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Analysis of students error in completing hots questions on fruction additional and subtraction operations class V SDN Karangtengah I

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Abstract

This study aims to 1) to describe the mistakes made by fifth graders at SDN Karangtengah I in solving HOTS questions on the addition and subtraction of fractions in grade V. 2) To describe the factors that caused fifth graders at SDN Karangtengah I to make mistakes in solve HOTS questions on the material of addition and subtraction of fractions in class V. This type of research is descriptive qualitative, with data sources from students and teachers of class V SDN Karangtengah I. Data collection techniques use written tests, interviews, observations and documentation. While the data analysis technique used is the analysis of the Miles and Huberman model which consists of data collection, data reduction, data display, and drawing conclusions. The results of this study indicate that 1) in solving the HOTS questions for adding and subtracting fractions, the fifth-grade students of SDN Karangtengah I make errors in encoding error with a percentage of 41.94%, process skill errors with a percentage of 37.9%, transformation errors with a percentage of 13, 71%, conprehension errors with a percentage of 4.84%, and reading errors with a percentage of 1.61%. 2) The factors that cause students to make mistakes in solving HOTS questions on addition and subtraction material are 2 factors, namely external factors and internal factors. The external factors that cause students to make mistakes because the learning process does not get used to the use of HOTS questions. Furthermore, the internal factors that cause students to make mistakes are a) the encoding error indicator is that students do not know the next step after carrying out the calculation process and students do not know how to conclude answers; b) the process skill error indicator is that students' numeracy skills are low, students do not know the concepts of fractional arithmetic operations and *porogapit*; c) the transformation error indicator is that students cannot determine arithmetic operations; d) on the comprehension error indicator, students have difficulty in writing down the information contained in the questions, students do not write down the information contained in the questions and students are in a hurry to take the test; e) the reading error indicator is that students are not careful in reading the questions and students are not able to understand the keywords or sentences in the questions; and the most common internal factor is the intellectual ability of students and students experience errors in the previous stage.

Keywords: Error Analysis; Addition and Subtraction of Fraction; *Porogapit*

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1. Introduction

Ki Hadjar Dewantara in Modul Pelatihan Kurikulum 2013 Sekolah Dasar/Madrasah Ibtidaiyah (2018) revealed that education can be carried out in three environments or what is called the tri education centers namely: home environment, school environment and community environment. One of the educational processes that can be in the school environment is education in elementary schools. In the 2013 curriculum, basic education in elementary schools is packaged in thematic learning. One of the contents in this study is mathematics.

Learning mathematics is one of the subjects that is considered very important because mathematics is very necessary in everyday human activities. Therefore, mathematics must be mastered early on by students. According to the Ministry of Education and Culture, the aim of learning mathematics in elementary schools is for students to get to know simple numbers, simple arithmetic operations, measurements and fields. With goals that have been designed in such a way, not many think that mathematics is an easy and fun lesson. Most students think that mathematics is a difficult subject. Negative views like this result in the learning process not running effectively and causing students to experience difficulties in learning mathematics and resulting in low student learning outcomes in mathematics.

This low learning outcome is evidenced by the results of the PISA (Program for International Student) survey regarding the quality of Indonesian education in the last 3 years which was carried out in 2018. In the survey, the average score for mathematics was 379 with an OECD average of 487. Based on This result can be found in the findings that Indonesia is in the low performance and high equity quadrants. This is in line with the results of an interview with the class V teacher at SDN Karangtengah I which was conducted on August 24, 2021. In the interview the class V teacher said that the mathematics learning outcomes for class V were low. This statement is reinforced by the results of the Mid Semester Assessment (PTS) semester I for the 2021/2022 school year which was held on September 13-17, 2021. From this assessment, the class average was 61.1. From the low learning outcomes, the most mistakes were made by students in the fractional arithmetic operation material.

The skills needed in solving problems are students' thinking skills. In the 2013 curriculum to hone students' thinking skills is to apply learning based on Higher Order Thinking Skills (HOTS). Sofyan (2019) said HOTS (Higher order thinking skill) was first put forward by a writer and Associate Professor from Dusquance University named Susan M Brookhart in her book, 'How to Assess Higher-order Thinking Skills in Your Classroom. He defines this model as a method for knowledge transfer, critical thinking, and problem solving. HOTS is not just a question model, but also includes a teaching model. The teaching model must include thinking skills, examples, application of thoughts and adapted to the needs of different students.

Anderson & Krathwohl (2016) revised the knowledge domain based on Bloom's Taxonomy into 6 levels namely: knowing (knowing- C1), understanding (understanding- C2), applying (appling- C3), analyzing (analyzing- C4), evaluating (evaluating- C5), and creating (creating- C6). Then Puspendik classifies it into 3 cognitive levels namely level 1 includes knowledge and understanding includes the cognitive process of knowing (C1) and understanding (C2), level 2 application includes the process of thinking applying (C3) and level

3 reasoning includes analysis (C4), evaluating (C5), and creating (C6) or what is called HOTS. The following is a table of indicators from HOTS.

Table 1 HOTS indicators

HOTS	Indicators
Analyze	Specifies aspects or elements. Verbs: compare, check, criticize and test
Evaluate	Make up your own mind. Verbs: evaluate, assess, refute, decide, select and support
Create	Create your own ideas or ideas Verbs: construct, design, create, develop, write and formulate

(Hasyim & Andreina, 2019)

In the 2013 curriculum to hone students' thinking skills is to apply learning based on Higher Order Thinking Skills (HOTS). The same thing was also expressed by Kunanti (2021) that the 2013 curriculum being developed aims to improve the skills students have. One of these skills is the ability to solve problems. However, in the field findings, not all students have good problem-solving skills. This makes students experience difficulties in working on problem-solving-based questions, resulting in errors in working on HOTS questions.

To find out the causes of errors made by students in working on HOTS questions, it can be done by analyzing the errors that occur in solving these questions. By holding an error analysis carried out by students, it is hoped that the teacher can take steps that are used as improvement efforts. The procedure that can be used to analyze student errors in working on HOTS questions is the Newman Error Analysis (NEA) procedure. NEA is a stage used to understand and analyze how students answer a problem in the question. In this case Mulyani and Muhtadi (2019) also revealed that mistakes in doing math problems were divided into five mistakes, namely:

Reading error

Reading errors are errors that occur because students read the main information questions so that students do not use that information in working on questions and student answers do not match the intent of the questions.

Comprehension error

Comprehension error is an error that occurs because students do not understand, especially in concepts, students do not know what is actually being asked in the problem and are wrong in capturing the information in the problem so that students cannot solve the problem.

Transformation error

Transformation error is an error that occurs because students have not been able to change the problem into mathematical form correctly and are wrong in using arithmetic operation signs.

Process skill error

Process skill error is an error that occurs because students are not skilled at doing calculations

Encoding error

Encoding error is an error in completion. Based on the description above, the following is a table of error indicators according to Newan:

Table 2 Indicators of Newman's Error

Error type	Indicators
Reading Error	Students misread symbols, terms, words or important information in the problem
Comprehension error	Students do not know what is known and asked questions Students are not appropriate in writing things that are known and asked in the questions Students do not write down what is known and what is asked in the questions and are unable to explain implicitly (interview)
Transformation error	Students do not change the questions into mathematical language or mathematical form Students are not suitable in changing the question sentences into mathematical sentences Students are wrong in using arithmetic operations to solve problems
Process skill error	Students did not write down the calculation process or completion steps Students are wrong in carrying out the calculation process or completion steps
Encoding error	Students are wrong in writing the conclusion of the final answe Students do not write down the conclusion of the final answer

(Dinda Amalia & Windia Hadi, 2020)

2. Method

This type of research is descriptive qualitative. The qualitative descriptive method is a method that aims to fully and in-depth describe social reality and various phenomena that occur in society, so that details of the characteristics, characteristics and how these phenomena occur are clearly described. Sugiono (2014) thinks that this method is used to examine the condition of natural objects, the researcher is a key instrument, who retrieves data using triangulation techniques and analyzes them inductively, and the results of his research emphasize meaning rather than generalization. This research was conducted at Karangtengah I Elementary School, located in Wuni Hamlet, Giricahyo, Purwosari, Gunungkidul. The subjects of this study were Class V students at SDN Karangtengah I. Data collection techniques used in this study are test techniques, interviews, observation and documentation. The test used in this study was a HOTS test. Test the credibility of the data in this data research is to use technique triangulation and source triangulation. The data analysis technique used in this study is the data analysis technique of the Mills and Huberman model, which includes data collection, data reduction, data presentation, and drawing conclusions.

3. Results and Discussion

3.1. Mistakes made by fifth grade students at SDN Karangtengah I in solving HOTS (Higher Order Thinking Skill) questions on fraction addition and subtraction operations

To be able to find out the mistakes made by class V students at SDN Karangtengah I in solving HOTS questions on addition and subtraction of fractions, the researcher conducted a

HOTS test with a total of 5 items. The results of the answers that have been obtained through the HOTS test are used to find out the types of errors made by students in solving the questions. Based on the results of these answers it is known that there were student errors in solving HOTS questions on addition and subtraction of fractions. The mistakes made by students in working on HOTS questions were analyzed using Newman's error analysis. The initial method used in this study was a test supported by observations, interviews, and documentation studies. The following presents the results of the recapitulation of the percentage of errors made by fifth grade students at SDN Karangtengah I.

Table 3 Percentage of Student Errors

Error tyoe	Types of student errors matter					Amount	Percentage (%)
	1	2	3	4	5		
Reading Error	1	1	-	-	-	2	1,61%
Comprehension Error	1	1	-	1	3	6	4,84%
Transformation error	3	5	-	8	1	17	13.71%
Process Skill Error	8	7	9	11	12	47	37,9%
Encoding Error	10	8	11	10	13	52	41,94%

Based on the results of the recapitulation of the total percentage of students in table 3, it can be seen that the most mistakes made by students in working on the HOTS questions on addition and subtraction of class V SD fractions were errors in writing the final answer (encoding error) of 52 errors with a percentage of 41.94%, errors (process skill errors) of 47 errors with a percentage of 37.9%, transformation errors (transformation skills) of 17 errors with a percentage of 13.71%, comprehension errors of 6 errors with a percentage of 4.84% and the least error is a reading error (reading error) that is as much as 2 errors with a percentage of 1.61%. The more detailed description is as follows:

a. Reading error

Reading errors were made by 1 student, namely with the subject code of S2. The following is an excerpt of an interview with Subject S2:

LW : "Now try to pay attention to question number 1, try to read question number 1"
DPM : "reading a questionl"
LW : "What is the part of the first child?"
DPM : "$\frac{1}{5}$"
LW : "if the second child?"
DPM : "$\frac{1}{3}$"
LW : "$\frac{1}{3}$ paryt? If the mean $\frac{1}{3}$ part more, what is it?"
DPM : "I don't know"

Based on the results of the tests and interviews, Subject S2 made a reading error. Subject S2 did not know the meaning of $\frac{1}{3}$ part more than the part of the first child. In the results of the test, Subject S2 wrote that the second child's portion of the cake was $\frac{1}{3}$ part and in the results of the interview, Subject S2 was also unable to explain the meaning of the sentence "the share of the second child is $\frac{1}{3}$ part more than the portion of the first child". In reading the S2 subject matter, it was still stuttering, it was wrong to cut off words, there were some that were misread and there were words that were missed to be read.

b. Comprehension error

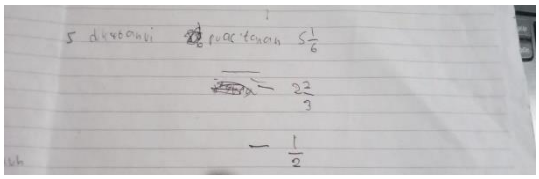

Figure 1 description comprhension error

Based on figure 1 for question number 5 Subject S3 writes down what is known in the problem but does not provide any explanations. This made subject S3 make comprehension error.

c. Transformation error

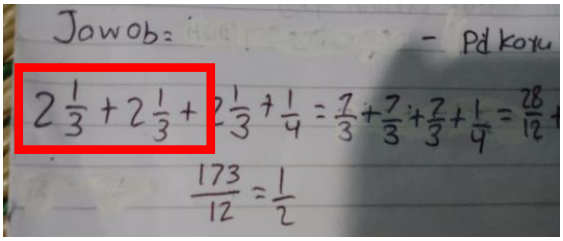

Figure 2 description transformation error

Based on figure 2, Subject S1 wrote the mathematical sentence for question number 2 incorrectly, causing Subject S1 to make a transformation error. Subject S2 just wrote a mathematical sentence length of wood 1 + length of wood 2 + length of wood 3.

d. Process skill error

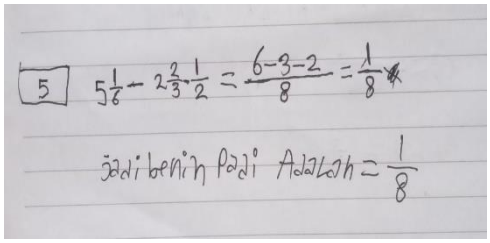

Figure 3 description process skill error

Based on figure 3, Subject S4 has taken the right steps in determining the area of land planted with rice. However, during the calculation process, Subject S4 experienced an error. On the answer sheet, the first mistake made by Subject S4 was not changing mixed fractions to ordinary fractions before doing the calculations. Subject S4's next mistake seen on the answer sheet immediately equated the denominator of the fraction operation. However, even in equating the denominator, Subject S4 also made a mistake. This error caused Subject S4 to make a process skill error

e. Encoding error

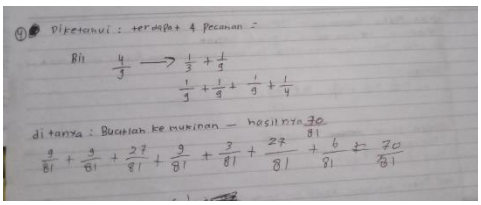

Figure 4 description encoding error

Based on picture 4 Subject S5 did not write a conclusion of the answer. This caused subject S5 to make an error in writing the final answer (an encoding error). The following is an excerpt of an interview with Subject S5:

LW : "So what's the conclusion?"
YS : "I don't know miss"
LW : “why? Not used to it?"
YS : "yes"
LW : “okay. I can help you”

Based on the interview with subject S5, when asked to conclude the answer to question number 4, he said he did not know. Subject S5 is not used to writing conclusion conclusions. In working on S5 subject word problems it only stops at the calculation stage. So that Subject S5 made a mistake in writing the final answer.

3.1 Factors that caused class V students at SDN Karangtengah I to make mistakes in solving HOTS (Higher Order Thinking Skill) questions on addition and subtraction of fractions

Based on the results of interviews, observations and documentation studies with several sources, it was found that there were factors that caused students to make mistakes in solving HOTS questions on addition and subtraction of fractions. The factors are:

a. External factors

External factors that cause students to make mistakes include the learning process not getting used to using HOTS questions. This is in line with the results of research conducted by Bahir & Mampouw (2020) where one of the factors that causes students to make mistakes in solving math problems is the lack of practicing similar questions.

b. Internal factors

Internal factors that cause students to make mistakes include:

1) On the reading error indicator

The causes of students making reading errors include students not being careful in reading the questions and students not being able to understand the keywords or sentences in the questions. This is in line with Hidayah (2016) that it is known that the cause of students making mistakes is because students are not careful and thorough in reading the questions.

2) On the comprehension error indicator

The causes of students making misunderstandings include students having difficulty writing down the information contained in the questions, students not writing down the information contained in the questions and students in a hurry in working on the test.

3) On the transformation error indicator
   The reason students make transformation errors is that students cannot determine arithmetic operations.
4) On the process skill indicator eorrr
   The cause of students making process skill mistakes is the low students' numeracy skills. This opinion This opinion is in line with the research conducted by Sa'adah and Pramesti (2022) which said that one of the internal factors that causes students to solve math problems is that students are less skilled in performing arithmetic operations. The next causal factor is that students do not know the concept of fractional arithmetic operations and *porogapit*. This is in line with Viani et al. (2020) who stated that the factor that causes students to make mistakes in solving HOTS questions is not knowing the concept.
5) On the encoding error indicator
   The cause of students making mistakes in writing the conclusion of the final answer is that students do not know the next step after carrying out the calculation process and students do not know how to draw conclusions. This is in line with the results of research conducted by Murtiyasa and Wulandari (2020) that the factors that cause students to make mistakes in solving math problems at the encoding stage do not draw conclusions from the answers.
6) The most common internal factors that cause students to make mistakes are students' intellectual abilities. This is in line Handayani et al. (2020) which revealed that if intelligence in the form of student skills and students' understanding of the material is still lacking, it will result in errors made by students in solving problems. Another reason students experience errors in the previous stage. This finding is the same as the results of research conducted by Viani et al. (2020) that the factors that caused the subject to make mistakes in solving math problems were mistakes made by the subject at the previous stage so that they had the opportunity to cause subsequent mistakes.

4. Conclusion

Based on the results of research and discussion, it can be concluded as follows; 1) The mistakes made by students in solving HOTS questions on the material for addition and subtraction of class V SDN Karangtengah I were coding errors with a percentage of 41.94%, process skill errors with a percentage of 37, 9%, transformation error with a percentage of 13.71%, comprehension error with a percentage of 4.84%, and the least error is reading error with a percentage of 1.61%. 2) Factors that cause students to make mistakes in solving HOTS questions on addition and subtraction of class V fractions are 2 factors, namely external factors and internal factors. The external factors that cause students to make mistakes are due to a lack of practice questions, especially HOTS-based questions. Furthermore, the internal factors that cause students to make mistakes are the internal factors that cause students to make mistakes, namely a) on the encoding error indicator, students do not know the next step after carrying out the calculation process and students do not know how to draw conclusions; b) on the process skill error indicator, the students' numeracy skills are low, students do not know the concept of fractional and *porogapit* arithmetic operations; c) on the transformation error indicator, the student cannot determine the arithmetic operation; d) on the comprehension error indicator, students had difficulty writing down the information contained in the

questions, students did not write down the information contained in the questions and students were in a hurry in doing the test; e) the reading error indicator is that students are not careful in reading the questions and students are not able to understand the keywords or sentences in the questions; and the most common internal factor is the intellectual ability of students and students experience errors at the previous stage.

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