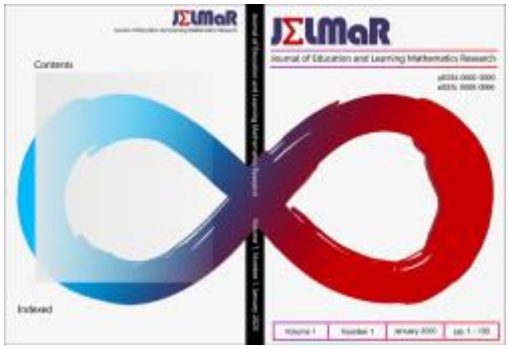

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Analysis of Student Errors In Solving Story Problems Based On Newman's Stage In Class Vll

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Abstract *:. This study aims to describe the mistakes of students based on the Newman stage in solving the story problems of the One Variable Linear Equation material. This type of research is qualitative descriptive with a descriptive approach. The subjects of this study were 34 students of class VII-F SMP Negeri 17 Malang, consisting of 20 boys and 14 girls for the 2019/2020 school year. Research subjects 30 subjects from class VII-F students were present for analysis. Retrieval of data using written tests to obtain data about students 'mistakes in solving story questions based on Newman stages and interviews to complete the results and strengthen data about students' mistakes. Data analysis techniques include data reduction, data presentation and drawing conclusions. Checking the validity of the data used the source triangulation technique in the form of interviews with 3 students of class VII-F who were selected based on high, medium, and low abilities. Based on the results of the study, it appears that the mistakes made by students based on the Newman procedure, at the reading stage there were no research subjects who made mistakes. At the understanding stage there were 23 subjects who made mistakes, the transformation stage there were 30 subjects who made mistakes, the process skills stage there were 17 subjects who made mistakes and the final answer writing stage there were 29 subjects who made mistakes. The results showed that all students made four types of errors. The causative factor is that there are certain sentences in the questions that cannot be interpreted correctly, forgetting the formulas that must be used, rushing when writing formulas, not mastering the material of One Variable Linear Equations, not being thorough and in a hurry to do the problems.*

Keywords: Linear Equation System, error analysis, Newman's error

INTRODUCTION

Mathematics is a branch of science that is very important to be learned by everyone (Wijaya et al., 2018). Mathematics is something concrete and can be proved. Basically, unwittingly mathematics learning is needed in everyday life to increase innovation and improvement in various aspects of life (Dini et al., 2018) . Therefore, Learning mathematics, should be directed to find out on how to help students have a deeper understanding of a concept. Based on fact of the 2013 curriculum aims to increase the high order thinking skills in order to adapt to the development of technology (Nurfauziah & Fitriani, 2019). One of the objectives of learning mathematics is to solve problems which include the ability to understand problems, design mathematical models, solve mathematical models, and interpret the solutions obtained. Problem solving in school mathematics is usually given through story problems.

There are several mistakes that students make when solving problems. When students solve a problem there is a possibility that students experience errors in doing it. Lack of self-confidence, lack of understanding of the material, and experiencing anxiety in learning mathematics can lead to errors during work (Irfan, 2017). In addition, in general, students have difficulty focusing, using information on questions, deciphering questions,

and are less able to use numerics and do not understand the concept of material (Larasati, 2016). Principle errors, followed by misconceptions, skill errors (Zulfah, 2017), and procedural errors in working on problems (Azis, Lukman, & Agustiani, 2018; Yuwono, Supanggih, & Ferdiani, 2018) are mistakes that most often done by students

Sari & Yuwono (2020) state that High, medium and low skill students in completing the system of linear equations in two variables often make mistakes in operations, processes and conclude using Watson's criteria. Indrawati, Muzaki, and Febrilia (2019) state that information about student thinking processes can be used by teachers to find out the shortcomings of students in solving system of linear equations in two variables. These deficiencies must be corrected immediately so that student learning achievement can increase. In addition, many students have difficulty solving SPLDV problems (Yusuf & Fitriani, 2020). Therefore, using the Newman stage to explore student error information in solving one-variable linear equation story problems is important to do. Furthermore, the teacher can make it one of the considerations in teaching by knowing the information on student errors that have been made

Based on the observations of researchers at SMP Negeri 17 Malang, students made mistakes when asked to solve story questions related to problem solving. One aspect or scope of material in SMP and MTs education units is algebra. According to Krismanto (2004), algebra is a language of symbols and relations. Algebra learned in school is widely used to solve problems in everyday life. One of the materials included in the algebraic aspect is the one-variable linear equation .which is taught in class VII semester one. This material contains a lot of story problems related to problem solving aspects. The difficulties that often occur in students are understanding problems, translating problems into mathematical models, and determining strategies, and performing mathematical procedures.

For this reason, it is necessary to analyze the errors of students in solving story problems so that it is known how much mistakes were made by students. One effort that can be done is to analyze the mistakes of students in solving story questions based on the types and causes of students making mistakes. In this study, researchers analyzed the types and causes of students making mistakes using the Newman procedure. According to Newman, every student when solving math problems must go through 5 error steps, namely: (1) Reading Error; (2) Comprehension Error; (3) Transformation Error; (4) Process Skill Error; (5) Encoding Error.

Previous research using the Newman analysis stage was carried out by Yunia, & Zanthy (2020) which is about junior high school students' mistakes in solving story questions on social arithmetic material at Bina Putera Indonesia Middle School class VIII in Padalarang. , that is, students do not write what they know and ask. (2) type 2 error, that is, students do not change the story problem into a mathematical model. (3) type 3 error, namely the student's error in carrying out integer and decimal number operations

This shows that there are still students who make mistakes in solving problems related to story questions, so it is necessary to analyze the work of students. By analyzing the mistakes of students, it is hoped that the researcher can find out why students have difficulty working on story problems. One of the tools that can be used to identify the error category of the answer to an essay test is the Newman procedure.

The purpose of this study was to describe the types of errors made by students in solving story problems on the One Variable Linear Equation material based on the Newman procedure, to describe the causes of students making mistakes in solving story problems on the One Variable Linear Equation material based on Newman procedures and to

describe solutions that can be used to minimize errors based on the Newman procedure carried out by students in solving math story problems on the subject of One Variable Linear Equations The benefit of this research is to increase the ability of students to learn mathematics, especially in solving math problem solving problems.

METHOD

Researchers used a qualitative approach to describe the types of errors of students in solving story problems using the Newman error analysis procedure. This study describes the ability of students to solve problems in the form of story questions that are still lacking, so that researchers analyze the forms of errors made by students when solving story problems based on Newman's mistake. Sources of data in the study were students of class VII SMP Negeri 17 Malang in the 2019/2020 academic year. The data taken in this study are as follows: 1) The results of students' written tests in solving story questions on the material of One Variable Linear Equations (2) Results of interviews between researchers and subjects in the study.

Research subjects were selected from class VII-F which consisted of 34 students to work on one-variable linear equation story problem. In this study the interview aimed to complement the results of data collection and strengthen data about student errors in solving story problems based on the Newman analysis stage. Furthermore, the documentation in this study was carried out to obtain pictures of student activity during the study

three test questions were given to obtain data about student errors in solving story questions based on the Newman analysis stages. The tests is declared valid if it has been validated by a validator. Validator 1 is a material validator (lecturer in mathematics education at Kanjuruhan University of Malang) and validator 2 is a validator of learning (a teacher at SMP Negeri 17 Malang). The interview in this study aims to strengthen the data on the error forms of students based on the Newman stage, namely: 1) the reading stage; 2) the stage of understanding (comprehension); 3) the transformation stage (transformation); 4) the skill stage (process skill); and 5) the writing stage (endcoding).

RESULT AND DISCUSSION

Data collection in this study was obtained from written tests and interviews. The following is a description of the data collection process. The written test will be held on Tuesday, February 25, 2020 at SMP Negeri 17 Malang. The initial coordination by the mathematics teacher, class VII F students consisted of 34 students consisting of 20 boys and 14 girls. Subjects who took the test were 30 students because 4 students did not enter without information. Students are given 80 minutes to do the test questions.

When working on the written test questions, the researcher first tells students to read the instructions for solving the questions, after which the researcher directs the students to do it themselves according to their abilities. After the given time runs out, students collect answers to the researcher and the researcher corrects the students' work. The results of the written test showed that of the 3 test questions carried out there were a number of students who made mistakes based on the Newman error analysis stage. The researcher corrected all the students 'written test results by giving the code to 30 students' names, namely A1 to A30. As Shown in Table 2

Soal	Tahapan Newman				
	T_1	T_2	T_3	T_4	T_5
1.	-	$A_7, A_3, A_5, A_{12}, A_{16}, A_1, A_{19}, A_{26}$	$A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8, A_9, A_{10}, A_{11}, A_{12}, A_{13}, A_{14}, A_{15}, A_{16}, A_{17}, A_{18}, A_{19}, A_{20}, A_{21}, A_{22}, A_{23}, A_{24}, A_{25}, A_{26}, A_{27}, A_{28}, A_{29}, A_{30}$	$A_2, A_4, A_{10}, A_{27}, A_{23}, A_{29}, A_{18}$	$A_2, A_{11}, A_{25}, A_{14}, A_{17}, A_{20}, A_{21}, A_{24}, A_3, A_5, A_{12}, A_{16}, A_{19}, A_{26}, A_1, A_4, A_{10}, A_{27}, A_{23}, A_{29}, A_{18}, A_7$
2.	-	$A_{25}, A_{10}, A_{12}, A_{28}, A_3, A_{17}, A_7, A_5, A_{24}, A_6, A_9$	$A_2, A_4, A_{22}, A_{19}, A_{26}, A_{27}, A_{13}, A_{30}, A_8, A_{18}, A_{21}, A_{29}, A_{15}$	$A_{15}, A_{30}, A_8, A_{18}, A_{21}, A_{29}$	$A_{11}, A_{30}, A_8, A_{18}, A_{21}, A_{29}, A_{20}, A_{16}, A_{14}, A_1, A_{23}, A_5, A_{24}, A_6, A_9, A_{15}, A_7$
3.	-	$A_2, A_7, A_6, A_8, A_{12}, A_{18}, A_{21}, A_{28}, A_3, A_{20}, A_{22}, A_{29}, A_{30}, A_{17}, A_{25}.$	-	$A_{11}, A_5, A_9, A_{24}, A_{27}, A_{14}, A_{26}, A_{23}$	$A_2, A_7, A_6, A_8, A_{12}, A_{18}, A_{21}, A_{28}, A_1, A_{19}, A_4, A_{10}, A_{13}, A_{16}, A_5, A_9, A_{24}, A_{27}, A_{14}, A_{26}, A_{23}, A_{11}, A_{15}.$

T1: Reading Error
T2: Comprehension Error
T3: Transformation Error
T4: Process Skill Error
T5: Encoding Error
-: Doing No Mistakes

From Table 1 it can be described as follows: a) In question number 1 students A11, A14, A17, A20, A21, A24 and A25 made the same mistakes, namely at the transformation stage (Transformation Error) and the final answer writing stage (Encoding Error) . Students A3, A7, A5, A12, A16, A19, A26 and A1 make the same mistakes, namely at the understanding stage (Comprehension Error), the transformation stage (Transformation Error) and the final answer writing stage (Encoding Error). Students A6, A8, A9, A13, A15, A22, A28 and A30 made the same error, namely at the transformation stage (Transformation Error). Students A2, A4, A10, A27, A23, A29, and A18 made the same mistakes, namely at the transformation stage (Transformation Error), the process skills stage (Process Skill) and the final answer writing stage (Encoding Error). b) In question number 2 students A2, A4, A13, A19, A22, A26 and A27 made the same error, namely at the transformation stage (Transformation Error). Students A8, A15, A18, A21, A29 and A30 made the same mistakes, namely at the transformation stage (Transformation Error), the process skills stage (Process Skill) and the final answer writing stage (Encoding Error). Students A1, A11, A14, A16, A20 and A23 made the same error, namely at the writing stage of the final answer (Encoding Error). Students A3, A10, A12, A17, A25 and A28 make the same mistakes, namely at the

understanding stage (Comprehension Error). Students A5, A6, A7, A9 and A24 made the same mistakes, namely at the understanding stage (Comprehension Error) and the final answer writing stage (Encoding Error).

c) In question number 3 students A2, A6, A7, A8, A12, A18, A21 and A28 made the same error, namely at the understanding stage (Comprehension Error) and the final answer writing stage (Encoding Error). Students A1, A10, A1, A4, A15, A16, and A13 made the same error, namely at the writing stage of the final answer (Encoding Error). ¬ Students A25, A3, A20, A22, A29, A30 and A17 made the same error, namely at the understanding stage (Comprehension Error). Students A11, A5, A9, A24, A27, A14, A21, A26 and A23 made the same mistakes, namely in the process skills and the final answer writing stage (Encoding Error).

The subjects interviewed were all class VII F students who attended. However, when interviewed there were students who had the same answer, so not all were shown. The interviews conducted with students are expected to be more complete in relation to the mistakes made in solving the One Variable Linear Equation story problems given based on the Newman error analysis stage. Based on the Newman stage, the first stage in error analysis is the reading stage. Rahayuningsih (2014) states that the reading stage is when students can read the problem by knowing the meaning of the words from the sentence in the given problem. According to Andayani (2017) states that mistakes read the words or symbols in the problem. In this study, research subjects who made mistakes at the reading stage were research subjects who were unable to interpret the meaning of the words from the sentences in the questions given. Singh, et al. (2010) states that reading errors occur when students fail to recognize or are unable to read the key words or symbols contained in the problem so they fail to find a solution to the problem. The results obtained indicate that in question number 1, number 2 and number 3 none of the research subjects made a mistake at the reading stage.

Based on the Newman stage, the second stage in error analysis is the understanding stage. Rahayuningsih (2014) states that the understanding stage is when students can explain the problem by interpreting the context of the problem given and can find out what is being sought. According to Andayani (2017) states that misunderstanding is when students are able to read the questions but fail to solve the problems. In research, research subjects who make mistakes at the understanding stage are research subjects who are unable to understand the context of the story questions given so they are unable to determine what is known and what is being asked in the questions given. Oktaviana (2017) students who do not understand the meaning of the questions are the cause of misunderstanding students.

Singh, et al. (2010) states that an understanding error occurs when students are able to read a question but fail to understand the meaning of the question, causing students to fail to solve a problem. The results obtained show that in question number 1 the ones who made mistakes at the understanding stage were A7, A3, A5, A12, A16, A1, A19 and A26. In question number 2 the ones who made mistakes at the understanding stage were A25, A10, A12, A28, A3, A17, A7, A5, A24, A6 and A9. In question number 3 the ones who made mistakes at the understanding stage were A2, A7, A6, A8, A12, A18, A21, A28, A3, A20, A22, A29, A30, A17 and A25.

Based on the Newman stage, the third stage in error analysis is the transformation stage. Rahayuningsih (2014) states that the transformation stage is when students can choose the method used and can change the method used and can change the problem into a mathematical form. According to Andayani (2017) states that transformation errors occur when students are able to understand what is known and needed in solving problems, but are unable to identify mathematical operations appropriately in solving the problem.

Murtiyasa, Rejeki, & Ishartono (2020) said that student difficulties were encountered at the stages of understanding and transforming.

Students who have good intuition can make problem-solving plans and use the right formulas. This is in accordance with the opinion of Wuryanie (2020) that students' intuition does not develop properly, so the problem-solving process can be hampered. In this study, research subjects who made mistakes at the transformation stage were research subjects who were unable to identify the appropriate method or strategy in solving the given questions. Singh, et al. (2010) states that an understanding error occurs when students are able to read the question but fail to understand the meaning of the question, causing students to fail to solve a problem. The mistakes made by students can also be caused by the students' inaccurate state of mind in understanding the problem. This is in accordance with the opinion of Sumadji and Yuwono (2020), the difficulty of students in solving problems is not caused by supporting factors in the learning process, it can also be in conditions that are in the minds of students.

Based on the Newman stage, the fourth stage in error analysis is the process skills stage. Rahayuningsih (2014) states that the process skills stage is if students can carry out the mathematical calculation process correctly with the correct steps in completing problem given. Andayani (2017) states that process skill errors occur when students are able to determine the right mathematical operations, but students are wrong in suggesting the correct work procedure. In this study, research subjects who made mistakes at the process skills stage were subjects who were slightly wrong in the calculation process and subjects who were unable to carry out the mathematical calculation process with the correct steps. According to the results of the interview, it was found that a calculation error was caused by the student forgetting which operation should take precedence. In addition, there is a lack of thoroughness in the subject in the calculation process. This is according to the opinion of Rohmah & Sutiarso (2018) students who are not careful and not careful in the work process are the cause of calculation errors.

Singh, et al. (2010) states that a process error occurs when the correct operation is used, but students fail to carry out the procedure correctly. The results obtained indicate that in question number 1 the ones who made mistakes at the process skills stage were A2, A4, A10, A27, A23, A29 and A18. In question number 2 the ones who made mistakes at the process skills stage were A15, A30, A8, A18, A21 and A29. In question number 3 the ones who made mistakes at the process skills stage were A11, A5, A9, A24, A27, A14, A26 and A23.

Based on the Newman stage, the fifth stage in error analysis is the stage of writing the final answer. Rahayuningsih (2014) states that the stage of writing the final answer, if students can write down the answers correctly and completely. According to Andayani (2017: 8) states that errors in writing the final answer can occur even though students have been able to work on math problems correctly, but these students do not write down the conclusion of the final answer. In this study, research subjects who made mistakes at the final answer writing stage were research subjects who were unable to write the final answer correctly and completely.

Singh, et al. (2010) states that writing errors occur even though they have solved math problems correctly, but students fail to provide written answers correctly. The results obtained show that in question number 1 the ones who made mistakes at the writing stage of the final answer were A2, A11, A25, A14, A17, A20, A21, A24, A3, A5, A12, A16, A19, A26, A1, A4 , A10, A27, A23, A29, A18 and A7. In question number 2 the ones who made mistakes at the writing stage of the final answer were A11, A30, A8, A18, A21, A29, A20, A16, A14, A1, A23, A5, A24, A6, A9, A15 and A7. In question number 3 the ones who made a mistake at the writing stage of the final answer were A2, A7, A6, A8, A12, A18, A21, A28, A1, A19. Errors in writing the final answer (conclusion) are mistakes students often make.

Almost some students make this mistake. It was proven that many students wrote wrongly and did not write down their final answers. Kristianto, et al. (2019) students solve problems but do not write the appropriate solutions. According to the results of the interview, it was known that the cause of the error in writing the final answer was due to a calculation error made by the student. According to Wahidah & Ismail's (2017) research, the wrong calculation process causes errors in writing answers. Another reason why students do not write down answers is because students are accustomed to writing the final answer (conclusion) on the worksheet. Based on the results of this study, to improve students' abilities, it is recommended that students practice more independently working on problems, especially story questions. In addition, before working on the questions, students should first write down the complete information in the questions. By writing down this information, students not only practice understanding the problem but also learn to use the correct procedure.

CONCLUSION

At the reading stage there were no research subjects who made mistakes, at the understanding stage there were 23 research subjects who made mistakes, at the transformation stage there were 30 research subjects who made mistakes, at the process skills stage there were 17 research subjects who made mistakes, at the final answer writing stage There are 29 research subjects who make mistakes. The factors that cause errors in students are that there are certain sentences in the questions that cannot be interpreted correctly, students forget the methods or methods that must be used in working on questions, students do not master the material of the One Variable Linear Equation students are not careful and rush in working on questions.Based on the research results and conclusions, the researcher can provide the following suggestions: For teachers, as input in order to find out the variation of errors made by students and to obtain a description of the level of students' ability in solving math problems. For teachers, as input in order to find out the variation of errors made by students and to obtain a description of the level of students' ability to solve math problems. The teacher more often provides exercises in the form of story questions in order to find out the ability of students in solving story questions. For future researchers, regarding the types of errors in solving problems in the One Variable Linear Equation material in the ability to present concepts in various forms of mathematical representations

The weakness of this study is that it does not classify the results of student work based on specific mathematical abilities, so that exploration is not so deep, so for further research it is recommended that student error analysis is based on students' specific mathematical abilities, for example based on mathematical reasoning abilities or mathematical communication skills, creative thinking abilities or others. .

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