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Problem-solving Ability of Fifth-graders in Mathematical Word Problem

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Abstract.
This study aims to analyze the students' problem-solving skills in solving the daily problems that deal with the operations of fractions. This research was conducted at a State Elementary School in Bandung City, West Java Province, Indonesia. The research method used was a qualitative approach with a narrative case study method. The participants in this study were 36 students of grade V. Data were collected from student test results, interviews, results between students and teachers. Data analysis was performed using interpretational analysis. The results show that the fifth-grade still have difficulty in understanding the problems. Other interesting findings were: (1) Some students still do not understand the rules or how to change mixed numbers into ordinary fractions or vice versa. (2) Some students still do not understand how to design and implement solving strategies. (3) Some students still do not understand the concepts and procedures of counting operations, such as addition, subtraction, multiplication, and division. (4) Some students do not conclude the final result from the answer to the story problem (5). Some students do not validate the question of the story problem, she/he just give answers to mathematical solutions.

Keywords: problem-solving ability, mathematical word

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1. INTRODUCTION

Problem-solving is one of the abilities that students must master after learning mathematics. This ability is needed by students, related to the needs of students to solve the problems they face in everyday life and be able to develop themselves. According to [1] , problem-solving is one of the higher-order thinking skills. The problem is the gap between reality and what is expected. These gaps and gaps need to be minimized, resolved, and resolved. Problem-solving abilities must be provided to students, not only used to solve mathematical concepts, to answer questions about learning that only require cognitive aspects, but students use it as a provision to solve all problems in everyday life, which involves various elements and complex issues. Therefore, this ability is very important for students to master. [2] states that the background or reason

a person needs to learn to solve mathematical problems is the fact in the twenty-first century that people who can solve problems live productively. According to [2], people who are skilled at solving problems will be able to keep pace with their needs, become more productive workers, and understand complex issues related to global society. [2] states that the background or reason a person needs to learn to solve mathematical problems is the fact in the twenty-first century that people who can solve problems live productively.

Mathematics learning should start with the introduction of problems that are by the situation (contextual problem). To improve problem-solving skills, it is necessary to develop skills in understanding problems, making mathematical models, solving problems, and interpreting solutions [3]. Theory Fractions are one of the most difficult topics for students and teachers alike, are among the difficult math concepts children encounter in elementary schools [4, 5]. One of the main reasons that students find fraction operations difficult is that they memorize formulas and algorithms instead of understanding fractions, while another is that they perceive the denominator and numerator infractions as two separate integers [6]. Three reasons for the students' low conceptual understanding of the fraction material from the TIMSS results, namely 1) the content of the Indonesian curriculum which places a low emphasis on the basic concept of fractions and introduces fraction operations too early; 2) Indonesian mathematics textbooks only present one definition of fractions, namely as part of the whole; and 3) there is limited use of fraction models or representations in classroom practice [7].

Research conducted [8] showed that by the end of fifth grade, students had not mastered part-all fraction sub-constructions and had problems relating congruence to whole parts. [9] explains that fractions are known to be difficult to learn and difficult to teach, but they are very important for students because they have access to more advanced mathematical concepts. [10] explains that the concept of fractions is considered one of the most difficult materials in mathematics to learn and teach in school.

The problem of learning fractions was also strengthened from the results of learning observations and interviews conducted with a grade V teacher at an elementary school in Bandung, who still had difficulty understanding and answering fraction operations. The diverse characteristics of students made the writer interested in exploring the students' way of solving the problem of the story about fraction operations to a deeper level.

Based on the problems and phenomena described above, the authors are interested in analyzing the problem-solving abilities of grade V students in solving the operation of calculating fractions. The problem studied in this article is limited to the method of

grade V students in solving the operation of calculating fractions in a public elementary school in Bandung. The great hope that it can provide benefits to various parties, both theoretically, namely adding a broader insight into the learning difficulties faced by elementary students.

2. RESEARCH METHOD

This research uses a qualitative approach with a narrative case study method [11]. Qualitative research investigates events that occur naturally [12]. In this study, the researcher investigates a case or material issue that is considered difficult by grade V students, namely the material of the operation of fractions. To examine this issue, the researcher analyzed the results of the students' work in solving the problem solving the operation of fractions, then the results were analyzed interpretatively in a narrative form. This study involved purposive sampling. The sample is selected using the researcher's judgment to select information-rich samples by the phenomenon under study [13]. The sample in this study were teachers and students of Class V in an elementary school in Arcamanik District, Bandung, totaling 36 people. The data processing instrument used in this study were student test results, student and teacher interviews. Analysis of the data used in this study using the qualitative analysis model of [14]. The analysis phase is data reduction, data display, data verification, and conclusion drawing. Each data that has been collected from the field is written in a detailed form and forms a daily report. Considering that the daily reports are very large and varied, the data collected is done by reducing the data, which is done by making an abstraction. Data abstraction is a summary of research data, then selected and focused on things that are important and related to the ability of students in solving the matter of the operation of of fractions to the story in elementary school.

3. RESULTS AND DISCUSSION

3.1. The Student Who Answered Correctly

In this study, the questions given to students were in the form of story questions about the addition of fractions. Students take several steps to solve: the first step, students understand the problem, namely by writing what is known and what is asked. Second step, students solve the problem by multiplying the mixed number becomes a regular

fraction (To be able to complete arithmetic operations, both addition, subtraction, multiplication, and division, students must have prerequisite skills, namely understanding the concept of fractions, fractions with a value) [15]. The concept of fractions is very important because of its association with concepts such as rational numbers, ratios, and proportions, decimals, percentages, and probabilities [4, 16]. The construction of the initial fraction concept depends on the integration of the calculation and divider schemes. [17] distinguish four historical approaches to fractions, namely: the whole-part approach, the measurement approach, the set-theoretical approach, and the division approach. To understand the concept of fractions, it is necessary to understand that division produces a quantity represented by a new number [18].

Based on the results of the students' answers above, if it is related to the 4 steps of solving Polya's problems (Heuristics) [19]. So we can say that students who answered correctly have taken 3 steps, namely (1) understanding the problem, this can be seen from the students' answers in the first step which write down what is known and asked. (2) planning problem solving and (3) implementing the two-step problem-solving plan we can see in the second step solving the problem in the student's answer.

In the second step in the student's answer and steps 3 and 4 in the Polya problem-solving step, the students already understand some of the concepts used to solve the problem and this is a prerequisite that students must have to solve the story problem of the addition operation on fractions including equating the shape of the fraction before doing the addition and multiplication count operations on fractions, equalizing the denominators of the two fractions for the addition calculation operations on fractions using the KPK, and simplifying the final result. However, from the students' answers, we have not found any concluding steps and step (4) looks back or checks the answers obtained (Polya).

Based on the results of interviews with students, the reason for step 4 was not carried out because it was caused by 3 factors, the first student felt that the final result of the answer was correct, secondly, there was not enough time to check it again, and the three students did not know how to check again. This is reinforced by the answers to the results of the teacher's interviews, which state that some students who have completed the story questions tend not to want to check their answers again because if the final result has been found, it means that the answer is correct or that they think the answer is correct even though the teacher has reminded them to check again. Likewise, the teacher found that some students also felt that solving story problems, especially the counting operations on fractions, needed a long completion so that it was time-consuming and not enough to double-check the final answer, and if the teacher

asked what difficulties they faced so they did not want to check the final answer again, students answered confused and did not know how to check the final answer even though it had been explained and even given an example by the teacher how to do it. The teacher also thinks that maybe students are not accustomed to doing it so they must continue to be trained until they feel used to it and consider it a necessity in solving story problems in mathematics. students answered confused and did not know how to check the final answer even though it had been explained and even given an example by the teacher how to do it. The teacher also thinks that maybe students are not accustomed to doing it so they must continue to be trained until they feel used to it and consider it a necessity in solving story problems in mathematics. students answered confused and did not know how to check the final answer even though it had been explained and even given an example by the teacher how to do it. The teacher also thinks that maybe students are not accustomed to doing it so they must continue to be trained until they feel used to it and consider it a necessity in solving story problems in mathematics.

3.2. Students Who Answered Incorrectly

Based on the work on the questions above, there were 20 students out of 36 students who answered incorrectly. What was interesting was that there were 3 variations of the answers from the students' answers, interpreted by addition, division, and multiplication.

Based on the answers from students, we can compare with Polya's 4 problem-solving steps, namely step (1) understanding the problem, in this step students only looking for answers from 1 long trousers and 1 short sleeve shirt even though what was asked for was 2 pieces each for long pants and a short-sleeve shirt. In contrast to the students who already understood, the purpose of this matter can be seen from the fact that the combined length of 1 pair of trousers and 1 short-sleeved shirt is known and then multiplied by 2. The next step (2) planning problem solving and (3) implementing the problem-solving plan, at the stages of steps 2 and 3, students answer by directly adding two mixed numbers to the problem without understanding that the first mixed number is for trousers and the second mixed number is for short-sleeved shirts, thus there must be a preliminary procedure. they do first and then combine them. So that the final result is obtained by the problem in the question. For step (4) seeing / checking the answer again, from the picture above the students did not do it. The results of the answers to the interviews of students who answered incorrectly were the same as the teacher's

answers, namely that students felt short of time and did not understand how to take steps (4) to solve the Polya problem

Based on the answers from students, we can know that the mistakes made by students are associated with Polya's 4 problem-solving steps, students have not been able to carry out the first stage, namely understanding the problem. This is proven by the students solving the problem in the form of a division operation which should be an addition operation on fractions. Some students have also not carried out the second stage of planning problem solving and the third stage is carrying out the problem-solving plan, this is evident from the students being less careful in writing in the answers change 1 $\frac{1}{2}$ to be $\frac{3}{1}$ supposed to be $\frac{3}{2}$ a student's error can be caused by two factors, namely writing errors and students have not understood the procedure for converting mixed numbers into ordinary fractions (There is a misunderstanding in understanding the story problems, one of the factors may be because students do not understand the language in the questions and have difficulty learning fractions) [20, 21] and perform the counting operation procedure from the student's answer, the result is $\frac{9}{8}$ x $\frac{3}{1}$ = $\frac{18}{9}$ it should be $\frac{27}{8}$, students also cannot conclude the result. The student writes the answer 2 x 2 x 2 = 8 meters. This student's answer is less relevant to the problem and solving the problem to the problem. Elementary school students have the greatest difficulty in representing fractions with the model, denominator, and numerator concept [20]. Students also still haven't done the fourth stage, which is checking/reviewing the final answer. The results of the students 'and teachers' answers about the fourth step in this group were almost the same, namely, they felt the answer was correct, felt they did not have enough time to do it, and did not know the procedure / how to do it. Even though in the implementation both when learning in class and in the implementation of the test the teacher always reminds us to be careful in solving the story questions and not forgetting that when you have finished working, checking/checking the final answer results that have been obtained by students because this step will be useful to find out whether the calculation operations are carried out. we do that the procedure is correct as well to find out mistakes in writing when filling out the questions.

Based on the answers from students in this group still cannot understand the problem (stage 1). The student immediately carries out the counting operation procedure without writing down what is known and what is asked of the questions we can see.1 $\frac{1}{8}$ x 1$\frac{1}{2}$ =.... Likewise for stage (2) planning problem solving and stage (3) carrying out problem-solving. Student changes the two mixed numbers into ordinary fractions $\frac{9}{8}$ x $\frac{3}{2}$ = ... the results are $\frac{27}{16}$ obtained then the results are simplified to 11 $\frac{1}{16}$ then changed to $\frac{16}{11}$ at this stage the students multiply the numbers 11 with the numerator 1 becomes 11

and reverses the position of the denominator to become a numerator and vice versa the numerator becomes a denominator so that the final result is different from $\frac{16}{11}$, the student first converts the two fractions into ordinary fractions $1\frac{1}{8}$ be $\frac{9}{8}$ while $1\frac{1}{2}$ becomes $\frac{3}{2}$ then each fraction is multiplied by 2, in carrying out the multiplication operation students use the scratch system for numbers that can be divided by the same number. The students scratch the denominator for both fractions and number 2 as multipliers by dividing numbers by number 2. So that the results for the first fraction 64 and the second fraction 3 then add up the two results 64 + 3 = 67 meters, in this case, the students still do not understand the operation rules for calculating the multiplication of fractions with real or whole numbers [21]. The students multiply the two mixed numbers by number 2, the next step is to change the mixed number to an ordinary fraction then multiply by the fraction $\frac{2}{1}$ as follows: $\frac{9}{8}$ x $\frac{2}{1}$ = $\frac{18}{8}$ and $\frac{3}{2}$ x $\frac{2}{1}$ = $\frac{6}{2}$, then the student simplifies the result $\frac{18}{8}$ to $\frac{9}{4}$ and $\frac{6}{2}$ or $\frac{3}{1}$. Then the students add up the results of the two multiplication operations $\frac{9}{4}$ + $\frac{3}{1}$ =$\frac{12}{4}$ = 3 from the last step that the student did, we can find out that the students do not understand the rules in the addition of the calculation operation on fractions, namely one of them equating the denominator. The student's answer then the results are added up as in the student's answer 36 + 3 = 39 meters. Even in this group, the students did not conclude and did the fourth stage of Polya, namely seeing/checking the final answers of the students.

4. CONCLUSION

Based on the description of the analysis of student answers seen from the 4 stages of solving the problem solving (Heuristics) proposed by Polya, we can conclude that some students still have difficulty understanding the intentions and problems that exist in the story problem (stage one of the 4 stages of solving / solving problems (Heuristics) Polya), this can be seen from some students solving problems that exist in story problems with the multiplication fraction calculation operation. and the operation to calculate the division of fractions, even though the operation for adding fractions should be, even if someone has finished the calculation operation with the addition of fractions, the procedure for solving it is still wrong. Students are also still confused in understanding the questions on the story questions, for example, in this question, the number of fabrics needed for 2 long pants and 2 short-sleeved shirts is still found, students who only answer the length of the cloth for 1 trousers and 1 short-sleeved shirt are still found. Some students still do not understand the rules or how to change mixed numbers into ordinary fractions or vice versa. Some students still do not understand how to design

and implement a problem-solving strategy (the second and third stages of the 4 stages of solving / solving problems (Heuristics) Polya), we can see that only a few students wrote what they knew and asked about how to solve the problem. Some students still do not understand the concepts and rules that exist in fraction counting operations, both addition, subtraction, multiplication, and division. Some students do not conclude the final result of the answer to the story problem, for example, the question reads: "So the cloth needed to make 2 trousers and 2 short-sleeved shirts is 5 $\frac{1}{4}$ meters" and some students do not understand the benefits of checking / reviewing answers (fourth stage of 4 stages of solving/solving problems (Heuristics) Polya), so they are reluctant to do so because they feel the answer is correct, there is not enough time to do it, and do not understand how to do it.

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