



Improving Mathematical Creativity through Problem Posing Learning Model of Algebra in Junior High School

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Abstract

Nowadays mathematical creativity is important either for students or teacher and it is low in among students because the students tend to be passive, they only accept what the teacher conveys in learning process. One of the important thing that can be influenced the learning process is the learning model. The alternative learning model is the problem posing model. The purpose of this article is describing how to improve mathematical creativity through problem posing learning model in junior high school students. This research is using study literature of the researchers about the increment of mathematical creativity after implementing problem posing learning model especially in algebra material. Based on the results in study literature, it is known that there is a significant increment of mathematical creativity by using problem posing learning model. If compared with the other learning models, such as mind mapping and student scientific approach, in the problem posing learning method is more effective to improve mathematical creativity.

Keywords:

mathematical creativity, problem posing, algebra

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1. Introduction

1.1. Background

Mathematics is one of the important subjects that can be found in every level of education such as kindergarten, elementary school, junior high school, senior high school, and in college. Mathematics is a lesson that can help students to have the ability to decide, plan, and solve problems in daily life. According to Ulfah *et al* (2017) said that one of ability in mathematics that should be developed is mathematical creativity, which is low in among students nowadays. In fact, the mathematics learning process is monotone because the teacher just explaining, give example, and exercises that do not give an opportunity to students to develop creative thinking skills. Lutvaidah (2015) said that mathematics is one of the subjects to be afraid of and get difficulties. So, the students are not interested to study mathematics deeply.

Ulfah *et al* (2017) stated that in learning mathematics students tend to be passive because they only accept what the teacher conveys. This is supported by the fact that the teacher consider the benchmarks in mathematics learning is logic. The teachers prioritize computational ability (counting) and logic, beside that the mathematical creativity considered as less important thing. It makes the students loss their opportunities to develop mathematical creativity. For example, when the teacher explains about the way to solve a problem, the teacher asks students to always follow the explanation that already exemplified before.

Even though Vale and Barbosa (2015) argued that creativity has an important role in mathematics learning, because creativity can arise curiosity and involve the students in experimenting and exploring so that raising their originality and imagination. Research has showed that one of the learning models that is closely related to creativity is problem posing and it can be categorized by three dimensions: flexibility, fluency, and originality. It is supported by the argument of Ayllon *et al* (2016) that problem posing model is carried out to measure creativity.

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Based on the research of experts, in this article we will describe the results of researches about problem posing learning model in improving mathematical creativity of students in Junior High School.

1.2. Literature Review

1.2.1. Active Learning

Active learning is a concept that indicates learning activities that provide the students a degree of control of these activities. The students are able to freely and actively participate in how the shape of the learning experience will look like. Moreover, active learning can be called student driven learning approach where teacher-facilitated teaching approach (Alkilany, 2017). In the active learning process, it is important to consider two important characteristics that stimulate the process, they are influences students' higher order thinking positively and helps students' motivation to increases to a greater extent (Abdullah and Yang, 2018).

1.2.2. Creativity and Mathematical Creativity

One of ability which needed to solve mathematics problems is creativity. Ummah *et al* (2019) state that creativity is a process that find something new, which is sustainable, useful, and satisfying for people. By learning mathematics, students have opportunities to develop logical, critical, analytical, creativity, and productivity (Diantari, 2017). Beside that, creativity as "the right to create, creation capacity" and there is no agreement on it (Ayllon *et al*, 2016). Creative thinking is a dynamic process that includes divergent and convergent thinking. The divergent contains four necessary elements that are: fluency (number of ideas), flexibility (variety of ideas), novelty (unique idea), and elaboration (develop an idea). In the thinking fluency, it allows generating ideas in certain time. Flexibility is the possibility people to change the approaches of a problem and it makes people seek different ways or strategies to solve it. In addition, creativity also has originality characteristic originality means that people can generate new knowledge based on knowledge that already have before.

Based on the factors, creativity is categorized into two main sources, that are from internal sources or inner mind included imagination and attitudes also from external sources included resources and culture (Christou, 2017). Rochmad *et al* (2018) said that students who have creativity, they will be able to solve problems and they can look for the other alternative solutions based on their own. The students in creative thinking becomes the main capital in solving problems. With the higher education requires creative thinking skills to solve open ended problems.

1.2.3. Problem Posing Model

There are many ways that can be used to teach mathematics, one alternative model is the problem posing model. Problem posing is learning models that focus on formulating problems and solve the problems by the given situation. Because of problems and answer is constructed by students it is possible that problem posing could grow the students mathematical creativity (Diantari, 2017). Sari and Surya (2017) said that the students have a chance to develop independents thinking processes by using problem posing model in their mathematics learning. Problem posing approach make the students tend to be knowledgeable, innovative, skilled in problem solvers. The benefits of that model are changed the way conventional math learning became a guide for generating problem from a number of diverse imaginative ideas. The students more actively creating and solving their problem. In creating new problem, the students increase their sense of responsibility in critiquing and refining problems with the others. Efforts to encourages the development of students' fluency, problem posing could use (Ayllon *et al*, 2016). Problem posing stimulates mathematical learning that can be shown when a person poses a problem, they are obliged to establish relationship among several concepts, which involves several cognitive processes. The benefits of the problem posing are increase of mathematical and linguistic knowledge, motivation increase, decrease the students' anxiety of mathematics, overcoming mathematical mistakes often made by the students, the creativity of the students increase, and as an evaluation tool.

2. Discussion

Based on Pusfita & Fitriyani (2016) in their research about problem posing learning to increase students' creativity have been concluded that by using problem posing learning method can increase students' creativity in mathematics learning. Their method was Classroom Action Research (CAR) and their subject were students of VIII C 10 Muhammadiyah Junior High School Yogyakarta in academic year 2016/2017. Its research consisted of two cycle, that was cycle 1 and cycle 2.

In cycle I, the presentation of observation result could reach 57,78% with the criteria was adequate while in cycle II the presentation of observation result could reach 83,05% with the good criteria. Whereas for presentation of assessment of creativity test result in cycle I can reach 58,52% with adequate criteria and the presentation in cycle II can reach 80,37% with very good criteria. In this research, beside used observation and test, the researcher also used interview. In the end of the cycle, researcher did interview about their opinion about the use of problem posing method in this case students of VIII C. Their opinion very good and positive, they were happy with thus method. After seeing overall, the researcher got the conclusion that learning mathematics by using problem posing method can increase students' mathematical creativity in VIII C of 10 Muhammadiyah Junior High School on academic year 2016/2017.

Diantari (2017) in her research about the effectiveness of learning model problem posing and mind mapping observation from creative thinking student's skill in material linear equations two variable, she used the sample was students of VIII grade in 2 PGRI Pagu Junior High School. The researcher concluded that problem posing learning model is effective to improve creative thinking skill of students, it can be known from the mean of creative thinking learning outcomes that reached $\geq 80\%$. In comparison with mind mapping model, problem posing learning model was more effective in terms of students' creative thinking skills.

Kelen (2017) did a research about mathematics learning with problem posing approach to improve creative thinking ability of students. The subject is 36 students of VII grade in Neonbat Junior High School 2014/2015. Researchers use primary data and data collection techniques namely observation and tests. The results showed that the percentage of students' creative thinking abilities increased by 19.44%, where in the first cycle the percentage of students' creative thinking abilities amounted to 63.89% and in the second cycle increased to 83.33%. Thus, it can be concluded that the problem posing approach can improve students' creative thinking ability.

Nurasih (2017) in her research about the application of problem posing learning model type pre posing solution to improve the ability of students' mathematical problem solving in the main discussion of algebra operations at grade VIII in 1 Prambon Junior High School argued that by using problem posing learning increase students' mathematical problem solving.

The researcher used problem posing type pre solution posing which designed in lesson plan. The subject was students of VIII 2 of 1 Prambon Junior High School in material algebra operation and the research implemented in two meetings in the classroom. On first meeting the ability of students' mathematical problem solving could reach 86% and on the second meeting could reach 89%, so it can be concluded that the ability of students' mathematical problem solving in two meetings can increase 3%, or in other words the ability of students' mathematical problem solving in the students' of VIII grade in 1 Prambon Junior High School after implementing problem posing learning model type pre solution posing along two meetings became better.

Hartini *et al* (2018) in their research about the influence of problem posing learning model toward mathematical creative thinking skill of students, it used sample was students of VIII grade 1 Lumbok Seminang Junior High School in academic year 2017/2018. The design of the research was pretest-posttest control group design. The result of the research show that there was enhancement of students' mathematical creative thinking ability who follow learning from conventional model to problem posing. Based on the result, it was concluded that problem posing influenced students' mathematical creative thinking ability.

Permana *et al* (2019) in their research was about the implementation of problem posing approach to improve the mathematical creative thinking abilities of junior high school. The type of this research is quasi experiment that used control group pre-test and post-test design. The research was conducted at 1

Cimahi Junior High School. As many as 62 students of class VII being sampled in this study consisted of 30 students in the experimental class with problem posing learning and 32 students in the control class with scientific learning. The researcher concluded: (1) Increasing mathematical creative thinking ability by using the problem posing approach is better than the scientific approach, (2) A problem posing approach will be effective if it is carried out in a well-planned, and (3) Students who are inadequate in solving problems about the ability to think creatively because of lack of understanding of the problems asked in the problem. It can be shown from some responses of students who are incomplete in giving the response.

Fauziah, *et al* (2018) in their research about student's creative thinking skills in mathematical problem posing based on lesson study for learning community argued that there was ability difference of creative thinking in mathematical problem posing. The objective in their research was to find out the differences in terms of creative thinking ability between one class taught using implementing mathematical problem posing based on Lesson Study for Learning Community (LSLC) and another class taught in conventional. The research applied Mixed-Method study which was initiated by developing instructional instruments based on Lesson Study for Learning Community (LSLC) to train students' creativity, collaboration, and communication

3. Conclusion

Mathematical creativity is important for students also teacher and it is low in among students because the students tend to be passive, they only accept what the teacher conveys in learning process. One of the important thing that can be influenced the learning process is the learning model. Based on the result of the research can be concluded that problem posing learning model which implemented in algebra material can improve students' creativity in mathematics learning of students in junior high school. When compared with other methods such as mind mapping, student scientific approach, in research the problem posing learning method is more effective to improve mathematical creativity.

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