What is the Problem with Mathematical Problems Posing?

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Abstract. Mathematical problem posing is students' low mathematical abilities. This is because the teacher is not used to compiling tests that can do this. What form of question is a mathematical problem posing problem? Presented several examples of mathematical problem posing problems in this article. Data collection is done by surveying 120 students of class XI. Based on the survey results there are several indicators included in the difficult category, including: arranging problems before, during, and after solving problems, arranging new problems for structured situations.

1. Introduction

Learning mathematics must be seen as a process to construct mathematical concepts. In constructing these concepts, students must be actively involved optimally. During the process of constructing knowledge questions will arise for students when a problem occurs in the process. The questions asked can expand the next problem. So that the problems that arise are not too broad, it is important for students to be able to pose problems (problem posing) properly and correctly. The importance of mathematical problem posing ability is implied in the statement that the development of mathematical abilities requires mathematical creative imagination abilities which can be developed among others when raising new questions, creating new opportunities, and looking at old questions from new perspectives [1,2].

Problem posing is an activity to formulate problems related to planning because it allows the provision of problems that represent sub-goals for larger problems. Problem posing also directly empowers existing knowledge, because it is triggered by situations and compares with existing knowledge. The activity will be able to guide a considerable investigation in mathematics learning. Therefore, mathematical problem posing skills must be trained to students to develop the ability to think critically, logically, skillfully solve problems, and other high-level mathematical thinking skills.
Based on the description of the understanding of problem posing from a number of experts, the following summarizes some of the mathematical notions of problem posing as follows:

- Problem finding, problem sensing, formulating problems, problematizing
- Mathematical creative problem discovery (finding creative problems), mathematical problem creating
- Mathematical problem posing before, during, and after solving mathematical problems
- Mathematical problem posing that is associated with task variables and or subject variable.

Paying attention to the mathematical definition of problem posing in item e) is basically mathematical problem posing can be modified and associated with other mathematical abilities, for example with the ability of mathematical logical thinking [2-7]. The research questions from this study are formulated as follows: How to develop a test question for mathematical problem posing skills? On which indicators do students have difficulty in solving problem posing?

2. Experimental Methods
This research is a research and development that produces test questions to improve mathematical problem posing skills for high school students on statistics and opportunities. The procedure of this research is by conducting a field survey to obtain information about validation, reliability, distinguishing power, and the level of difficulty of the questions. The questions were made validated by a team of experts which were then tested on class XI students at High Schools in Garut.

3. Result and Discussion
Based on the literature review, in mathematical problem posing, activities consist of compiling new problems, or reformulating the original problem based on a series of data or information presented. In terms of the number of possible responses or answers and their quality, mathematical problem posing tasks are open-ended, which means there are various responses and varying quality of responses. Each individual can provide many responses with the same quality or maybe also with diverse qualities. In addition, the quality of the problem produced by an individual may be different from that produced by other individuals, depending on the extent to which mastery of mathematical concepts relates to the problem in question. Individuals with good or strong mathematical abilities are expected to produce more, more diverse, mathematical problem posing and higher quality compared to mathematical problem posing of students with lower mathematical abilities. The indicator of the ability of mathematical problem posing includes: composing mathematical problems based on a series of information / mathematical given situation; arrange problems of new forms of existing mathematical problems or state a problem in the form of other problems with the same meaning; detailing the main problems into the mathematical problems of the part; arrange mathematical problems before, during, and after solving mathematical problems. [8]

| Table 1. Grid and Item Ability Test Questions Mathematical Problem Posing |
|---------------------------------|-----------------|
| **Ability Indicator** | **Question** |
| 1. a. Asking / phrase questions in a series of information given about the material statistics. | Pay attention to the data in the following distribution table: |
| | Score | Frekuensi |
| | Mathematik Test | Physic Test |
| 31 - 40 | 3 | 8 |
| 41 - 50 | 5 | 5 |
| 51 - 60 | 5 | 9 |
| 61 - 70 | 9 | 7 |
| 71 – 80 | 8 | 5 |
| 81 - 90 | 7 | 3 |
| 91 - 100 | 3 | 3 |

The task of compiling MPP:
a) Arrange 3 questions from the information above. Then select one question and finish accompanied by an explanation of the formula or rules used.

Ability Indicator

b. Stating the question / problem in another form.

Question

b) State the question in a) in another form that has the same meaning.
Possible answers
  a) 1) Determine the quartiles for each group of data
      2) The results of the math test are better than the results of the physics test. Is that true?
      3) Draw the appropriate diagram for the data above!
  b) 1) Determine the values of Q1, Q2, and Q3 from the data above!
      2) Physics test results are no better than math tests. Do you agree with the statement?
      3) State the data in the right diagram!

2. a. Detailing the main problems from a non-simple math problem to the problem parts.

In the second grade of a high school there will be a selection of student council administrators consisting of 1 chairperson, one vice chairman, 1 secretary, 1 treasurer, and 3 members. A total of 6 male students and 4 female students will participate in the management. Each student has the same opportunity to occupy one of the positions in the committee. Are female or male students more likely to become chairmen? Write down the formulas or rules used.

MPP’s assignment:
  a) Describe the problem from the above questions into several sub-problems then complete
  b) Ask two new questions outside the problem in number a). Then choose one of the new questions and complete. Possible answers:
     a) 1) Determine the amount of opportunity for female students to be elected
        2) Determine the amount of opportunity for male students to be elected
        3) Compare which opportunities are greater
     b) The selection of the chairman vice chairman, secretary and treasurer has been carried, out. How many members can be formed? What concepts and formulas can be done to solve the problem?
3. a. Arrange problems before, during, and after problem solving. A Muslim fashion store provides 5 tops, 3 skirts, 3 veils and 2 accessories. There are three types of coupons, namely A coupon, B coupon, and C coupon. A coupon can be exchanged with 2 tops, 3 skirts, 2 veils and 1 accessory. Coupon B can be exchanged for 3 tops, 2 skirts, 3 veils, and 2 accessories. While the C coupon can be exchanged for 3 superiors, 3 skirts, 1 veil and 2 accessories. Which coupons provide more packages to choose from?

MPP's assignment

a) Arrange several questions before completing the above questions; arrange two questions during problem solving; arrange two questions after getting a solution.
b) Arrange 2 new questions from the information above

Possible MPP answers

a) What is known?; What is asked?; Is the information adequate?; that are the chances of getting two superiors?; what are the chances of taking 2 skirts? what concept is used?; Is it true that the answers obtained?
b) Which coupons give the least variety?
c) How many arrangements can be made by Muslim fashion stores?

b. arrange new problems for structured situations

Table 1 shows indicators and test questions about mathematical problems posing on statistical and opportunity topics. The question was then tested on 120 class XI students. The results of the calculation of item validity, reliability, level of difficulty and distinguishing power are presented in Table 2 as follows.

| No. | Validity | Distinguishing Power | Difficulty Level |
|-----|----------|----------------------|------------------|
|     | $r_{xy}$ | Kriteria            | DP Criteria     | DL Criteria     |
| 1a  | 0,637    | Valid               | 0,33 Medium     | 0,54 Medium     |
| 1b  | 0,715    | Valid               | 0,25 Medium     | 0,55 Medium     |
| 2a  | 0,636    | Valid               | 0,25 Medium     | 0,53 Medium     |
| 2b  | 0,818    | Valid               | 0,25 Medium     | 0,30 Difficult  |
| 3a  | 0,735    | Valid               | 0,25 Medium     | 0,20 Difficult  |
| 3b  | 0,708    | Valid               | 0,25 Medium     | 0,20 Difficult  |

Reliability Test

| $r_{11}$ | Criteria |
|----------|----------|
| 0,892    | High Reliability |

The results of the analysis show that the mathematical problem posing has fulfilled the characteristics that are sufficient to be used as test kits. From the results of the analysis it appears that for indicators: asking new questions outside the existing ones, arranging problems before, during, and after solving problems, arranging new problems for structured situations has a level of difficulty with difficult criteria. This shows that students have difficulty solving questions asking new questions.
outside the existing ones, arranging problems before, during, and after solving problems, arranging new problems for structured situations. Student difficulties in these indicators occur because students are not accustomed to solving problems by mathematical problem posing. Students are accustomed to solving mathematical problems by directly providing solutions to the problems given. This is in accordance with the results of Elerton [9] study which states that students tend to prefer to solve mathematical problems rather than propose mathematical problems, the task of preparing MPP is the first experience for students; mathematical problem posing assignments help understand mathematical concepts, and are challenging tasks.

From the point of view of learning, mathematical problem posing can be a tool for accessing teacher understanding in developing students' cognitive processes, finding misconceptions, and obtaining information about student learning levels to advance the teaching-learning process. So that teachers can improve mathematical problem posing skills with a variety of learning strategies that eventually students get used to mathematical problem posing.

4. Conclusion

Mathematical problem posing includes high level mathematical abilities that have not been mastered by students. This is because students are not used to doing this in the learning process. Students are used to solving problems rather than asking questions about problems that occur. Another factor that causes students to be untrained is not the teacher's ability to arrange questions that can encourage students to mathematical problem posing. With this example, it is expected that the teacher can develop mathematical problems in posing on other topics.

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