IS OPEN ENDED QUESTION STILL DIFFICULT FOR ELEMENTARY SCHOOL STUDENTS?

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Abstract: *This study aims to provide an overview of students' answers in answering open-ended questions on square and rectangular material. The research method used in this study uses a qualitative descriptive method. The subjects of this study were third grade elementary school students who were adapted to the material being studied in relation to students' daily lives. Test questions are given to students and then interviewed about written answers and to explore students. The results showed that students did not know if the answer to the question could be more than one and the reasons given were less exploratory. This is due to the learning and evaluation that teachers use on a daily basis only as "textbooks". These results become the teacher's reflection material in planning learning, implementing learning and planning evaluations at the end of learning.*
Keywords: *Reasoning, Problem Solving, Open Ended Question*

INTRODUCTION

The purpose of mathematics education in primary schools according to the standards set by the National Council for Mathematics Teachers (NCTM) is for students to understand mathematical concepts and apply them in solving everyday problems. (Bossé et al., 2010). Nowadays problem solving is usually offered as a method to develop mathematical thinking (Schoenfeld A.H, 1985). The complex nature of the problem thus demands that a support structure be provided when students are involved in solving the problem, because without a support structure, students may fail. Structure, broadly understood, comes in many forms such as structuring the problem itself, scaffolding, instructional facilitation, provision of tools, expert assistance, and so on, and a large number of studies examine the effects of structuring and scaffolding learners in complex problem solving activities (Sadhana puntambekar, 2005). The problems of learning mathematics in elementary schools so far can be

viewed from several learning variables and one of them is the delivery strategy (Reigeluth & Carr-Chellman, 2009).

Open ended Question

Open-ended questions may ask for textual information (for example, "Can you tell me what you associate with the term 'correct'?") or numerical information (for example, "How many minutes per week do you exercise?"). Since numerical information differs from textual information in terms of its function and the cognitive response processes involved, this contribution focuses only on the aspects of collecting and analyzing textual responses to open-ended questions. Open-ended questions are more suitable than closed questions for measuring knowledge, because they not only minimize the chance that respondents will try to guess the correct answer but also often produce more reliable and valid information. However, when respondents were unable to immediately recall the correct answer, open-ended questions also elicited more "don't know" responses or rejections than closed questions. (Krosnick, J. A., & Presser, 2010)

Obviously, technically an open question is an alternative to closed questions, it defines a better tool for getting answers to a particular question. Open-ended questions can be used for theory construction and are helpful when new theories are to be developed. The questions were used in the pilot and worked to show how the categories for the questions should be explained. Respondents have to provide longer answers, one may be able to find the emergence of predicted themes, i.e. there may be unexpected relationships between variables. Open-ended questions must be specific to provide meaningful and attainable data, therefore the formulation of relevant questions. The formula should be neutral, but also an invitation to answer. It should be as short as possible and should contain the correct question word. This is especially when there is no interview that can help in understanding the question (Popping, 2015).

The advantage of open-ended questions is that students can learn more actively. Students enjoy making wild guesses and trying to defend their opinions. However, students are still not used to accepting alternative answers, students will need more time to recognize the fact that there is more than one answer to a question or problem.

These open-ended questions require more preparation and time on the part of the teacher, but if viewed from these open-ended questions, students will begin to see math lessons as fun and meaningful (Fong, 2002)

The categories of problems in open-ended questions are unstructured questions, because they basically do not have a clear identification because of missing data or statements and there are no fixed procedures for finding the right answer. Open-ended mathematics questions require students to demonstrate their ability to answer questions in detail and detail as students work on independent projects oriented to creative applications and mathematical skills. the statement is comparable to the statement of Emilya (2010) open questions require students' creativity in thinking that they are required to answer more than just considering standard procedures in solving a problem. Cooney et (2004) determined that open-ended questions should include the following features: (1) It involves significant concepts in a related field. (2) There may be many answers to open-ended questions.. (3) Need to communicate the reasoning process. (4) Open-ended questions must be clearly stated. The fact is that open-ended questions should be incomprehensible. (5) Has an assessment rubric. Each item evaluated must have at least a 2-point rubric: yes or no. But the purpose of open-ended questions is to give students the opportunity to communicate their understanding in something other than a true or false answer scenario. Therefore, the issue here is whether it is possible to assume an answer has a score (better than a score of 0) but does not qualify for full credit. Giving students partial credit is a common perception, and using a rubric to formulate a process helps ensure fairness. This type of question has three openness principles, namely an open process (having more than one correct solution strategy), an open end product (having more than one correct solution/answer) and an open development method (can be developed into a new problem by changing the initial conditions). Open-ended questions (Boaler, 1998) can also be formulated from closed-ended questions.

Table 1. Open-ended question as modified from the closed-ended question

Closed-ended questions	***Open-ended questions***
Which of the following numbers are prime? 7, 57, 67, 117	*Fred thinks that 57 and 67 are prime because they both end in 7, which is a prime number. Dick says he is wrong. Who is correct and why?*

What are the next three numbers in the following sequence? 1, 4, 7, 10, 13,	*Consider the following sequence: 1, 4, 7, 10, 13, ... Is 100 a member of this sequence? Explain your reasoning.*
Round 37.67 to the nearest 10^{th}	*Generate three different numbers that when rounded to the nearest 10th give 37.7*
Find the LCM of 18 and 24	*Why can't 48 be the LCM of 18 and 24?*

RESEARCH METHODS

Design

This research is a descriptive research with a qualitative approach. The purpose of qualitative descriptive research is to comprehensively summarize in everyday terms, certain events experienced by certain individuals or groups (Lambert, V., & Lambert, 2012). In this study, the researcher described the students' reasoning ability in answering open math questions in the third grade of elementary school, which consisted of 20 students with an age range of 9 to 11 years..

Participants

The school chosen is an urban school with A(superior) accreditation. This school is one of the reference schools for the local government due to the achievements that have been obtained. This study involved twenty (20) students consisting of nine (9) male students and eleven (11) female students as the subjects of this study.

Instrument

The instruments used in data collection were tests and interviews. This test measures the reasoning skill of problem solving in answering open-ended mathematics questions. Test yang di gunakan adalah soal open ended materi persegi dan persegi panjang berjumlah lima soal. In addition to tests, interview results were also used for data validation. Validation of data in this study using member check by asking participants about descriptive responses through interviews (Creswell, 2014).

Procedures

This study involved 20 grade III elementary school students aged between 9-11 years. All students were given a math test to determine the students' ability to answer open ended questions. The test must be completed in 50 minutes. Then the student answer sheets are numbered 1-20 to facilitate coding. Students' answers are assessed based on

the rubric created by the researcher with a rating scale of 0 with the lowest score and 4 being indicated for the highest score. In addition, interviews were carried out in stages with students for 15-25 minutes after answering questions online.

Data Analysis

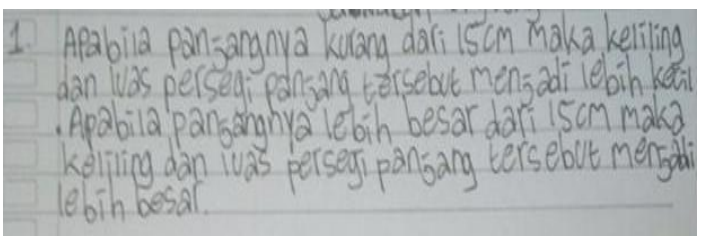
Data analysis was carried out in three stages (1) Data from test and interview results were reduced by selecting important data and eliminating useless data. this is done to avoid the appearance of data that is not in accordance with the research objectives (2) The test result data is analyzed by calculating the percentage based on the rubric that has been made by the researcher. (3) In addition to being presented in the form of percentages, several test and interview results are described descriptively in order to know the process and verify the results of student answers.

RESULTS AND DISCUSSIONS

Based on the analysis of answers and student interviews, it is divided into several parts. As follows:

Question 1

The attached open math questions and interviews with students, no student answered more than one answer with the correct reason. While 4 (20%) students answered one answer correctly with the correct reason. And 8 (40%) students by answering more than 1 answer but only one correct with the correct reason. And 6 (30%) students with wrong answers and correct reasons and vice versa. And 2 (10%) students with wrong answers and reasons. Some of the students' work and the results of the interviews are presented below:



If the length is less than 15 cm, then the perimeter and area of the rectangle are smaller. If the length is greater than 15 cm, then the perimeter and area of the rectangle will be larger

Figure 1. First Answer

Subject 2 (S2)

R : Do you understand what was asked in the first question?

S2 : Yes sir

R : Can you explain what is being asked in this question?

S2 : Find the area of the rectangle sir

R : How many answers did you get from this question?

S2 : Only 1 pack

R : any more answers?

S2 : No sir

Based on the answer and interview data, it can be concluded that the third grade students of the school can understand the questions posed by the questions. However, the student does not know the answer that can be answered if there is more than one answer. The reasons put forward by this master's student are quite clear and reflect a fairly mature mastery of the concept of flat shapes.

Question 2

The attached open math questions and interviews with students on second question, 4 (20%) students answered more than one answer with the correct reasons. While 4 (20%) students answered one answer correctly with the correct reason. And 1 (5%) students by answering more than 1 answer but only one correct with the correct reason. And 1 (5%) students with wrong answers and correct reasons and vice versa. And 10 (50%) students with wrong answers and reasons. Some of the students' work and the results of the interviews are presented below:

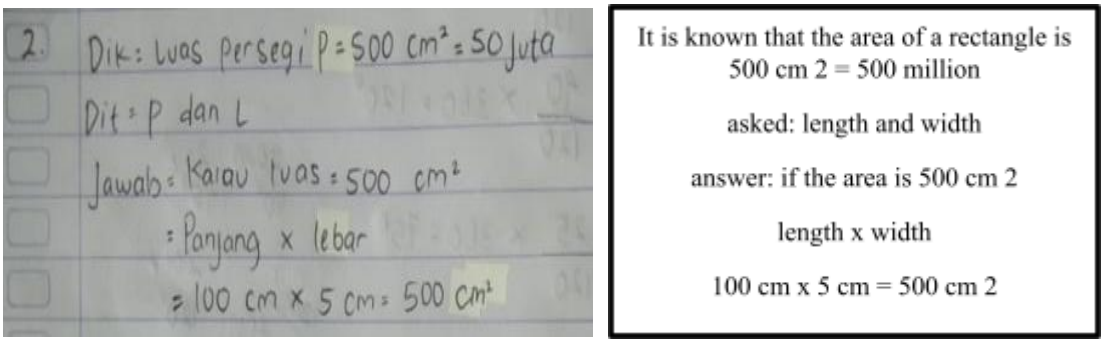


Figure 2. Second Answer

Subjek 9 (S9)

R : What do you know about question number two?

S9 : find the length and width sir

R : other than that?

S9 : no sir

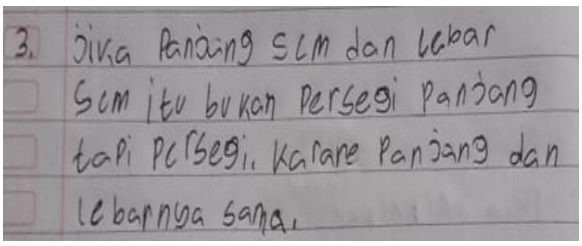
R : How many possible answers are there?

S9 : Only one pack

Based on the answers and interviews with S9 students, it can be concluded that S9 students already know what is being asked in the questions. However, the description of the answers shown is not complete and in addition there is no reason attached to the answer.

Question 3

The attached open math questions and interviews with students on third question, no student answered more than one answer with the correct reason. While 9 (45%) students answered one answer correctly with the correct reason. And 2 (10%) students by answering more than 1 answer but only one correct with the correct reason. And 7 (35%) students with wrong answers and correct reasons and vice versa. And 2 (10%) students with wrong answers and reasons. Some of the students' work and the results of the interviews are presented below:



if the length is 5 cm and the width is 5 cm it is not a rectangle but a square, because the length and width are the same

Figure 3. Third Answer

Subject 11 (S11)

R : are you sure about your answer?

S11 : Sure sir, it's a square

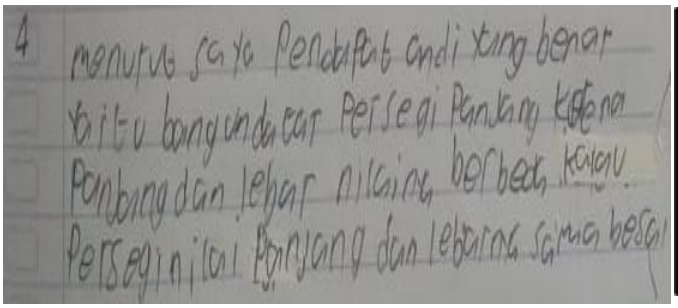
R : why?

S11 : All sides are the same length

Based on data from answers and interviews, S11 students have the ability to conceptualize the difference between squares and rectangles with clear reasons, although there are not many explanations. In this third question, the researcher tries to outwit the students in using long and wide language even though they are both the same length

Question 4

The attached open math questions and interviews with students on fourth question, 2 (10%) students answered more than one answer with the correct reasons. While 4 (20%) students answered one answer correctly with the correct reason. And 5 (25%) students by answering more than 1 answer but only one correct with the correct reason. And 6 (30%) students with wrong answers and correct reasons and vice versa. And 3 (15%) students with wrong answers and reasons. Some of the students' work and the results of the interviews are presented below:



In my opinion, Andi's opinion is correct, namely to build a flat rectangle because the length and width are different values, if the square has the same length and width

Figure 4. Fourth Answer

Subjek 5 (S5)

R : did andi really answer correctly?

S5 : yes sir

R : why are you so sure?

S5 : because the rectangle will have length and width not sides

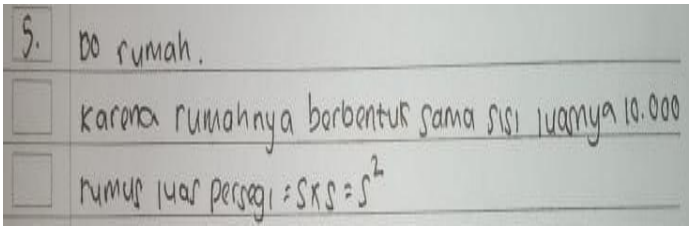
R : for the flat side what?

S5 : side for square sir

Based on data from answers and interviews with S5 students, the reasons stated are quite clear based on knowledge of the concept of rectangles and quite sure of the answers

Question 5

The attached open math questions and interviews with students on last question, no student answered more than one answer with the correct reason. While 2 (10%) students answered one answer correctly with the correct reason. And there are no students by answering more than 1 answer but only one is correct with the correct reason. And 7 (35%) students with wrong answers and correct reasons and vice versa. And 11 (55%) students with wrong answers and reasons. Some of the students' work and the results of the interviews are presented below:



100 houses because they are equilateral, the area is 10,000

formula for area of rectangle side x side = s2

Figure 5. Fifth Answer

Subjek 19 (S19)

R : are you sure about the answer that is 100 houses?

S19 : Not too sure sir, confused

R : why?

S19 : just found a question like this, sir

R : other than 100 houses, is there any other answer?

S19 : there seems to be nothing sir

Based on the answer data and interviews, these S19 students do not seem to understand what is meant by the question. This is because the questions encountered everyday are

text books with one correct answer. In addition, the attached answer is no less accurate with the reason being incorrect.

DISCUSSION

Based on the data in the field, many students are not used to expressing reasons in an opinion and only rely on one correct answer. This is due to the "textbook" learning for students so that students are familiar with the questions available in student books for the final evaluation of learning and are only glued to what the teacher explains. Students who spend most of their time copying solutions to routine math tasks (from examples in textbooks) can only develop resources that are connected to the area of surface mathematics. These observations and arguments show the relationship between narrow imitative reasoning and students' difficulties in learning mathematics. Most of the international results mentioned concern children in primary school and often in situations concerning arithmetic calculations (Lithner, 2004)

This places students as learners with low-level abilities and is not oriented to high-level thinking in accordance with eternal learning 21. Basically students will think to the stage of applying formulas or questions that are exemplified by the teacher. After the questions are changed and modified according to higher-order thinking, it will become a big problem. Of the five available, students' daily questions are aligned with the themes of students' daily lives. Question number five is a question with the lowest answer among other questions and question number two is the highest score obtained by students. This is because question number two is a simple question regarding the application of the rectangular but inverted formula. And for question number five is a question with a high level of analysis by looking for a pattern from a square from a flat shape whose area is known. In addition, the reason for each individual answer is still very low. The explanation of the reasons for students' answers is still very simple, there is no exploration in more detail and clearly. This is a common problem experienced by students from the five available questions.

Schuman and Presser (1981) reported an experiment in which either open or closed on one and the same topic was assigned to different subsamples. The content

evoked by the two question formats is overwhelming, which led the authors to recommend "...that open-ended questions, which lack the additional clues of a fixed alternative, may need to focus more on explanation than closed questions". In answering these open-ended questions, it can put a greater burden on the respondent compared to the answer choices in closed questions. Explanations should be formulated in the student's own words, which does not require the willingness to answer but also the ability to articulate only freely. Various studies have opened which respondents were even able to answer, they found that, as a rule, all were able to answer this type of question. (Geer, 1988). In our case, some issues with open-ended questions occurred because some of the answers were not specific to coding them. Especially in the case of attitude questions, researchers should be very explicit in trying to get more specific answers, because many respondents answered in very broad terms. This is a particular problem in all self-administered questionnaires where no interviewer can investigate and motivate respondents to provide more specific answers. (Urša Reja, Katja Lozar Manfreda, Valentina Hlebec, 2003). While close-ended problems provide a wide range of insights into the student's process, they are often unable to gain the deeper discernment of the student's understanding. Open response questions elicit a greater scope of the student's understanding. However, very few intelligent tutoring systems provide support to teachers and students for these types of questions. Within the few that can, they are not able to offer automation for the process. One of the greater appeals of computer-based systems is that they provide teachers automated grading and give students immediate feedback (Erickson, 2020).

Open ended questions can train students to become reliable problem solvers. Mathematical problem solving is not a topic but a process underlying an entire mathematics program that contextually helps concepts and skills to be learned (Ismail, 1997). They must be able to solve problems because problem solving is important for the development of human competence (Meerah, 2007). Mathematics learning should give students the opportunity to explore a variety of problems and problem situations, from exercises to open-ended problems and exploratory situations. It should provide students with a variety of approaches and techniques (ranging from the direct application of precise algorithmic methods to the use of approximation methods,

various modeling techniques, and the use of heuristic problem solving strategies) to deal with such problems (Schoenfeld, 2016). Generally, most students do not acquire this skill completely. Cognitive abilities in learning such as the ability to remember, memorize and perceive affect the efficiency of problem solving (Tambychik & Meerah, 2010)

From the explanation above, it is necessary for students to get used to giving the specified explanation. This means that the teacher as a facilitator can facilitate learning in the classroom to evaluation. New roles for teachers include: designer of student work, facilitator of the learning process, and caring mentor. New roles for students include: worker, independent learner, and teacher.. Finally, assessment for student learning is integrated with instruction, using authentic assignments and performance, certification of achievement and formative feedback (Cookson, 2015). In line with previous research, recommendations for teachers, Its classroom recommendations for teachers are as follows (Schoenfeld, 2016) model problem solving behavior whenever possible explore and experiment with students, create a classroom atmosphere where all students feel comfortable trying ideas Invite students to explain their thinking at all stages of problem solving, allows for the fact that more than one strategy may be needed to solve a problem given and the problem may require a genuine approach. And presenting problem situations that are very similar to real situations in their richness and complexity so that the experiences students gain in the classroom will be transferable.

CONCLUSION

From the results above, the ability of students to answer open-ended questions in square and rectangular mathematics is still very low. And the reasons for the students' answers as a whole have not been explored clearly and in detail. This is due to the fact that students are not familiar with open-ended questions, even when they first find the sola in mathematics. Therefore, the results of the answers to these five open-ended questions become a reflection of the picture of students' abilities in

answering questions with more than one answer with reasons as reinforcement of the answers. Starting from the lesson plan, classroom learning to evaluation needs to be considered by the teacher.

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