Problem Posing with Realistic Mathematics Education Approach in Geometry Learning

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Abstract. One of the difficulties of students in the learning of geometry is on the subject of plane that requires students to understand the abstract matter. The aim of this research is to determine the effect of Problem Posing learning model with Realistic Mathematics Education Approach in geometry learning. This quasi experimental research was conducted in one of the junior high schools in Karanganyar, Indonesia. The sample was taken using stratified cluster random sampling technique. The results of this research indicate that the model of Problem Posing learning with Realistic Mathematics Education Approach can improve students' conceptual understanding significantly in geometry learning especially on plane topics. It is because students on the application of Problem Posing with Realistic Mathematics Education Approach are become to be active in constructing their knowledge, proposing, and problem solving in realistic, so it easier for students to understand concepts and solve the problems. Therefore, the model of Problem Posing learning with Realistic Mathematics Education Approach is appropriately applied in mathematics learning especially on geometry material. Furthermore, the impact can improve student achievement.

1. Introduction
Geometry is one of the branches of mathematics that students must study at the junior high school level. In addition, geometry is also a branches of mathematics that touches most aspects of human life [1]. Studying geometry is very important for students because students' geometry learning will be faster in developing the ability of logical thinking and problem solving [2, 3]. Achieved or not the purpose of learning geometry one of them can be seen from the success of students in applying concepts and formulas geometry in solving the problem. As an effort to realize the purpose of learning geometry is required a good conceptual understanding in studying geometry. This is because conceptual understanding is the basic capital for students in learning the next mathematical concept or material [4]. However, in fact during this time students still have difficulty in learning geometry [5]. One of the difficulties of students in the learning of geometry is on the subject of plane that students must to understand abstract matters. The material discussed in the plane includes the properties, circumference, breadth, and application of the plane. Furthermore, the plane material in this study will be focused on the properties, circumference, area of triangle and quadrilateral at the junior high school level. The difficult of students in understanding the material plane may be influenced by many factors, one of which lessons is the way of teacher delivery the material in the class isn’t right. During this time the learning process still tends to focus on the teacher or in other words there are still many teachers who apply direct learning [6, 7]. This causes the students tend to be passive and less motivated in the learning process. Therefore, it is necessary to make changes in the learning of
geometry, especially in the model of learning applied by the teacher to improve students' conceptual understanding, especially on the plane material.

The learning model need an innovative learning model that can make students active in learning and train students to think creatively in proposing and problem solving [6, 8, 9]. As an effort to realize changes in the learning of geometry, the possibility of learning model that can be used is Problem Posing. Problem Posing in principle is an innovative learning model that make students to be able to reformulate the problems that have been given with the aim of improving the understanding and facilitate students in solving the problem [10, 11]. Students are invited to be active in learning so that information is not only obtained from the teacher, but the students are also required to construct their own new knowledge with capitalize knowledge that has been previously owned. However, in fact the application of Problem Posing still has many detriments among students still have difficulty to understand the problem because the problems given are sometimes difficult to imagine by the students. Based on that, the measure that can be done is to modify Problem Posing with Realistic Mathematics Education Approach. The Approach of Realistic Mathematics Education is one of the mathematical approaches that always connect mathematics materials to the world of students so that students feel more motivated and easier to imagine the material or problems given [12, 13].

Based on the explanation, the application of Problem Posing with Realistic Mathematics Education Approach that invites students to actively propose and solve realistic problems ascending to be studied. The purpose of this study is to determine the effect of Problem Posing learning model with Realistic Mathematics Education Approach in geometry learning. Furthermore, the impact can improve student achievement.

2. Experimental Method

This research is a quasi experimental research. In this research, the independent variable is the learning model which consists of Problem Posing learning model with Realistic Mathematics Education Approach as the experimental class and the direct learning model as the control class. The dependent variable in this research is the students' conceptual understanding on the plane material. The population of this research is all seventh graders of State Junior High School 1 Gondangrejo, Karanganyar, Indonesia academic year 2016/2017. The sample was taken by stratified cluster random sampling technique and consist of 63 students. The first class (n = 31) as the experimental class and the other class (n = 32) as the control class. This research took place from November 2016 until June 2017 which is divide into 3 stages. The first stage is preparation of research which took place in November 2016 until February 2017. The second stage is the implementation of research which took place in March 2017 until April 2017. The third stage is data analysis and reporting that took place in May 2017 until June 2017. The instrument for collecting data in this study is a conceptual comprehension test on a plane material. Implementation of the test in this study was conducted twice that is pretest and posttest. Pretest were performed to obtain conceptual understanding of the student data prior to treatment. This data is then used as a basis for normality and homogeneity testing. Normality test in this research using Lilliefors method with 5% significance level and homogeneity test using Bartlett test with 5% significance level. Posttest were performed to obtain conceptual understanding data after being subjected to treatment. Furthermore, pretest and posttest results were used as the basis for hypotheses tested by using t-test with significance level of 5%.

3. Result and Discussion

Based on normality test the result of using Lilliefors method toward student pretest data on plane material showed that the sample of research came from normally distributed population. Then, based on the homogeneity test the results of using Bartlett test of the students' pretest data on the plane material showed that the population variance is homogeneous. Furthermore, the research hypothesis test is processed using t test on the pre-test and posttest data of students on the plane material can be seen in Table 1 below.
Students who are directly model on the subject of mathematics Education Approach: improving students’ conceptual Mathematics Education: the use effect. To make students become easier learning has better learning achievement than students who are taught by direct learning. Demeanor has a positive effect, this study are understanding better than the students in the control class. Problem Posing learning model with Realistic Mathematics Education have conceptuation so as to facilitate students in modeling (characteristic Approach of Realistic Mathematics Education: utilization of student construction result). Students tend to be more motivated and understanding especially on the subject of a plane. The results of the study, it can be see that the experimental class students after being subjected to the treatment experienced increased conceptual understanding is more significant than the control class students. Students of experimental class are students who are subject to Problem Posing learning model with modification of Realistic Mathematics Education Approach. This modification between the model and the learning approach has a positive impact in improving students’ conceptual understanding especially on the plane matter. There are some factors increases of conceptual understanding of students who are subject to Problem Posing learning model with Realistic Mathematics Education Approach are as follows. (1) Students tend to be more motivated and challenged in the learning process. It is cause, in the material lesson is not delivered directly but the material is delivered by giving problems to the students, so that from the problem students can construct their knowledge and find the concept to be taught (characteristic Approach of Realistic Mathematics Education: utilization of student construction result). (2) Students tend to be easier in understanding concepts and learning becomes more meaningful. It is cause students in learning are always given realistic problems (characteristic Approach of Realistic Mathematics Education: the use of contextual problems) so as to make students become easier to imagine the problems. (3) Students tend to be easier in problem solving. It is cause students tend to be easier in performing mathematical modeling (characteristic of Realistic Mathematics Education Approach: using model for progressive mathematization) so as to facilitate students in problem solving. (4) Students become more active in learning. It is cause students in learning will be divided into several small groups that can be used for discussions related to the given problem, so that learning becomes more alive (characteristic Approach of Realistic Mathematics Education: interactivity).

Different with students in control classes who are subject to direct learning models. Students in the control class tend to be passive in their learning because learning is only focused on the teacher. In addition, students in the control class also tend to be not challenged in their learning because the learning materials are explained directly by the teacher. Furthermore, students in the control class tend to be less motivated because learning only focus one way so that students only writing and listening, they aren’t construction their own new knowledge by capitalizing on the previous knowledge.

Based on the description, it can be concluded that the students who are subjected to the Problem Posing learning model with Realistic Mathematics Education Approach have conceptual understanding better than the students who are directly model on the subject of plane. The results of this study are appropriate with the research conducted [14] can concluded, Problem Posing learning has a positive effect to improving learning achievement, problem solving skills, problem asking, and demeanor toward mathematics, and [15] which concluded, students who were taught Problem Posing learning has better learning achievement than students who are taught by direct learning.

| Groups     | N   | Mean Pretest | Mean Posttest | $t_{obs}$ Pretest | $t_{obs}$ Posttest | $t_{table}$ |
|------------|-----|--------------|---------------|------------------|-------------------|-------------|
| Experimental | 31  | 75.96        | 79.19         | -3.5568          | -4.8168           | -1.99962 or |
| Control    | 32  | 62.5         | 64.06         |                  |                   | 1.99962     |

Table 1 shows the average pretest of the experimental class is 75.96 and the average of pretest of control is 62.5. In addition, Table 1 also shows the average posttest of the experimental class 79.19 and the average posttest of the control class is 64.06. Furthermore, Table 1 also shows that $t_{obs}$pretest = (-3.5568), $t_{obs}$posttest = (-4.8168), and $t_{table}$ = (-1.99962 or 1.99962) or in other words $DK = \{ t \mid t < -1.99962 \text{ or } t > 1.99962 \}$. This means $t_{obs}$pretest $\in$ $DK$ so $H_0$ rejected, it means that there is a difference in conceptual understanding between experimental class students and control class prior to treatment, especially on the subject of a plane. It is same with the result of the post-test shows that $t_{obs}$posttest $\in$ $DK$ so $H_0$ rejected, it means that there is a difference in conceptual understanding between the experimental class and control class after being subjected to treatment, especially on the subject of a plane.
4. Conclusion
The conclusion of this research is Problem Posing with Realistic Mathematics Education Approach can improve students' conceptual understanding significantly in geometry learning especially on plane topics. It is because students on the application of Problem Posing with Realistic Mathematics Education Approach are become to be active in constructing their knowledge, proposing, and problem solving in realistic, so it easier for students to understand concepts and solve the problems. Therefore, the model of Problem Posing learning with Realistic Mathematics Education Approach is appropriately applied in mathematics learning especially on geometry material. Furthermore, the impact can improve student achievement.

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