Difficulty Analysis Of Elementary School Students In Mathematical Problem Solving In Solutions

Ety Mukhlesi Yeni, Wahyudin, Tatang Herman

Abstract : Problem solving is one of the mathematical competencies that students must achieve from elementary school through college. However, in reality problem solving is still a competency that is difficult for students to achieve with various kinds of difficulties in solving mathematical problems. This study has a goal to be achieved in the form of identifying and describing problem solving difficulties based on the theory of Newman to students in fraction material . This research was conducted using descriptive qualitative research methods . The research sample consisted of 34 5th grade elementary school students and 3 students as interview samples with a background of different cognitive abilities. The data of this study were collected from test questions of problem solving skills and interviews. The results showed that students' difficulties in solving problem solving problems were students do not understand the questions in the problem, students are still lacking in understanding mathematical concepts and procedural steps, student mistakes in representing problems in mathematical models, students are not happy to re-evaluate the answers that have been written to check the truth of the answers.

Index Terms: problem solving, newman theory , qualitative research

1. INTRODUCTION

Mathematics is one of the fields of science that must be studied by children in every level of education in schools from elementary school to high school and even in college. Even though the curriculum is constantly changing, mathematics is still a compulsory subject that is studied and is one of the subjects required to pass the UN (National Examination). There are many benefits from learning mathematics for children for their daily lives to their future. Problem solving is an integral part of all mathematics learning, and therefore should not be an isolated part of a mathematics program. By studying problem solving in mathematics, students gain ways of thinking, persistence habits, curiosity, and belief in unusual situations that will help them outside the mathematics class. Students must have frequent opportunities to formulate, interact, and solve complex problems that require significant effort and then must be encouraged to think about their thinking [1]. Sakshaug et al. [2] describes the experience of solving mathematical problems as something that includes the act of exploring, reasoning, strategy, estimating, guessing, testing, explaining and proving. This is a very active process for those involved. Through problem solving, we are challenged to think beyond the point where we were when we started, we are challenged to think differently. We are challenged to expand our thinking about a situation in a new or different way. Yeo [3] defines problem solving abilities as the abilities or strategic competencies students have in understanding, choosing approaches and strategies for solving them, as well as a complete model for finding solutions to a problem. It was emphasized also by Anderson [4] which states that the ability to solve problems is a very important life skill that involves various processes such as analyzing, interpreting, reasoning, predicting, evaluating, and reflecting. Solving problems is one of the goals or fundamental components of pock uluum schools in various countries . Furthermore, NCTM added that the term refers to solving problems of mathematical assignments that have the potential to provide intellectual challenges and enhance understanding of students' mathematical development. According to NCTM [1] indicators to measure students' mathematical problem solving abilities include: 1) Students can identify the elements that are known, are asked, and the adequacy of the required elements, 2) Students can formulate mathematical problems or develop mathematical models, 3) Students can implement strategies to solve various problems (new types and problems) in or outside mathematics, 4) Students can explain the results according to original problems, and 5) Students can use mathematics meaningfully. But in reality at school, students still have difficulty in solving problems related to problem solving. Based on research conducted by Yeo [3] in Singapore who examined the difficulties experienced by students of class VIII in solving mathematical problems stated that the difficulties experienced by students when solving mathematical problems are difficulties in: (a) understanding the given problem (lack of comprehension of the problem posed), (b) determine the right solution (lack of comprehension of strategy knowledge), (c) make a mathematical model (inability to translet the problem into mathematical form), and (d) perform the correct mathematical procedure (inability to use the correct mathematics). In fact, according to Newman [5] , difficulties in problem solving can occur in one of the following phases, namely reading, problem understanding , knowledge strategies, transformation, process skills and solutions. Then, Schoenfeld [5] suggested four aspects that contribute to problem solving performance. These are problem solvers: (1) mathematical knowledge, (2) heuristic knowledge, (3) affective factors that influence the way problem solvers perceive problem solving, and (4) managerial skills connected with choosing and implementing appropriate strategies.

Furthermore Lester [6] states that difficulties experienced during problem solving can also be caused by student characters such as: the ability of spatial visualization and the ability to pay attention to the structural features of the problem, the disposition of beliefs and attitudes, and the background of students' experiences in getting variations of learning in classes such as learning models, instructional media and the types of problem problems given in class. The purpose of this study is to identify and describe the difficulty of solving problems based on the newman theory of students in fractional material.

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2. METHODS

This research was conducted using a qualitative research approach. Qualitative research is research that tries to understand phenomena in their natural settings and contexts (not in the laboratory) where researchers do not try to manipulate the observed phenomena [7]. The research design used is descriptive research. Descriptive research is a study aimed at describing a situation or phenomena as they are [8] .
The research subjects involved were grade V students at 178 Elementary Schools, Sukasari District, Bandung City. Data collected from diagnostic tests and interviews. Diagnostic tests were given to 34 students after studying the specified material. This diagnostic test contains 5 questions about fractions. Furthermore, to get deeper information about student difficulties, interviews were conducted on 3 students who were selected by purposive sampling. Purposive sampling is a sampling technique with certain considerations [9]. Descriptive analysis is used to conduct qualitative data analysis in this study.
To assess the results of diagnostic tests based on Newman's theory , the researcher makes rubric assessment of students' problem solving abilities as follows:

Table 1. *rubric assessment of problem solving abilities [5]*

No	**Stages Analysis Newman**	**The Reaction of The Students Against the Reserved**	Score
1	Reading Errors	Identify information and mathematical symbols with complete	3
		Identify information and precise mathematical symbols	2
		Wrong in determining information and mathematical symbols	1
		Don't answer	0
2	Comprehe nsion Errors	Write down what is known and asked a question on demand	3
		Write down what is known and not in accordance with the request asked the question	2
		Wrong in determining what is known and asked question	1
		Don't answer	0
3	Transform ation Errors	Write down the mathematical model correctly	3
		Write down the mathematical model but not complete	2
		Wrong in determining mathematical model	1
		Don't answer	0
4	Process Skills Errors	Using a particular procedure right and the answer is true	3
		Using a particular procedure right but the answer wrong	2
		Using a particular procedure is wrong and the answer wrong	1
		Don't answer	0
5	Enconding Errors	The conclusion is rendered right	3
		Conclusion given less precise	2
		Conclusion given the wrong	1
		Don't answer	0

3. RESULT AND DISCUSSION

Problem solving based on Newman's theory, has 5 stages of resolution, namely error reading problems, errors understanding problems, errors in transformation of mathematical models , errors in process skills, and errors in deducing. The following is a presentation of the results of the analysis of each train, hospital, and FK subject on Newman's theory, namely:

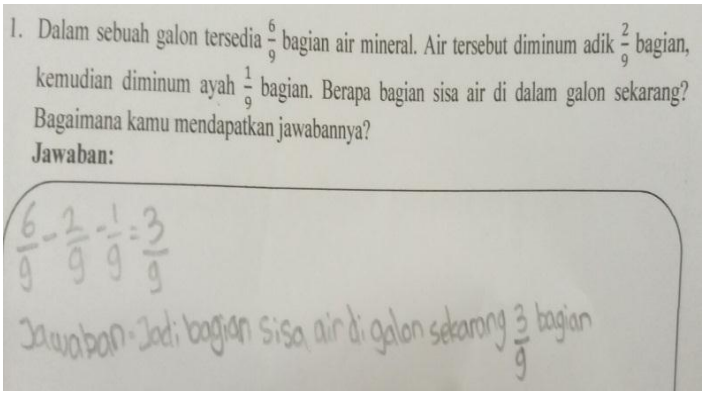

Fig. 1. *RS students' answers question number 1*

In question number. 1 like the picture above for the subject of the train is able to fulfill 5 stages of completion based on newman's theory it's just that the train is still unable to put the answer in the form of visual diagrams or drawings. The same thing was also found in the answers of hospitals that were able to fulfill the 5 stages of completion based on Newman's theory, but were also unable to put the answers in the form of visual diagrams or drawings. While the FK answer did not meet the indicator encoding errors, FK tried to fulfill it with a visual representation but it was not right. This is because FK does not understand the concept of fractions in the form of diagrams. This shows that someone is able to display mathematical models but not necessarily able to visualize them in drawings or diagrams.

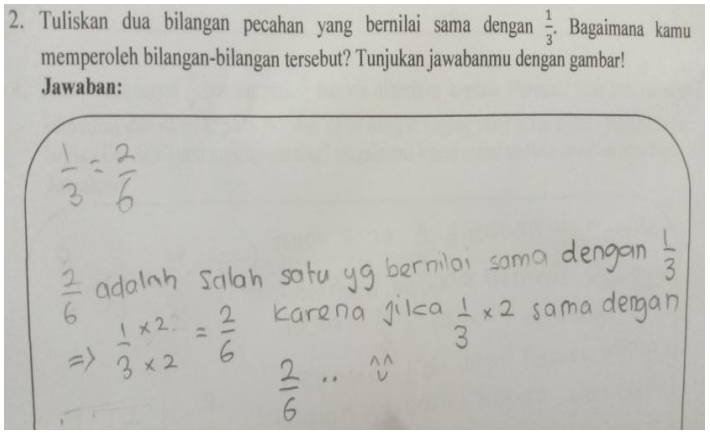

Fig. 2. *KA students' answers question number 2*

In question number. 2 like the picture above for the KA subject does not meet the transformation indicator and encoding errors, this occurs because of the subject's carelessness in reading the question. So that the subject of the train skips to double-check the answers so that they appear to be confused with the answers they have worked on. Whereas for the subject of the hospital and the FK did not meet the five indicators of problem solving Toeri Newman, this is due to the subject not understanding the question and not fully understanding the concept of fractions properly. The subject tried to answer in the form of a picture or diagram, but it was still wrong.

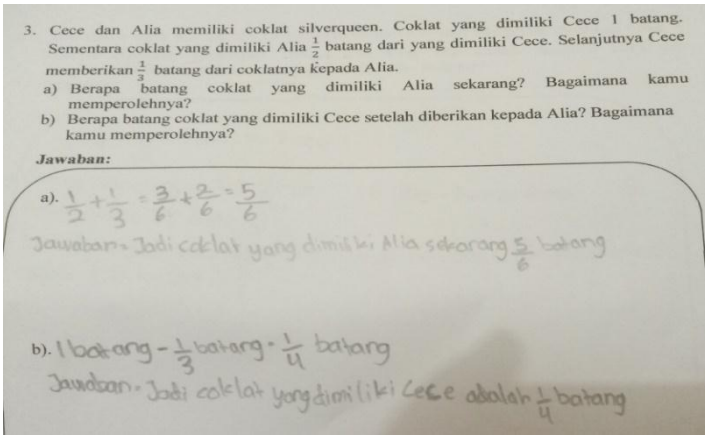

Fig. 3. *RS Students' answer question number 3*

In question number. 3 like the picture above for the subject of KA is able to fulfill 5 stages of completion based on the theory of newman in answering question 3. KA answers with procedural calculation of fractions correctly, only for point (b) in number 3, the result of KA is written in decimal fraction. This answer is in the form of a railroad initiative to make it easier to calculate. It's just that the weakness of the KA is not making a final conclusion from the answer. Hospital subjects were able to fulfill 5 stages of completion based on Newman's theory in answering question 3 point (a), but wrong in point (b). Errors occur in the final results of the answer to the calculation process, this is due to errors in counting and lack of accuracy from the subject of the KA itself. KA errors illustrate the lack of ability to evaluate or re-check answers from a solution that has been done. FK subjects were also able to answer question number 3 point (a), but could not answer point (b) because FK did not understand the question so that it was also unable to transform mathematical models and procedures for completing questions.

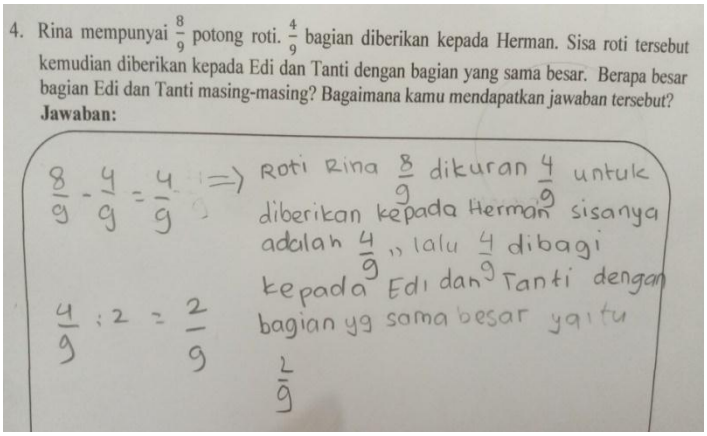

Fig. 4. *KA Students' Answers question number 4*

In question number. 4 like the picture above for the subject of KA is able to fulfill 5 stages of completion based on Newman's theory in answering question 4 . KA answers procedurally the calculation of fractions correctly and is able to give correct conclusions to question 4 . Subject RS is able to give the answer 's right to question 4 , only less precise at this stage of the transformation that is an error in the writing of a mathematical model that is not complete . Here the subject of a direct RS unites a mathematical model for the first and second questions in Question 4. Although the results obtained are correct, but there are steps or processes that terloncati or miss so it is affecting kesimp ulan end provided by the hospital . Not much different from hospitals , FK subjects are also incomplete at the transformation stage. FK is incomplete in making mathematical models from question number 4 and FK also does not write conclusions from the answers it has done. FK tries to display the answers in the form of images of bread cut to facilitate FK in answering, but this picture is not appropriate to describe the mathematical model of question number 4.

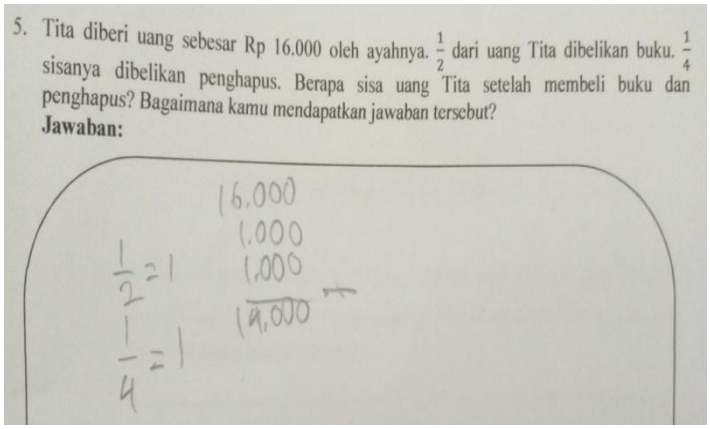

Fig. 5. *FK Student Answers question number 5*

In question number. 5 like the picture above for the subject of KA is able to fulfill 5 stages of completion based on the theory of newman in answering question 5 . KA answers procedurally the calculation of fractions correctly and is able to give correct conclusions to question 5 . Subject KA able to provide the correct answer to question 5 , only less precise at this stage of the transformation that is an error in the writing of mathematical models that are not complete and errors in the procedure of skills. Errors on skills such procedures m eng use any particular procedure, but it produces the correct answer. This is due to lack of understanding and thoroughness of the KA in understanding the process of mathematical models and the process of completion procedures. This also happened there is a subject of the hospital. Even the hospital is not only wrong in modeling and procedures, but also does not provide conclusions on the answers it does even though half of the answers are correct. While FK subjects cannot answer question number 5 because they do not understand the questions in the questions. Based on the description of the three subjects above it can be concluded that the three subjects have not been able to meet all the indicators of problem solving based on *Newman's* theory . Descriptions of each indicator are as follows; The first stage). indicator of Reading Errors, the subject of the train can identify information and mathematical symbols are right, but there is also a problem number 2 that can not be well absorbed information in the statement. Hospital subjects cannot fulfill this indicator in questions number 2 and 3 points (b), this can be stated that the hospital is not able to absorb information in the questions properly. Subject FK can not meet this indicator in a matter of numbers 2, 3 points (b), and 5. I ni can be stated that the hospital was not able to acquire information on the questions well. Second stage). indicators of Comprehension Errors, KA

subjects can meet this indicator, subjects can determine what it is known and asked for each problem given in the problem , this is because the subject can absorb information well even though at the end it is not all perfect. Hospital subjects cannot fulfill this indicator in questions number 2 and 3 points (b), this is because the subject does not know very well the request or problem in the question. This is also caused by the subject not fully understanding the concept of fractions so that it is difficult to understand the questions in the given problem. FK subjects did not meet this indicator in questions number 2, 3 points (b), and 5 . FK has the same difficulty as the hospital, ie the subject does not know very well the requests or problems in the question. Third tage). Indicator of transformation error, the subject of KA cannot fulfill this indicator in problem number 5. KA error occurs in the wrong writing a mathematical model correctly, even though the answer given is correct. Hospital subjects did not meet this indicator in questions number 2, 3 points (b), 4 and 5 . The hospital cannot answer correctly on questions number 2 and 3 points (b), this is because the hospital forgot about the concept of fractions worth of lessons that had previously been obtained. Whereas in questions number 4 and 5 the hospital had difficulty in writing mathematical models correctly, because they did not really master the concept of fractions. FK subjects did not meet this indicator in questions number 2, 3 points (b) and 5. FK had difficulty in making mathematical models correctly and completely, this was because FK did not understand the concept of fractions worth from the previous lesson. Fourth stage). Indicator of Transformation Errors, KA subject does not meet this indicator in question number 5. FA is not right in using certain procedures, so the answers given are also incorrect. Hospital subjects did not meet this indicator in question number 3 point (b), where hospitals using certain procedures were wrong and the answers were wrong. FK subjects did not meet this indicator in questions number 2, 3 points (b) , and 5, this happened because FK using certain procedures was wrong and the answer was wrong . There are indicators that it seems clear that the train, hospital, and FK are still lacking in understanding fraction material and the subject is also not careful in carrying out calculation operations. Fifth stage). Indicator of encoding error, the subject of the train does not meet this indicator in questions number 3 and 5. This occurs because of carelessness and inaccuracy of the train that does not write the conclusions from the answers given. The subject of the hospital did not meet this indicator in question number 2, this happened because the hospital did not remember the material of worth fractions that made the hospital unable to work on question number 2 so that it was unable to give a final conclusion. FK subjects did not meet this indicator on all questions, this happened because according to the FK it was not important to draw conclusions on the answers he had done, for FK it was enough to answer without having to double check answers.

4. CONCLUSION

Types of errors experienced by students in solving mathematical problems in the material are reading errors of 4.2 5%, understanding errors 20.19%, transformation errors 32.20 %, processing skills errors 11, 1 5%, and enconding errors 31, 21 %. The error factor in solving fractional problems is that students do not understand questions in the problem, students are still lacking in understanding mathematical concepts and procedural steps, students' mistakes in representing problems in the mathematical model, students are not happy to re-evaluate the answers that have been written to check the truth the answer.

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