan harga kursi

$$U_1 = a = 120.000$$

$$u_n = a$$

$$b = 10.000$$

Ditanya = berapakah banyak kursi yang digantikan ?

- Barisan term gratis

$$u_n = a + (n-1)b$$

$$a = (120.000 + (n-1)10.000)$$

$$a = 120.000 + 10.000n - 10.000$$

$$120.000 = 120.000 + 10.000n - 10.000$$

$$120.000n = 120.000 - 120.000$$

$$n = 10$$

Jadi, kursi yg digantikan ada 10

- kursi yang gratis

$$u_n = a + (n-1)b$$

$$u_{10} = 10 + (10-1)2$$

$$u_{10} = 10 + 9 \times 2$$

$$u_{10} = 30$$

Figure 2. Results of Student SP's Answer**Process Skill Error**

Based on Figure 2. in the solution SP has written the known and questioned completely and correctly, but when entering the value of b (difference) SP entered the wrong value, SP should have entered the value of $b = -10,000$ but in the solution SP entered the value of $b = 10,000$ [SPT1-10]. In the solution, SP also did the wrong calculation operation, SP should have divided 130,000 with 120,000 but SP only subtracted 130,000 with 120,000 [SPT1-14]. SP also did the calculation operation incorrectly, SP should have multiplied 9 by 2 and then added it to 10, but SP first added 10 to 9 and then multiplied it by 2 [SPT1-18]. This is in line with (Sumadiasa, 2014) which states that student inaccuracy causes errors that occur in arithmetic operations.

Encoding Error

Based on Figure 2. in the solution SP incorrectly performed the calculation operation as a result the answer produced by SP was not correct, so SP was wrong in writing the final answer [SPT2-20]. This is in line with (Risnawati & Asnayani, 2019) writing that the causes of answer writing errors are students' difficulties when writing the final answer or unit in accordance with the question's request, students' low ability to determine solutions to mathematical problems, students' weak arithmetic skills, students cannot re-check the results obtained, and students are not accustomed to writing conclusions.

CONCLUSION

Based on the results of research and discussion, it can be concluded that the errors of students in class VIIIA MTs Syekh Lokiya Towale in solving story problems of row and sequence material based on *Newman's Error Analysis* (NEA) are Male subjects made 3 errors (1) Error understanding the problem (*comprehension error*), namely SL was wrong in writing the known and questionable information from the problem of row and sequence material. (2) *Process skill error*, namely SL is wrong in performing arithmetic operations on the problem and SL is

wrong in determining the procedures or steps that will be used to solve the problem (3) Final answer error (*encoding error*) SL is wrong in writing the final answer in accordance with what the question asks. While the female subject made 2 mistakes, namely (1) *Process Skill Error*, namely SP was wrong in performing arithmetic operations on the problem and SL was wrong in determining the procedures or steps to be used to solve the problem (2) Final answer error (*encoding error*) SP was wrong in writing the final answer according to what the question asked.

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