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Analysis of Student Errors in Solving SPLDV Problems based on Newman's theory

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Abstract

The purpose of this study was to describe the types of errors made by Class VIII students when solving SPLDV questions based on Newman's theory. This qualitative research aims to provide descriptive information about individuals or observed behavior in the form of written or spoken words. Written tests and interviews were used to collect data. The test was carried out on all 25 Class VIII students, and then 3 of the 25 students were selected as research subjects. Data were analyzed by reducing information, presenting information, and drawing conclusions. The results of the work of individual testers were analyzed for the types of errors using the Newman analysis method. The factors that led to student errors were then explained in the interviews. Based on the study results, it can be concluded that the errors made by students in the SPLDV questions are as follows: 1) Failure to understand the problem, including not recording what is known and what is not in the duration of the task. Ask when in trouble. 2) Conversion errors, including misunderstanding of the billing method used. 3) Commanding process failure involves failing to continue to complete the process. 4) Error in writing HP, including not writing down HP. Student errors occur when students are not careful when solving problems, are too busy, or do not practice narrative tasks. 3) Commanding process failure involves failing to continue to complete the process. 4) Error in writing HP, including not writing down HP. Student errors occur when students are not careful when solving problems, are too busy, or do not practice narrative tasks. 3) Commanding process failure involves failing to continue to complete the process. 4) Error in writing HP, including not writing down HP. Student errors occur when students are not careful when solving problems, are too busy, or do not practice narrative tasks

INTRODUCTION

Education is vital as a provider of quality and competent human resources in developing science and technology. It is recommended that to obtain maximum results, training should be carried out repeatedly. Changes in the field of education are increasingly visible in the learning system, where previously the learning system was

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implemented traditionally, and now the learning system is implemented in a modern, contemporary manner. The center of student learning is no longer the teacher but the students who are the center of education, and students must be more active and responsive than teachers. Students can also purchase study resources or information sources to expand their knowledge.

Although mathematics is essential in education, mathematics is less popular with students and adults because it is still considered difficult (Mujis & Reynolds, 2008, p. 332). This can be proven by the students' lack of desire when working on the questions, so that there are many mistakes in working on the questions. According to Hujodo (Ulifa, 2014, p. 124), mathematics is abstract ideas or concepts arranged hierarchically for deductive reasoning. Therefore, errors in understanding the material, missteps, and technical mistakes when solving mathematical problems must be minimized because they relate to the subsequent understanding of the material. In mathematics, misunderstanding of previous material will impact the following material because the material in mathematics is continuous.

The material on systems of linear equations in two variables (SPLDV) has various solution methods to find the solution set. According to the interview results, the elimination method that students most enjoy and use. However, not one or two students made a mistake while working on the questions. Observation results show that many students make several mistakes when processing SPLDV questions. Common mistakes that students often make include, for example, defining variables in elimination and making inaccuracies in numbers, which results in an incorrect solution set.

Clement (Susilowati & Ratu, 2018) said there are five fallacies according to Newman's theory, including (1) Reading errors are students making mistakes when understanding symbols, words, and essential information. (2) Errors in understanding questions, namely errors resulting from misunderstanding information and failure to understand what is asked in the question. (3) Conversion errors are caused by students not converting the problem into a mathematical model. (4) Skill process errors are a form of error because students do not understand problem-solving techniques and are not careful when performing algebraic operations. (5) A typing error in the final answer (coding error) is an error when writing the final answer or solution set. The researcher used error analysis with Newman's steps to look at the exposure that had been revealed. The material used is SPLDV.

METHOD

Researchers used the descriptive qualitative method to determine the forms of student errors when working on questions on SPLDV material. Twenty-five class VIII students were taken as research subjects, then 3 of them were taken as research subjects. The tool in this research is the SPLDV material test questions, which contain three valid essay questions and interview instructions, determining the origin of students' mistakes in solving the questions.

Data was analyzed based on Newman's Theory to determine student errors. In

addition, students who reported any errors were taken as research subjects. Sugiyono (2016) states that data analysis techniques include data reduction, presentation, and conclusion. This means that the data reduction steps carried out by researchers are: (1) review of student test results and student interviews; (2) grouped based on accuracy and false; and (3) Analysis of students' answers and placement in Newman's error theory categories.

The data presentation steps occur as follows: (1) Submission of information about student test scores; (2) Presentation of answer sheets and student interviews. The material is packaged in a descriptive format with pictures and tables that discuss student errors in completing SPLDV assignments; (3) researchers conclude the mistakes made by students when solving SPLDV questions.

RESULTS AND DISCUSSION

According to Newman's theory, there are five errors, namely mistakes in reading the questions, mistakes in understanding the questions, mistakes in changing the questions, mistakes in processing, and mistakes when writing the results of the discussion. The percentage of errors made by students is shown in Table 1.

Table 1 Percentage of Student Errors According to Newman's Theory

No.	Part Name	Percentage	Information
1.	Read	10	Error in determining variables
2.	Understand	10	Mistakes in understanding known questions
3.	Transformation	15	Errors in problem modeling
4.	Process Skills	45	Error in process
5.	Final Answer Writing	20	Error in writing the definitive answer

Error Reading Questions

Reading errors in the questions in this study were misspellings of familiar symbols, signs, or numbers in the task. Generally, students' reading errors are in the form of misspellings, and the input of addition and subtraction is called a problem. Figure 1 shows that students made mistakes when reading the questions.

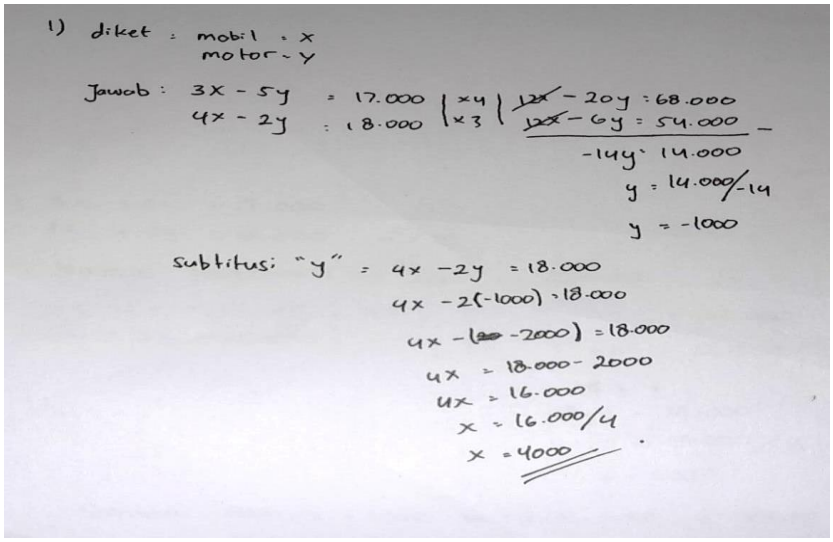

Figure 1. Errors in Reading Questions

Figure 1 shows that students made mistakes in the reading phase, namely in writing addition and subtraction in the questions. In the question above we know that 3x + 5y and 4x + 2y, but students write 3x – 5y and 4x – 2y. The interview results showed that students were hurrying to complete the questions only read once. The mistakes made by the students were by research findings (Hariyani & Aldita, 2020), namely that the students incorrectly identified the symbols in the questions.

Misunderstanding of the Question

Misconceptions This research question is: (1) not writing variables; (2) writing variables but not correctly; (3) students do not record questions; and (4) students write the questions asked but are wrong. Usually, students are wrong because they wrote a variable that does not fit the question, and the question in question was not written down. Figure 2 shows that students misunderstand the questions.

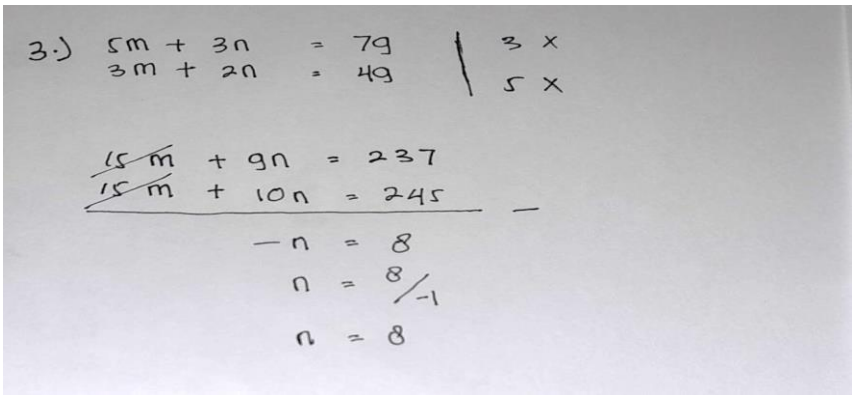

Figure 2. Misunderstanding of the Question

Figure 2 shows students' mistakes in understanding the questions, namely. When they write already known questions, students do not write questions. The results of the interviews were that students were less mature in understanding the SPLDV material, so they did not understand the questions given. This error is caused by research findings

(Kosasih & Pujiastuti, 2020), which means students have difficulty understanding the questions.

Problem Transformation Error

Conversion errors for this research problem are: (1) when modeling questions, many students make mistakes, and (2) students choose inappropriate operations. Usually, this occurs because students make mistakes when they choose the wrong operation to solve the problem. Figure 3 shows that students carried out the problem transformation.

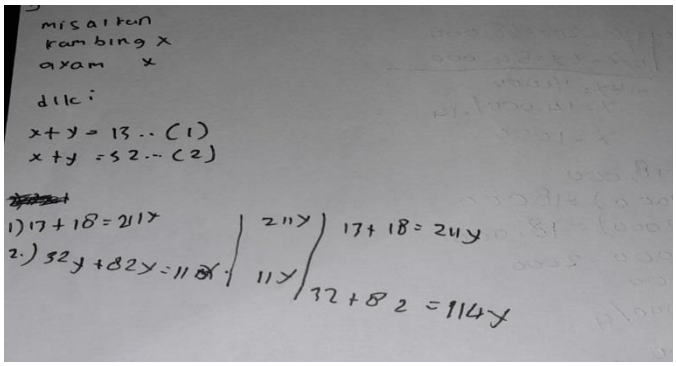

Figure 3. Problem Transformation Error

Figure 3 shows that when changing the mathematical model, students made mistakes; namely, Errors in writing questions were known, and students did not record the contents of the questions.

Process Skills Errors

Process skill errors in this research are: (1) Students misuse mathematical rules; (2) Students do not know how to solve problems. Moreover, (3) Students make wrong calculations. The cause of procedural competency errors is usually because students do not try to solve the problem. Figure 4 shows students' process skill errors.

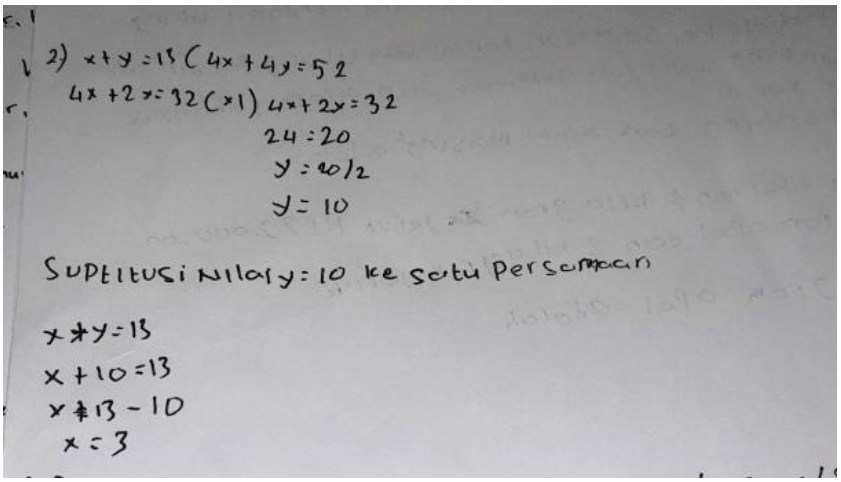

Figure 4. Process Skill Errors

Figure 4 shows that on the student answer sheet, the student did not continue with the following process. Students stop when X and Y are known.

Final Answer Writing Mistakes

Mistakes in writing the solution set for this research were: (1) The student did not write down the Solution Set, and (2) The Solution Set was written but was not specific. Usually, this happens because the time speed is shorter. Figure 5 shows spelling errors in students' final answers.

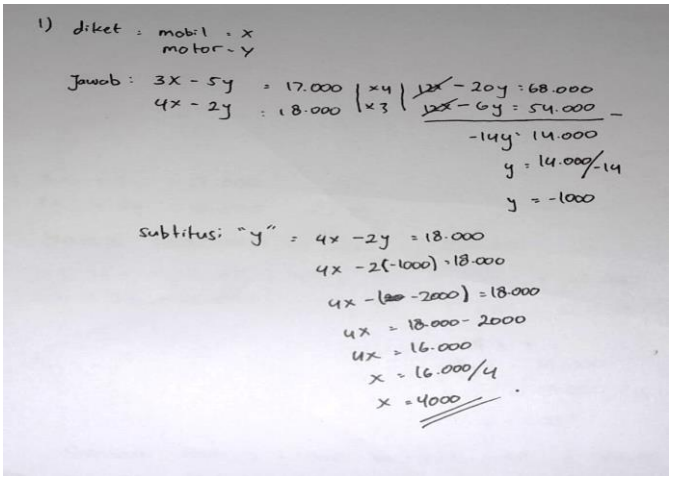

Figure 5. Final Answer Writing Mistakes

Figure 5 shows that the students did not write down their cell phones. Based on the interview results, it can be concluded that not one or two students often forget to write down their cell phones. This error aligns with what (Chairunnisa & Lestari, 2022): students do not write HP according to known variables.

In general, it can be seen from the explanation above that many students still do not understand the contextual matters of SPLDV material. This is to several research findings that there are still many students who make mistakes when working on SPLDV questions (Azmia & Soro, 2021; Hanipa & Sari, 2019; Prabawati et al., 2021; Mamonto et al., 2022; Hariyani et al., 2021) With Thus, the results of this study add empirical evidence that there are still many students' mistakes when solving SPLDV questions.

CONCLUSION

It can be concluded from the explanation above that many students still make mistakes based on Newman's Theory. The most common errors that occur are in continuing the problem-solving process.

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