Artikel Fatur

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CHARACTERISTICS OF STUDENTS IN RESOLVING WORD PROBLEMS BASED ON GENDER

Abstract: The purpose of this study is to analyze and describe the students' mistakes when completing the questions, which are then formulated into the error characteristics of students by gender. The subject selection was done randomly from male and female students of grade VII who made mistakes in solving the questions. Research data from the test results of 2 items word problem type. The form of student error is based on misconceptions, procedures, and techniques. The results showed the students' concept errors, namely not understanding the question, a writing wrong of information the question, not understanding the terms numerator and denominator, not understanding the sequence of a fraction value, not understanding number signs / symbols (negative / positive). Procedural error is incorrectly determining the completion operation. Technical errors, namely lack of understanding of number signs / symbols (negative / positive), careless using operations, and not writing down of answers (conclusions) according to question. The reason is not understanding the reading and not being familiar with the questions. Students' understanding and knowledge of reading have an important role in identifying, interpreting, and even selecting or determining completion strategies.

Keyword: Form of Student Error, Problem Solving, Word Problems

INTRODUCTION

Mathematics is a universal science that plays an important role in various disciplines and advances human thinking. For example is in the field of science and technology where its development uses number theory, probability theory, or algebra. Therefore, one of the goals of learning mathematics in school is to build skills in problem solving (Fatqurhohman., et al, 2020), and students are required to increase their understanding of the concepts being studied and use the ideas in their completion (Fatqurhohman., et al, 2017).

The results of observations by researchers and interviews with teachers conducted in junior high schools showed that the mastery of the concept of fractions was still low, this is proven when students solve the fraction question form word problems, they unconsciously struggle and make mistakes both in understanding the problem and in the operation (calculation) which have an impact on the final result. Lusiana (2017) reveals that the decline in student scores is due to errors when understanding lessons, where student scores are one of the components of the evaluation of classroom learning which is applied through solving related problems (Fatqurhohman., et al, 2020). and the characteristics of students' difficulties in learning mathematics related to the process of grouping, operating, and calculating (Jamaris, 2014: 186). Therefore, a teacher must often carry out self-evaluation, both from teaching methods or strategies and giving questions according to the ability level of students so that there are no repeated mistakes.

An error is a deviation from something that has been determined (Aryani & Maulida, 2019), an analyzing the mistakes is done by observing, identifying, and classifying them with certain rules (Astuty & Wijayanti, 2013). Variously studies have shown students' mistakes in solving math problems including misunderstanding of problem information, procedures or inconsistencies in interpreting the results of answers through their

mathematical models (Farida, 2015), misconceptions, facts, principles, and procedures (Ramlah dkk, 2016; Suciati & Wahyuni, 2018; Pradini, 2019), misuse of operation and carelessness or neglect (Saputro, 2016), and error transform problems, process skills, and the writing of the results (coding) (Abdullah dkk, 2015; Magfirah dkk, 2019).

Based on previous research, no one has focused on the characteristics of errors made by students while solving questions. If the teacher knows the characteristics of these student errors, it will be very helpful in designing methods or strategies and providing problems that can train and accustom students to using their skills. Therefore, this study aims to analyze and describe students' mistakes when solving problems, which are then formulated into the characteristics of the form of student errors and their causes.

METHOD

This research is a descriptive study using a qualitative approach. The subjects in this study were 100 grade VII students and 2 randomly selected subjects who were considered to be representative of the male and female groups. The research data were obtained from the results of the test answers which consisted of 2 question items. The test questions given are in the word problems of fraction which are used to analyze the form of student errors.

Table 1. Test Questions

No	Test Questions
1	Maria has 24 oranges. $\frac{3}{8}$ part is kept in the refrigerator, $\frac{1}{3}$ is given to her sister and how many oranges can be eaten of Maria?
2	Dina, Dewi, and Ratih are in one line. Dina stands at the very front, Dewi stands $\frac{3}{4}$ meters behind Dina, and Ratih stands $\frac{2}{3}$ meters behind Dina. What is the distance between Dewi and Ratih?

From the student answer data, the researcher analyzed and calculated the number of students who answered correctly, wrongly, or did not answer each question item. Meanwhile, the data chosen by the researcher were students' answers that were wrong and were grouped into categories of student error forms. The category determined by the researcher adapted the stages of the Kastolan error (Meilanawati & Pujiastuti, 2020), namely: (1) misconceptions: related to students' understanding of mathematical concepts, (2) procedural errors: related to the use of procedures or steps to solve, (3) technical errors (calculations): related to accuracy in calculations (operation) and writing the final answer

RESULT AND DISCUSSION

The results of this research in quantitative and qualitative analysis. The process of quantitative analysis is carried out by showing the number and percentage of correct answers, wrong answers, or non-response. The main focus is on student errors based on gender (male and female students). The process of qualitative analysis is carried out by showing the error in the results of the students' answers which refer to the error category and describing the components of the error.

The percentage of student answers to each question item is shown in Table 2 below.

Table 2. Percentage of Student Answers

Item Test	Student Answers (%)

	Right (n=100)		Wrong (n=100)		Didn't (n=100)	
	L	P	L	P	L	P
1	40	34	9	14	1	2
2	42	38	8	12	0	0

Male = 50 studets, Female = 50 students

Based on Table 2 that in the question item 1. The percentage of students who answered correctly 74%, namely boys as much as 40% greater than girls as much as 34%, the percentage of students who answered incorrectly 23%, namely boys as much as 9% smaller than girls as much as 14%, and the percentage of students who did not answer 3%, namely men as much as 1% smaller than women as much as 2%. In question item 2, the percentage of students who answered correctly was 80%, namely boys as much as 42% greater than girls as much as 38%, the percentage of students who answered incorrectly 20%, namely boys as much as 8% less than girls by 12%, and students who did not answer none or 0%. The percentage of item 1 and 2 shows that male students who answered correctly were greater than female students, male students answered incorrectly less than girls, and male students who did not answer were also smaller than female students. From the percentage of the results of the answers to item 1 and 2, it can be said that the understanding, skills, and accuracy of male students towards questions are better than that of girls. This is in contrast to the results of the research by Meilanawati and Pujiastuti (2020) that the ability of female students is better than that of men in solving math problems.

The percentage of each male and female student's error form based on the question items is shown in Table 3 below:

Table 3. Percentage of Student Error Forms

Item Test	Student Error Forms (%)					
	Concept		Procedural (process)		Technical (calculations)	
	L	P	L	P	L	P
1	2	7	3	3	4	4
2	3	5	2	3	3	4

Based on Table 3, the biggest student error in question items 1 and 2 lies in concept errors of 9% and 8%, followed by technique (calculation) as much as 8% and 7%, then procedural (process) as much as 6% and 5%. According to Magfirah., et al (2019) that most students make misconceptions incorrectly using the formula or inverse and misinterpreting the problems. Errors in interpreting the questions cause students to have the opportunity to make carelessness in their calculations (Amalia & Hadi, 2020), due to the limited understanding of students in identifying problem information and choosing the solution strategy (Pradini, 2019).

The following is an example of the answers of male students (SL) and female students' answers (SP).

SL · SP

Picture 1. Item Test 1

SL · SP

Picture 2. Item Test 2

Based on the results of the answers it is shown for each item of the question that the forms of student error are, namely: misconceptions, procedural errors (process), and technical errors (calculations).

Misconceptions

Concept errors relate to students' understanding of mathematical concepts. In item 1, SL and SP do not understand the question questions and misinterpret or translate question information that is converted into a simpler form. In addition, they did not write down what should be done to determine the completion step, but instead immediately took the completion step and made mistakes. In this case, students do not understand the meaning of the question, which means that the question is to determine the part to be stored in the refrigerator as much as $\frac{3}{8}$ of 24, look for the part then determine the $\frac{1}{3}$ part given to Maria's sister. However, SL and SP directly determine the completion step using the subtraction operation for the part without writing the correct information on the problems.

In item 2, SL and SP also did not understand the question questions and did not write them down correctly. Students here do not understand the order of the value of the fraction, for which they directly determine operations and perform calculations. This means that students' understanding of the concept of numbers is still low, which means that SL has not been able to distinguish signs or symbols in the value of a number against the value of a distance or position between Dewi and Ratih which is written with a negative value (-), SP made mistakes in interpreting the question using the addition operation and subtraction operations to determine Dewi's with Ratih of position. It's can be said that students in understanding the question information are still lacking. According to Lestiana., et al (2016) that the ability or skill in understanding information or reading is very important, because it is used as material for interpreting or translating or even identifying question information correctly and accurately. **So that the limitations of understanding a reading can result in students ignoring the keyword questions that can affect the completion process**

Procedural Errors (process)

Procedural (process) errors relate to the steps to solve or a person's inability to manipulate information when solving problems. In problem item 1, SL and SP incorrectly determine the operation that causes the error to change or simplify fractions and the steps for solving that are carried out are not sequential or regular. SL and SP are supposed to use the multiplication operation to determine the portion stored in the file using $\frac{3}{8}$ of the 24 and then determine the portion given to Maria's sister using $\frac{1}{3}$ of the 24. In fact they use the $\frac{3}{8} - \frac{1}{3}$ subtraction operation. SL) and $\frac{3}{4} - \frac{1}{3}$ (SP), then the results are to reduce the number of fruit purchased.

In question item 2, SL and SP also incorrectly determined the operation which caused Dewi's position with Ratih to not match the question information. SL incorrectly determines the order of the size of the fraction value in operation, namely $\frac{3}{4} + \frac{2}{3}$ which should be $\frac{2}{3} - \frac{3}{4}$.

Where as SP uses the addition operation $\frac{3}{4} + \frac{2}{3}$ and and the subtraction operation $\frac{3}{4} - \frac{2}{3}$. In subtraction operation, SL directly subtracts the numerator by the numerator and denominator by denominator without equating the denominator. It's said that students do not understand the concept of fractions correctly, either from the term fraction, the order of fraction values or using operations. According to Ratna, et al (2015) and Pradini (2019) that the error that often arises in solving problems is changing to a simple form and compiling systematic steps which are caused by the skill to understand the questions.

Technical Errors (calculations)

Technical errors (calculations) relate to accuracy in calculations (operations) and writing the final answer. In question item 1, SL did the calculation by $\frac{3}{8} - \frac{1}{3}$ which then reduced the number of pieces purchased $24 - \frac{3}{8} - \frac{1}{3}$ which resulted in $\frac{7}{24}$, while SP wrote the wrong part of the first fraction which should have been $\frac{3}{8}$ written $\frac{3}{4}$ by doing the calculation $24 - \frac{3}{4} - \frac{1}{3}$ which results $3\frac{10}{5}$. So that the results of the SL and SP answers do not match the questions, besides that they also do not provide final conclusions from the answers obtained according to the question orders, where the purpose of the question is to determine the part to be stored in the refrigerator, the part that will be given to Maria's sister, and the remainder of the division.

In item 2, there are two different SL answer results from determining the value of the fraction and using the fraction operations. In the first SL does not understand the value of a fraction which causes the result to be negative (-), the second SL when performing the operation does not understand the terms of the numerator and denominator which in carrying out the operation does not equalize the denominator and immediately performs the subtraction operation on the numerator and the denominator uses the largest denominator against the two fractions. In the SP answer there are also 2 different ones, the first SP uses a $\frac{3}{4} - \frac{2}{3}$ subtraction operation where the subtraction operation uses a numerator with a numerator and a denominator with a denominator. The second SP uses the addition operation $\frac{3}{4} + \frac{2}{3}$ which is the process of the operation by adding the numerator by the numerator and the denominator with a denominator. So that the results of the SL and SP answers do not match the questions either. In addition, they also did not provide the final conclusion from the answers obtained according to the order, namely determining the distance between Dewi and Ratih.

Based on the results of these answers, students do not understand the concept of fractions, either from determining the value of a fraction, the term of a fraction, or being careless (careless) in using fraction operations which cause the results of the answers obtained are not in accordance with the order or the question asked. This is in line with the statement (Verzosa & Mulligan, 2014; Malihatuddarojah & Prahmana, 2019) that technical errors are mostly caused by inaccuracy in using operations and settlement steps, which have an impact on the results (Dasmarwan, 2020). The description of the form of student error for each item is shown in Table 4 below.

Table 4. The Description Of The Form Of Student Error

Form Of Error	Male Student (SL)	Female Student (SP)
Misconceptions	➤ Don't understand the question command	➤ Don't understand the question command
	➤ Not writing down the information correctly	➤ Not writing the question information correctly or

Form Of Error	Male Student (SL)	Female Student (SP)
	➢ Don't understand the terms numerator and denominator ➢ Don't understand fractional values ➢ Don't understand number signs /symbols	misinterpreting the question information ➢ Don't understand the terms numerator and denominator
Procedural Errors (process)	➢ Incorrectly specifying the operation in the completion steps ➢ Incorrectly performing the operation in the completion steps	➢ Incorrectly specifying / using operations in completion steps ➢ Incorrectly performing the operation in the completion steps
Technical Errors (calculations)	➢ Don't understand and determine the signs / symbols of numbers incorrectly ➢ Don't understand using fraction operations ➢ Less precise with fractional operations ➢ Not writing down the answer according to the question command	➢ Don't understand using fraction operations ➢ Less precise with fractional operations ➢ Not writing down the answer according to the question command

CONCLUSION

In this study, the characteristics of the forms of student error when solving word problems are based on three errors, namely concept errors, procedural errors (process), and technical errors (calculations). In concept errors, mistakes that are often made by students include not understanding the question command, not writing or writing the question information wrong, not understanding the terms numerator and denominator, not understanding the sequence of a fraction value correctly, not understanding number signs/symbols (negative/positive). In procedural errors (processes) that were made by students, they were wrong in determining a fraction operation and carrying out the operation in the completion step. In technical errors (calculations), students do not understand and misunderstand number signs / symbols (negative / positive), use operations on fractions, are less careful (careless) in using fraction operations when calculating, and do not write down the results of answers (conclusions) according to orders question.

Based on the mistakes made by students, the main cause is the lack of or even not understanding the reading and being unfamiliar with the questions, not understanding the concept of operations properly which results in incorrectly determining and carrying out operations in calculations, not being careful (careless) in calculations, and can not manage the times properly resulting in insufficient time given to provide / write a summary answer according to the question command. In other words, an error and difficulty are something that cannot be separated, because if someone experiences a difficulty, it is likely that they will make an error which results in the results obtained not as expected. In addition, understanding the reading or problem is the main key in the completion process.

As an educator, at least know the mistakes that students often make, so that it can help in providing self-evaluation, both in terms of learning and students' understanding of the questions given. The use of word problem form questions is a question that is classified as difficult for students who have never been introduced / solved, because these questions require more understanding than ordinary questions, so that these questions can find out

or even measure the level of student understanding in interpreting, compiling or determining the steps for solving, as well as making various solutions of ideas developed through understanding.

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