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Analysis of Student Errors in Relation and Function Materials for Class VIII SMP Negeri Pandawai

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A B S T R A C T

This study has several objectives, obtaining a description of the characteristics of student errors, as well as factors that cause students of class VIII of State Junior High School to make mistakes in the settlement of relationships and functions. This type of research is qualitative descriptive. Class VIII students with a total of 27 people are the research subject. The technique in determining the research subjects is the purposive sampling technique. Data collection with written test techniques, interviews, and documentation. The data analysis techniques used are data reduction, data presentation, and data verification. Validity of data with triangulation of techniques and sources. The results of this study showed that students made 5 types of mistakes made by students on the settlement of relationships and fungi, namely mis-understanding of the concept of 19 students, errors in the use of data of 14 students, errors in interpreting the language of 18 students, technical errors of 26 students, and errors in the conclusion of 21 students. The factors that cause students to make mistakes in solving relationships and functions come from internal and external factors.

1. Introduction

Mathematics is a way of thinking and using logical reasoning, language using symbols that can be understood by all nations of diverse cultures, arts such as symmetrical music which is widely used in various disciplines, patterns and rhythms that can entertain, tools for map creators, architects, navigators space flight, engine processing and accountants (Hamzah, 2013). In the era of competitive reasoning and decision making, the mastery of Mathematics is not allowed to be bargained by students (Siagian, 2016). Thus, the role of mathematics in human life is so important because mathematics is not only used for the benefit of the of mathematics itself but for other sciences development.

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Relation and Function in Mathematics considered as important and must be studied by class VIII Junior High School (SMP) students (Kemendikbud, 2017). Relation and Function also a prerequisite material for Straight Line Equation. The importance of understanding previous concepts because it will form new concepts, so that mathematical concepts are arranged in stages (Chairani, 2016). The material of Relation and Function can also be applied in everyday life, which is regarding relationships such as family, friendship, work, and others. The conjunction can be used to connect two groups and get a name (Maryoto, 2016).
The level of student learning outcomes is determined by student errors in solving problems. Student learning outcomes increase when there are fewer student errors and student learning outcomes will decrease when student errors are increasing (Rukmana, Hasbi, & Paloloang, 2016).

Students' errors that are sometimes made very need to be analyzed more deeply to get some very clear pictures regarding the causes of students making errors in one of the materials (Apriliawan, 2013). The errors analysis of this study aims to find out various kinds of student errors in Relation and Function. Students make different types of mistakes such as understanding concepts, procedurals, and computing. The concept error made is that students do not understand the purpose of the problem to present the known, asked, and the student is wrong in the use of formulas. Procedural errors that students are wrong in writing step by step in solving problems. Computational errors made are miscalculating the settlement of blurbs (Hakim, Solechatun, & Istiqomah, 2020).

According to Budiyono (2008) in solving Mathematical questions, there are various indicators of student errors, given: a) Conceptual error is a student error in determining the formula/theorem in providing an answer to a question, the inappropriateness of the formula used by students in solving the problem. For example, misunderstood formulas and misunderstood symbols (Wahyudi, Abadyo, & Purwanto, 2017). b) Errors in using data is the data that being used by students, not contained in the problem, incorrect use of data to variables, and also students taking data from outside to be added in answering a problem. For example, they cannot capture the information presented in the questions (Atiqoh, 2019). c) Misinterpretation of language is misinterpreting everyday language, symbols, graphs, and tables in the language of Mathematics. For example, mistakes in using words or symbols (Romadiastri, 2012). d) A technical error is an error made by students in calculating and computing, as well as an error in manipulating algebraic operations. For example, a calculation error (Widyaningrum, 2016). e) Error drawing conclusions is the reasons that support an answer that is not appropriate in logical reasoning (Romadiastri, 2012).

There are many factors may be the cause of errors in problem solving. The factors in question can come from internal and external factors (Sari, 2013). a) Internal Factors: An error in solving Mathematics problems can also come from students (internally) (Syah, 2013): physically, physically factors that resist students in learning include eye and ear health, as well as other physical disabilities : psychologically and fatigue. Psychological factors that resist students in learning such as readiness, talent, maturity, interest, intelligence, motivation, attention.

Fatigue : Another inhibiting factor is fatigue. It is possible that students do not study because they are tired. b) External Factors, in addition to factors from students, these errors can also come from all environmental conditions of students' activities that do not support all student learning activities, including the following (Widyasari, Meter, & Negara, 2015): Family, school and society. Family environmental factors become an obstacle for students in learning when the relationship between father and mother is not harmonious, and the family's economic life is low. School factors also affect students so that students make many mistakes when the location of the school building and also the conditions are not good, for example close to the market, teacher conditions and inadequate facilities. Society factors also greatly affect student learning activities when the village area is slum, and playmates are naughty.

The results of research by Raharjo and Christanti (2020) show that in relationships and functions, students often make mistakes in statements of concepts and facts. In the study found that students are still wrong in defining the understanding of relationships and functions; Students also mis-wrote the set notation. Another study conducted by Kamariah and Marlissa (2016) also found that students make errors in concepts, principles, technicalities, and algorithms. In the study, students who make misperceptes are moderately capable students, for example students misrepresied whether a relationship is a function or not. While students who have low ability, almost in all types of mistakes are made, for example students are wrong in stating relationships, misrepres perpetrating the difference between relationships and functions, incorrectly drawing graphs of a function.

This study has several objectives, obtaining a description of the characteristics of student errors, as well as factors that cause students of class VIII of State Junior High School to make mistakes in the settlement of relationships and functions. This type of research is qualitative descriptive.

2. Methodology

The approach and type of research is qualitative approach with a descriptive type of research. This research was conducted in one of the junior high schools in Pandawai District, East Sumba Regency, East Nusa Tenggara Province. The research was conducted in October of the 2020/2021 Academic Year. The author's research subjects consisted of 27 students. This research technique uses 3 types of techniques, which are written tests, interviews, and documentation. The types of instruments in this study were written test questions and interview guidelines. For data analyzing, there are several techniques: reducing data, presenting data, and verifying data. The validity of this research data is the validation of test instruments and triangulation techniques.

3. Results and Discussion

The analysis result from the written test of class VIII-C students of SMP Negeri Pandawai is presented in Table 1. It can be seen that the table shows the number of students based on the error types when solving some Relation and Function topics is as follows.

Table 1. Number of Students Making Mistakes

No.	Error Types	Number of Students	Percentage (%)
1	Concept misstatement/ Conceptual Error	19	19%
2	Data Usage Error	14	14%
3	Language Misinterpretation	18	18%
4	Technical Errors	26	27%
5	Inference Errors	21	22%

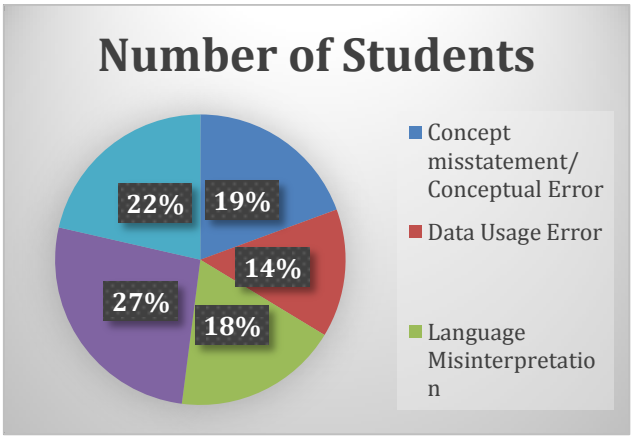

Figure 1. Percentage of Students Per Indicator

It can be seen from Table 1 and Diagram 1, the percentages of students based on the mistakes when solving the questions are 19% of students misstated concepts, 14% made mistakes when using the data, 18% of students misinterpreted the language, 27% made technical errors, and 22% made mistakes when concluding. The most frequent mistakes made by students are technical errors. The description of the errors made by students in solving the Relation and Fungi questions can be explained as follows:

1. Conceptual Error

Students' answers related to conceptual errors for the first and second questions indicate that students did not understand the form of presentation of relations in a set of ordered pairs and Cartesian diagrams. Moreover, the answers for the third question show that students misunderstand whether a relation from the problem is a function or not. The last is the answers for the fourth question demonstrated that students are still confused about how to present the relation concept by diagrams. This fact is supported by the interviews, which shows that students are still

confused with the idea of presenting a relation using arrow diagrams, Cartesian diagrams, and sets of ordered pairs

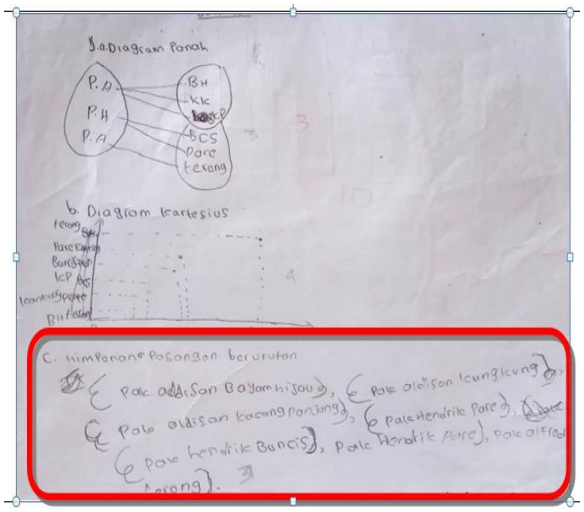

Figure 2. An Example of Conceptual Errors

2. Data Usage Error

Students' answers related to data usage errors indicate that students misunderstood the problem. Students took data from outside the question, or the actual data in solving the problem was not needed. According to the interview results, the test questions given were not well understood.

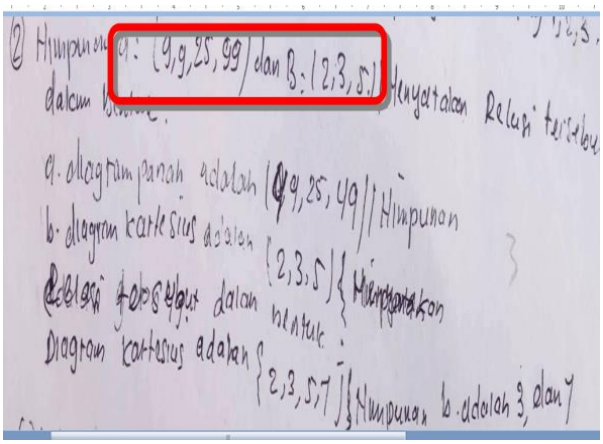

Figure 3. An Example of Data Usage Error

3. Language Misinterpretation

Students' answers related to errors in interpreting language show that they were less thorough in answering questions. Students mentioned known data from a question, but they did not do what was ordered. In addition, according to the interview results, they are still confused in understanding the commands from the questions.

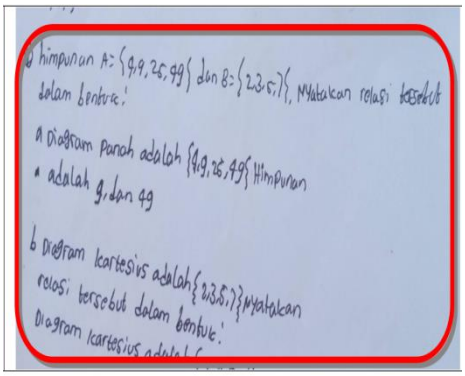

Figure 4. An Example of Language Misinterpretation

4. Technical Error

The student's technical error happened when the completion steps were correct, the multiplication result is right, but it is still wrong with a positive sign with a negative. According to the results of the author's interviews with students, these students did not find questions like the fourth question while studying the material on Relations and Functions. Moreover, the results of interviews with teachers, that during BDR learning, the teacher only explained the material in general, then the students were given assignments to learn more about the material.

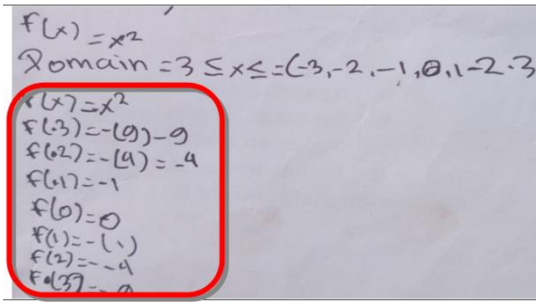

Figure 5. An Example of Technical Errors

5. Error in Drawing Conclusions

Students' answers related to errors in concluding show that students incorrectly explained their work. According to the interviews, the teacher did not pay too much attention to the findings of each question given to students. Students were not accustomed to working step by step until they came to conclusions in working on the questions.

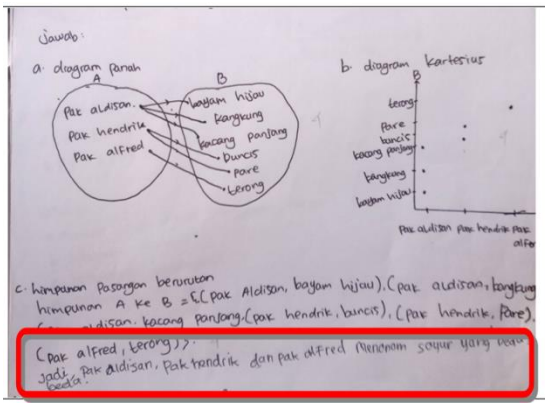

Figure 6. An Example of Errors in Concluding

Some of the students' errors in the material on Relations and Functions were caused by several factors found in students' written tests and also the results of interviews with teachers and students, namely:

1. The conceptual error means students do not master the prerequisite material, namely set material (writing of set members is flanked by a { } sign), Cartesian coordinates material (determining dots or points), and do not understand the concept of function.
2. Errors in using data describe that students have not understood the data that has been known from the problem; problem-solving is not made step by step. By doing this, the errors occur for the next stage.
3. Language Misinterpretation means students have not been able to state what was asked of the question.
4. Technical errors indicate that students do not understand the prerequisite material, namely integer material, the teacher only explains the material in general, and students are lazy to read or find out about the material taught.
5. Errors in concluding mean students are not used to making inferences from the student's answers.
6. The learning environment refers to the BDR meeting point being too crowded, so the students are not too focused on understanding the material that the teacher has explained.
7. The author's interviews with students and teachers show that only a few students are enthusiastic about accepting mathematics material because most of the students think mathematics is the most challenging subject. As a result, the students did not listen to the teacher's explanation, but they were busy with other activities that caused a commotion.
8. The results of teacher interviews describe that the material explicitly taught for Relationships and Function material which is only material in general, is not explained in detail. After that, students are assigned to find out for themselves about the material.

The results of teacher interviews show that many students are not accustomed to re-reading the material that has been taught.

4. Conclusion

The concludes that several types of errors made by students in the Relation and Function material are conceptual errors with a percentage of 19%, errors using data with a ratio of 14%, language interpretation errors with a percentage of 18%, technical errors with a percentage of 27%, and conclusions drawing errors with a rate 22%. These errors are: 1) errors in stating the concept, students do not understand the data that has been listed and also the questions on the questions and also cannot distinguish arrow diagrams, cartesian diagrams, and sets of consecutive pairs; 2) errors in data use; students do not use data that is known from the question, or students use data from outside the questions; 3) errors in interpreting language, students do not understand how to express something that is known from the problem into mathematical symbols; 4) technical error, operation error of integer multiplication; 5) Errors in concluding; namely students are in a hurry to solve problems, wrong in giving reasons.

Some of the factors that cause the eighth-grade students of SMP Negeri Pandawai to make mistakes in solving the Relation and Function questions are internal and external factors. Several internal factors are students do not master the prerequisite material and the concept of functions and present relations in various representations. In addition, students do not understand what is already known and what is being asked from the questions, and problem-solving does not use step by step, students are lazy to evaluate the material, students are not enthusiastic during math class hours, and students are too hasty in reading questions. While external factors, namely the atmosphere of the BDR gathering point, were too crowded, the teacher only explained in general terms related to the material on Relations and Functions.

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