THE COMPARISON OF THE EFFECTIVENESS OF MATHEMATICS LEARNING USING GENERATIVE LEARNING AND PROBLEM-BASED LEARNING OF PRISM AND PYRAMID LEARNING MATERIALS VIEWED FROM THE LEARNING ACHIEVEMENT OF THE GRADE VIII STUDENTS OF MTS PP DARUL QURRO

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Abstract

This research study is aimed at figuring out the difference of the effectiveness of Mathematic learning using generative learning model and problem-based learning model viewed from the student's learning achievement. This study is an experimental study applying pre test-post test design using two classes with one class as the first experiment class and the other as the second experiment class which were chosen using randomized pre test-post test control group design. The samples of this study were randomly chosen from the population. The population was the whole students of grade VIII of MTs PP Darul Qurro, while the samples were the students of grade VIIIA as the experiment class who were taught using generative learning model and those of grade VIIIB as the control class who were taught using problem-based learning model. The method of hypothesis testing was independent sample t-test. The results of the study show that: (1) the implementation of generative learning model in Mathematic subject matter of prism and pyramid learning materials viewed from the student's learning achievement was effective, which was proved by the higher mean of the post test score which was up to 7.9, higher than the minimum completeness criteria of 7.5; (2) the implementation of problem-based learning in Mathematic subject matter of prism and pyramid was not effective viewed from the student's learning achievement was not effective, which was supported by the mean score of the post test of 6.2 which was lower than the minimum completeness criteria; and (3) the generative learning model was more effective to be implemented than the problem-based learning model in Mathematic subject matter of prism and pyramid learning materials viewed from the student's learning achievement.

*Key words**:** generative learning model, problem-based learning model, student's learning achievement*

INTRODUCTION

The whole of the development of science and technology has been affecting many aspects of human life, including the education which is a part of the nation building. Through education, people are able to increase their basic potentials including the physical, intellectual, mental, social, and ethic potentials. Therefore, education is an important thing which must be earned towards the establishment of quality human beings.

Basically, education is an interaction between educators and students in order to achieve the goal of that specific education environment. Educators, the ones managing the teaching and learning activity have a complex

task because they are factors with great influence on the learning achievement. Therefore, educators are expected to own some capability, skills in the field, and wide range of knowledge and insight. The required capability, skills, and expertise of professional educators are varied as they are not only facilitators but also motivators for the students.

In teaching, educators must create a learning condition that enables the students to actively participate in constructing the knowledge in order to understand the concepts, in this case that of mathematics. The students will be able to develop their ability to construct if they get a chance to actively participate in the learning process. However, educators have not intensively implement the design of teaching and learning program which is able to develop the knowledge constructed by the students. They always use lecture method which is believed as the easiest way of delivering the teaching materials.

The data found in the field show that Mathematics is considered as the most difficult subject matter and even spooks the students. The fact that they are unfamiliar with the functions of it in the daily life is a factor causing them bored and uninterested in it. Other causes are Mathematics teachers who teach monotonously, no variation in the teaching method, and the use of only certain source book.

Learning mathematics becomes meaningless because there is no appropriate mathematic construct as the students learn to memorize the concept instead of to understand it. This is in line with Ratna Wilis Dahar (1996: 114) that one of the complaints in educational field is that the absence of the relevant concepts in one's cognitive structure will cause them to learn new information by memorizing it. Learning by this way makes the students unable to actively participate, so that there is no development of cognitive structure happens in their mind. Besides, the methods applied by educators are often boring and less stimulates the students to think. Therefore, their mathematics learning achievements are still low.

Winkel via Sukestiyarno and Budi Waluyo (2006: 6) suggests that learning achievement is a proof of success achieved by students of which every learning activity causes special change. Meanwhile, Oemar Hamalik (via Ridwan, 2008: 1) claims that learning achievement refers to things achieved after doing activities. According to Bloom cited in Suharsimi Arikunto (2006: 32), learning achievement is divided into three aspects namely cognitive, affective, and psychomotor. It is supported by S. Nasution (via Ridwan, 2008: 1) who states that learning achievement is:

> "the perfection achieved in thinking, feeling, and doing. Learning achievement is said to be perfect if it meets the three aspects namely cognitive, affective, and psychomotor. In contrast, achievement is said to be less satisfying until one is able to fulfil the target of the three criteria."

Meanwhile, Brown&McNamara (2005, p. 16) defines mathematic learning achievement as the following:

> Mathematical achievement is understood more in term of performance of prescribed mathematical procedures. This is quantifi-able through diagnostic testing, and broader understanding is anchored around test indicators in a statistically defined environment

MTs PP Darul Qurro is a school located in Cilacap regency with varied characteristics viewed from the academic capability. Based on the result of the interview with the Mathematics teacher, the teachers of the school apply expository teaching model and never apply any other teaching model. The model is applied because it is believed to be efficient.

Based on the data of daily test 1 of grade VIII MTs PP Darul Qurro in the academic year of 2012/2013 of prism and pyramid materials, a number of 70% of the students had not meet the minimum completeness criteria. It can be concluded that the learning achievement of the students was still very low. The low learning achievement of the students was caused by many factors. Based on the information, it happened because the centre of the teaching and learning process was teacher so that the students did not get adequate time to independently gain the knowledge. Therefore, an effort to make them become more active in the teaching and learning process needed to be taken. Some teaching and learning models considered to be able to increase the learning achievement of the students are generative and problem-based models.

Generative learning is defined as an explanation of how a student builds his own knowledge such as building ideas, the meaning of certain words, and also a strategy to come to an explanation of the questions of how and why. The purpose of the implementation of this model of learning is to create a fun learning situation where the students are free to state their ideas and problems, to discuss mathematics concepts with no worry, and to argue until they understand the concepts.

In the implementation of generative learning model, according to Seel (2006: 1357), 4 strategies can be used: Recall, Integration, Organization, and Elaboration. Recall invites the students to pull information from their long-term memory, with the aim of learning the basic fact of it. Integration allows the students to integrate the new knowledge with their existing one in order to make it easier to remember. Then, Organization refers to the activity of linking the existing knowledge to the new concepts and ideas meaningfully. The next strategy, Elaboration, is a strategy that is performed by the students by connecting the new materials to the existing information or ideas in the student's mind so they are added and become new information. These four strategies can be applied independently or be integrated to meet the purpose of the learning. In other words, the implementation can be suited to the want and creativity of the teachers in order to maximize the achievement of the learning objectives.

Problem-based learning (PBL) is a model of mathematics learning of which basis is the construction of knowledge by the students. The focus of PBL is the problem selected. Therefore, the students do not only learn the concepts related to it but the scientific methods to solve it as well. In other words, they are not required to understand the concept related to the problem which becomes the focus of the study but also to get the learning experience of solving it (I Wayan Santyasa: 2008).

In PBL, a real life problem is presented to the students in order to make them interested in learning mathematics so that they realize that it has many functions. According to Seel (2001: 2687), the characteristics of PBL are: (1) learning is started by a problem, (2) the problem is related to the real life of the students, (3) the learning is about the problem, (4) a full responsibility is given to the students to directly experience their learning, (5) small groups is used, and (6) it requires the students to demonstrate what they have learnt in product or performance.

Research study about the effect of generative learning model and problem-based learning model to improve the learning achievement of the students of prism and pyramid learning materials has been conducted by many parties with good result. However, the study that compares the effectiveness of the two models are so hard to be found that a question arises: "which of the two methods is more effective to improve the learning achievement of the students?"

To know how far the effectiveness of the generative learning model and problem-based learning model to improve the learning achievement is, a research study is conducted with the title of "The Comparison of the Effectiveness of Mathematic Learning Using Generative Learning and Problem-Based Learning of Prism and Pyramid Learning Materials Viewed from the Learning Achievements of the Grade VIII Students of MTs PP Darul Qurro".

METHODS

This research study is quasi-experiment. This study was conducted in MTs PP Darul Qurro on May-June 2014 in the academic year of 2013/2014. The population of the study was the entire students of grade VIII MTs PP Darul Qurro in the academic year of 2013/2014 which consists of 3 classes. By choosing randomly from the three classes, two classes were chosen as the sample of the study. They were the students of class VIIIA and VIIIB.

The independent variables of this study are generative learning model and problem-based learning model, while the independent variable is the student's learning achievement. The instruments used to measure the mathematics learning achievement are tests of learning achievement consisted of 15 multiple choices. The technique of data collection was by giving a pre-test to the samples before the treatment was given. Then, the treatment was given in the form of the implementation of generative learning model to class VIIIA as the

first experiment class and the problem-based learning model to class VIIIB as the second experiment class. To figure out the students' capability to understand the materials given during the process of teaching and learning, a post-test was given at the end of the learning activity.

The data description of this study were divided into two namely the early stage and last stage data description. The early stage of data description consisted of normality test and homogeneity test. The statistics test χ^2 was done to test the normality and F-test was done to test the homogeneity of the variance. Furthermore, the last stage of data description was the description of the hypothesis. Before the hypothesis test was administered, the researcher administered the test of the mean score of the pre-test of the two experiment classes to find out whether there was difference between the two classes. After that, if there was no difference between the score of two classes, a t-test was administered to test the hypothesis. A teaching and learning process is considered effective if the mean score of the post-test of the students are at least pass the minimum completeness criteria (KKM) which is 7.5. If the result of the mean test shows that the pre-test scores of the two experiment classes are different, the hypothesis test is administered by the score gain: by using the difference of the post-test and pre-test score. Learning is stated effective viewed from the learning achievement if the score gain reaches a minimum score of 0.7 based on the category criteria as it is shown in Table 1.

Table 1. Criteria of Score Gain

Mean score gain	Criteria
$(g) \geq 07$	High
$0{,}3 \leq (g) < 0{,}7$	Medium
$(g) < 0{,}3$	Low

RESEARCH FINDINGS AND DISCUSSIONS

This research study was conducted in MTs PP Darul Qurro grade VIII second semester, as it was scheduled to do the teaching and learning process on 17 May up to 08 June 2014. The process lasted for 12 meetings; 6 meetings for class MPG and 6 others for class PBM. Each meeting spent 80 minutes. There were 2 meetings a week.

The data collected by the study are divided into two: the pre-test and post-test scores of the students of the first experiment class who receive the treatment of generative learning model and those of the second experiment class who receive the treatment of problem-based learning model. The data of the pre-test score are shown by Table 2.

Table 2. Data of Pre-test Score

Data	Number of students	Score		Mean
		Max	Min	
Class E_1	25	9.33	2.00	5.73
Class E_2	23	9.33	2.67	5.39

Meanwhile, the data of the post-test of the study are shown by Table 3.

Table 3. Data of Post-test Score

Data	Number of students	Score		Mean
		Max	Min	
Class E_1	24	10	4.67	7.97
Class E_2	23	9.33	2.00	6.20

Before the hypothesis test was administered, a requirement test was performed towards the data of students' learning achievement namely normality and homogeneity tests. Table 4 shows the result of the normality test, while table 5 shows that of the homogeneity test.

Table 4. Normality Test

	Class	Sig.	α	Result
Score/pre-test score	E_1	0.615	0.05	Normal
	E_2	0.811	0.05	Normal

Table 5. Homogeneity Test

Data	Df	Sig.	α	Result
Pre-test	46	0.694	0.05	Homogeneous

Table 4 indicates that the significance level is higher than 0.05. It means the data distribution of the pre-test scores of the two experiment classes is not significantly different from the normal distribution. Meanwhile, table 5 shows that the significance level is higher than 0.05 which means the data variances of the pre-test scores of the two experiment classes are homogeneous.

Besides the normality and homogeneity tests, mean test was also done before the hypothesis test administered. The mean test was done to figure out whether there is difference in the mean of the pre-test scores of the two experiment classes. The result can be seen in table 6.

Table 6. Result of Mean Test

Score	Sig.	*A*	Result
Pre-test	0.609	0.05	There is no difference on the mean Pre-tests E_1 and E_2

Table 6 shows that the significance level of the pre-test is 0.609 which is higher than α so the null hypothesis (H_0) is accepted. In conclusion, there is no difference in the mean of the pre-test of the first and second experiment classes.

After all the requirement tests are fulfilled, the three hypotheses were then tested using f-test. The first hypothesis test is used to answer the first problem formulation whether the generative learning model is effective viewed from the students' learning achievement. Based on the data analysis, significance level of 0.218 was gained which is higher than 0.05, so the H_0 which states that the minimum mean of the post-test score is 7.5 was accepted. In other words, the generative learning model was effective viewed from the students' learning achievement.

The second hypothesis test aims to answer the second problem formulation whether the problem-based learning model is effective viewed from the students' learning achievement. The result of the data analysis is that the significance level is 0.02 which is lower than 0.05, so the H_0 which states that the mean of the

post-test score gain the minimum score of 0.5 was rejected. Therefore, the problem-based learning model was not effective viewed from the students' learning achievement.

The third hypothesis test was administered to find out whether the generative learning model or problem-based model is more effective viewed from the students' learning achievement. This test would be done if both models were effective viewed from the students' learning achievement, but based on the first and second hypothesis tests it was found out that the generative learning model was effective and the problem-based learning model was not. Therefore, the third hypothesis test was not performed.

Based on the observation done by the researcher and his collaborator during the whole activity of the implementation of the problem-based learning model in the teaching and learning process, there were some causes of the ineffectiveness of the implementation of the problem-based learning model:

a. Some members of some groups did not participate in the discussion as there were some students talking to each other when the discussion had been started. In addition, they were not talking about the materials in the students' worksheet.
b. The students could not maximize the communication in their groups. It was shown by the tendency of some students to do the task in the students' worksheet individually and when they found difficulties, they asked the other groups instead of discussing it with their group members. It was because the students were not familiar with group work.
c. The students were afraid and shy to come forward to write the result of their discussion and to present it later so the researcher had to point at the group representatives to do so. They were afraid if they made mistake in answering the questions in the students' worksheet and were shy to speak up in front of their friends.

CONCLUSION AND SUGGESTIONS

Conclusion

The generative learning model was effective to be implemented in mathematics class of prism and pyramid learning materials while problem-based learning model was not, viewed from the students' learning achievement.

Suggestions

Although this research study is suited to the theoretical review and the relevant studies, there are some limitations existed which hindered the research conducted. From this point, the researcher would like to give some suggestions as the following: teachers should implement varied learning methods or models which enable the students to actively participate in the learning or even create a learner-centred learning, such as generative learning model and problem-based learning model in Mathematics class especially when discussing prism and pyramid materials so the students become

familiar with constructing their own knowledge; teachers should prepare the needed instruments such as students' worksheets (LKS) when implementing generative learning model and problem-based learning model to activate the teaching and learning process; teachers should also prepare simple teaching kits so the students are able to use them easily, and other things which are able to grow the students' appreciation towards mathematics.

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