

STUDENTS' CREATIVE THINKING PROCESS IN POSING MATHEMATICAL PROBLEM VIEWED FROM GENDER

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Abstract

Creative thinking process is the stage of creative thinking that includes the stage of synthesizing, generating, planning implementation, and applying ideas. Problem posing can be used to identify the process of students creative thinking. Problem posing is students process to make problem from given situation and solve it. Researcher used problem posing in free, semi-structure, and structured situations. This research is a qualitative descriptive research which designed to describe creative thinking process of male and female students in posing mathematical problem. Technique of data collection was carried out by giving mathematical problem posing test and interview. The results showed that (1) in free situation, in the stage of synthesizing ideas, male and female students could understand the information well. The stage of generating ideas, male and female students raised ideas from known information. The stage of planning implementation of ideas, female students were more careful to make problem and when the stage of applying ideas, male students tended to be able to make different problems. (2) in a semi-structured situation, in the stage of synthesizing ideas, male and female students could understand the information well. The stage of generating ideas, male and female students raised ideas from known information. The stage of planning implementation of ideas, male students tended to find different ideas to make problems and when the stage of applying ideas of male students were less precise in solving problems. (3) in a structured situation, in the stage of synthesizing ideas, male and female students could understand the information well. The stage of generating ideas, male students could related to ideas with other concept. The stage of planning implementation of ideas, male and female students did not use different ideas to make a problems and when the stage of applying ideas, male students were less precise in solving problems.

Keywords: creative thinking process, problem posing, gender

INTRODUCTION

Mathematics is one element in education and has a very important role in education. The importance of learning mathematics in education is mentioned in the principle of learning of the National Council of Teachers of Mathematics (NCTM, 2000) that students must learn mathematics by understanding, actively building new knowledge from experiences and knowledge before. In mathematics learning, the problems of daily life are often used as an alternative to attract students to develop their creative thinking skills. In the sector of education, creative thinking gets great attention and creativity is a rarity in Mathematics learning.

Standar Kompetensi Lulusan contained in attachment of Permendikbud number 20 of 2016 in the skill dimension explains that students must have the skills of thinking and acting creatively, productively, critically, independently, collaboratively, and communicatively through a scientific approach as the development of what is learned in educational units and other sources independently. Based on this matter seen that creative thinking is very important

in implementation of learning process. Munandar (2012: 31) argues that with the ability to think creatively students are able to create and finding solutions to any problems encountered.

Then creativity is essentially a process of thinking, the ability to understand and do with abstract concepts or with concrete reality in new or different ways. In reasoning there are basic, critical and creative thinking. Creative thinking is closely related to the creative thinking process. The process of creative thinking of students is important in the learning of mathematics, this is in line with Lenaerts (in Kurniawati, 2015) view that understanding the thinking process is very useful. This will be very useful for teachers in designing learning to help students face obstacles and mistakes in dealing with a problem.

To knowing the creative thinking process of students, the guideline used is the process of creative thinking by Siswono (2007) that mentions four stages of creative thinking process, that is to synthesizing ideas, building ideas, planning implementation of ideas, and applying ideas.

Synthesizing ideas is the stage by which a person collect the information and correlates mathematical concepts related to the problem. Generating ideas is showing with some ideas and combine some ideas to plan for problem solving. Planning implementation of ideas is choosing ideas and developing ideas for planning problem-solving. Applying ideas is implementing a planned idea to solve the problem.

Siswono (2004) argues that the problem solving aspect of mathematics required creative thinking in making (formulating) interpreting and solving the model or planning problem solving. So we need a way or method that encourages students' creative thinking skills in learning mathematics. One possible method is through problem posing. The problem posing in the lesson asks the students to ask questions or problems.

There are several situations in the problem posing by Stoyanova and Ellerton (1996) is free, semi-structured, and structured problem posing. Silver (1997: 75) says that problem solving and problem solving can increase the ability of creativity through the dimensions of creativity, namely the details, fluency, flexibility and novelty. Based on that opinion in Siswono (2004) states that creativity as a product of creative thinking associated with the problem posing and problem posing can be a means to assess / measure students' creative ability.

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Furthermore Agustina (2013) argues that gender differences may also be one of the factors that affect the ability to ask questions and solve problems. The results of research conducted by Krutetskii (in Patmaningrum, 2011: 4), mentions that female are superior in accuracy, thoroughness, anxiety, and inequality in thinking. Another case with male students who usually tend to be less thorough, in a hurry and tend to solve the problem in a very short way.

Based on this, researcher want to know about the students' creative thinking process in posing mathematical problems viewed from gender. This research is useful: (1) For teachers, providing information about creative thinking process of male and female students in math problem posing on free, semi structured, and structured situation that can be used to design student learning facing obstacles and mistakes in activity teaching and learning process in school; and (2) For other researchers, it provides a description of the creative thinking process of male and female students in posing mathematical problems in free situations, semi-structured situations, and structured situations so that it can be followed up in relevant research.

METHOD

Approaches and research design

This research is a descriptive research with qualitative approach. The purposes of this research are describing the difference of creative thinking process of male and female students in the posing mathematical problems using qualitative data obtained from the test of math problem posing and interview results. This research was conducted in February-March 2018. The data were collected in class X MIPA 4 Senior High School (SMA) Negeri 9 Surabaya. The subjects of this research are 5 male and 3 female students who meet the criteria of math problem posing test.

The instruments of this research include the following: (1) researcher, the basic principle that must be obeyed by the researcher is objectivity and neutral so that the authenticity and purity of the data is maintained; (2) math problem posing test, this test is made by researcher with the aim to obtain the subject of research; (3) interview guidelines, aims to guide researcher in expressing in depth the completion of the problem posing test conducted by the subject. Interview guidance is necessary because sometimes what the student thinks when asking a problem is not entirely written on the answer sheet. It may be that students have some planning in posing a problem that is not in the answer.

Technique of data analysis

The data obtained in this research is the results of the problem posing test and interview results. Then data are analyzed with the following steps: (1) analysis of instrument validation, the validation sheet is used to analyze the problem test instrument and interview guidelines. The validation sheet contains a validation assessment and suggestion from the validator. The validation sheet is given to the validator before giving the problem posing test and the interview; (2) analysis of problem posing test, the subject of the researcher who completed the task of posing the problem was categorized into the correct student asking the problem and correct solving it (BB), correct student asking the problem and wrong solving it (BS), wrong student asking the problem and correct solving it (SB), wrong student asking the problem and wrong solving it (SS); (3) analysis of interview guidelines is data reduction, data display and drawing and verifying conclusions.

RESEARCH RESULT AND DISCUSSION

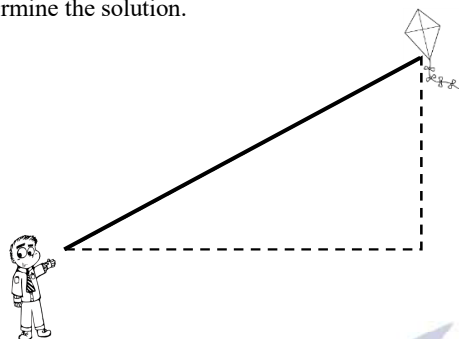
This research was conducted in class X MIPA 4 SMA Negeri 9 Surabaya which amounted to 36 students including 13 male students and 23 female students. The researcher gave the test of math problem posing as follows

1. Free Situation

Make free math problems related to trigonometric material you like and determine the solution.

2. Semi-structured situation

Make a math problem based on the image below and determine the solution.



3. Structured situation

A ship is docked on the dock with a position facing the tower. An observer at the top of the tower sees the front end of the ship with a depressed angle of 60° and the rear end of the ship with a depression angle of 30° .

- If the tower height is 45 m above sea level, determine the length of ship!.
- Make a math problem from the situation and determine on the solution.

From the test given shows that the result of the test of male students problem is as follows:

- Free situation there are 11 students (84,6%) for the correct category of problem posing and correct solving (BB) and 2 students (15,4%) for correct category of problem and wrong solve it (BS).
- The semi-structured situation found 8 students (61.5%) for the correct category of posing the problem and correct solve it (BB) as well as 5 students (38.5%) for the correct category of posing the problem and wrong solve it (BS).
- Structured situation there were 5 students (38,5%) for the correct category of problem and wrong solve it (BS). Then there are 8 students (61,5%) have not finished to do the test of math problem posing because the time given is not enough.

For the results of the test of female student problem is as follows:

- Free situation there are 23 students (100%) for the correct category of problem posing and correct solving (BB).
- Semi-structured situation there are 23 students (100%) for the correct category of problem posing and correct solving (BB).
- Structured situation there were 16 students (69,5%) for the correct category of problem and correct solve

it (BB). Then there are 7 students (30,5%) have not finished to do the test of math problem posing because the time given is not enough.

From the results of the mathematics problem posing test, elected subject of research 8 people. The results of subject selection are obtained as follows.

Table 1.1 Subject of Male Research

Num.	Initials Name	Situation	Category	Subject Code
1.	DIZ	Free	BB	LB1
2.	ASW	Free	BS	LB2
3.	DIZ	Semi-structured	BB	LS1
4.	ASW	Semi-structured	BS	LS2
5.	ICS	Structured	BS	LT2

Tabel 1.2 Subject of Female Research

Num.	Initials Name	Situation	Category	Subject Code
1.	GK	Free	BB	PB1
2.	APAC	Semi-structured	BB	PS1
3.	SAR	Structured	BB	PT1

Based on that need to be discussed in this research that is in structured situation there are few students who make a problems. This is because the time given to do on the mathematics problem posing test sheet (TPM) is not enough so that there are students who have not finished and do not make a problem on the test posing sheet of the problem. Then the weakness in this research is not the emergence of research subject categorized wrong student in asking problem and correct solving (SB) and subject of research categorized wrong student in asking problem and wrong solve (SS).

Furthermore, in the research the researchers also found the findings is in free situation, percentage of male students for the correct category of problem posing and correct solving (BB) is 84,6% and for correct category of problem and wrong solve it (BS) is 15,4%. While for female students is 100% for the correct category of problem posing and correct solve it (BB). in semi-structured situation, percentage of male students for the correct category of problem posing and correct solving (BB) is 61,5% and for correct category of problem and wrong solve it (BS) is 38,5%. While for female students is 100% for the correct category of problem posing and correct solve it (BB). in structured situation, percentage of male students for the correct category of problem posing and wrong solving (BS) is 38,5% and another was not done yet, while for female students is 69,5% sedangkan untuk siswa perempuan sebesar 69,5% for the correct category of

problem and correct solve it (BB) and anothers was not done yet.

CONCLUSION AND SUGGESTION

Conclusion

Based on the results of the analysis and discussion can be concluded that "the students' creative thinking process in posing mathematical problem viewed gender" is described as follows:

1. The creative thinking process of male students in the posing of problems in free situations.

In the stage of synthesizing ideas, students understand the information provided by reading in detail, the students collect information by reading the situation and mention the information used for the posing of the problem.

In the stage of generating ideas, students find the concept of trigonometric material from the given problem. Students come up with some ideas related to known information and can form different ideas

In the stage of planning implementation of ideas, students choose different ideas to apply in preparing the problem. Students develop their ideas by re-understanding the material. Subjects have different ideas to ask from the question.

In the stage applying ideas, students using / applying previous ideas that have been selected to make the problem and also use/ apply different ideas from the ideas used. Then the students make the problem in accordance with the idea, the students who categorized correctly posing and correctly solve the problem of giving the argument that from each of the completion strategy that is made right while the students who categorically correct to posing and wrong solve the problem of realizing that the settlement is not correct.

2. The creative thinking process of male students in the posing of problems in semi-structured situations.

In the stages synthesizing ideas, students collect information by reading the situation and mention information from the test posing sheet of the problem.

In the stage of generating ideas, students find the concept of trigonometry of the given problem. Students who categorize correctly propose and correct the problem of forming the idea with the concept of trigonometry while the students who categorically correct pose and wrong to solve the problem of forming ideas by recalling the formulas that have been taught by the teacher.

The stage of planning implementation of ideas, students who categorize correct to posing and correct solve the problem of developing ideas by processing

the sentence that is easy to understand while the students who categorize correctt to posing and wrong solve the problem in making scratch book first. Students have different ideas that can be proposed by changing the numbers and changing what is asked.

In the stage of applying ideas, students use ideas related to the given situation to make the problem. Students who categorize correctly posing and correct solve the problem using the context of different problems while the students who categorized correctly posing and wrong solve the problem using different content. Then the students explain that the problem, the strategy of completion and the answer made from the problem given in accordance with his idea. Students who categorize correctly posing and correct solve the problem of argument that states that the strategy of completion and answers made is correct while the strategy of completion of students who categorize correct to ask and wrong solve the problem there is a mistake.

3. The creative thinking process of male students in the posing of problems in a structured situation.

In the stages synthesizing ideas, students collect information by reading the given problem and mention what information is known from the TPM sheet.

In the stage of generating ideas, students form ideas with the concept of trigonometry and comparison. Students make problems relevant to the problems that exist in the TPM.

In the stage of planning implementation of ideas, students choose the idea of comparative material that will be applied in preparing the problem. Students develop ideas using trigonometric concepts and add additional information. Students compose the problem with a simple idea and not complicated.

In the stage of applying ideas, students use the idea of comparison material to make a problem. Students do not use different ideas from the ideas used because students use concepts similar to the TPM sheet. Then the students make the problem in accordance with the idea and the subject argues that the strategy of the settlement is made less precise.

4. The creative thinking process of female students in the posing of problems in free situations.

In the synthesizing stage, students collect information by reading the TPM sheet instructions and mention the information used for posing the problem.

In the stage of generating ideas, students find the concept of trigonometry of the given problem. Subjects come up with ideas and combine ideas from known information from remembering questions or books and objects around them

In the stage of planning implementation of ideas, students choose the idea by linking objects that exist around to be applied in preparing the making of the problem. Students choose the idea by recalling and processing different words. Subjects develop ideas by composing words and thinking about what makes sense or not.

In the stage of applying ideas, students use the idea of a kite that has been chosen to make a problem. Students use different ideas from the ideas used by changing the content on the matter. Then the students make the problem according to the idea and the subject check by reading and explaining that from each of the completion strategies that are made is correct.

5. Creative thinking process of female students in the posing of problems in semi-structured situation

In the stages synthesizing ideas, students collect information by reading the situation and mention the information used for posing a problem.

In the stage of generating ideas, students find the concept of trigonometry of the given problem. Students generate ideas from questions or books that have previously been read and the subject combines the idea.

In the stage of planning implementation of ideas, students choose the idea of the reference book that will be applied in preparing the problem. Students develop ideas by looking for inspiration to determine information on the problem created and students need more information to make a problem.

In the stage of applying ideas, students use ideas with drawings on TPM sheets that have been selected to make a problem. Students use different ideas with different questions on the subject. Then the students make the problem in accordance with the idea and the subject gives the argument of each of the completion strategies that are made is correct.

6. Creative thinking process of female students in the posing of problem in structured situation

In the stages synthesizing ideas, students collect information by reading the situation and mention the information used for posing a problem.

In the stage of generating ideas, students find the concept of trigonometry of the given problem. Students come up with ideas from previously read questions or books.

In the stage of planning implementation of ideas, students choose an idea similar to the TPM sheet to be applied in preparing the question. Students develop ideas by drawing first and then determining the known information on the problem. Students have no other ideas for the proposed problem because time is not sufficient.

In the stage of applying ideas, students use ideas similar to TPM sheet to make a problem. Subjects use different ideas from the ideas used in which the subject adds known information. Then the students make a problem in accordance with his idea and give the argument of the settlement strategy that is made is correct.

Suggestion

Based on the research that has been done, researcher giving suggestions as follows

1. Teachers should find out difficulties or obstacles of students in learning certain concepts to prevent errors or lack of telitian in solving problems. Having known the existence of students experiencing it is expected that teachers can perform handling to students in accordance with the causes, one of which is to explain the material with a detailed way of completion and ensure students understand with the material.
2. Teachers should always stimulate to students' thinking activities, one of them by giving attention, trust, listen, support and accept all the weaknesses. So that students will have a strong drive to courageously deliver and smoothly present their ideas. And often communicate in both directions with students to encourage discussion by stimulating students' curiosity.
3. During the research process, for the interview session there are questions that can not be understood by the students, therefore for other researchers who will conduct research by using the instrument of interview guidelines should provide questions that are easy to understand by students so that students can give a good answer.
4. Then research results indicate there are some students who are still not finished doing on the test sheet of mathematical problems due to the insufficient duration of the workmanship. So there should be enough time for students to do on the math posing test sheet to complete. Then to measure the time appropriate with the test posing the problem should be tested legibility first to other students who are not as research subjects.

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