DIFFERENCES IN MATHEMATICS LEARNING ACHIEVEMENT THROUGH THE APPLICATION OF PROJECT-BASED LEARNING MODELS WITH CONVENTIONAL MODELS ON STATISTICS MATERIAL

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Abstract

This research is motivated by the low mathematics learning achievement of students and the learning process is still teacher-centered. This study aims to determine the comparison of student learning achievement between the Project Based Learning learning model and the conventional learning model. This research is an experimental research, with the research design used is post test only control group design, the sampling technique in this study used 2 classes, namely class X-3 as a control class totaling 35 students and class X-4 as an experimental class totaling 36 students. Student learning achievement in this study is seen from the post test score. Through a series of statistical tests, hypothesis testing was carried out using descriptive statistical analysis and inferential statistical analysis, one of which used the independent sample test. The instrument used is a student learning achievement test on statistics material. The results show that, there are differences in the mathematics learning achievement of students taught using the application of the Project Based Learning learning model and those taught using the application of conventional learning models on statistics material. With evidence of the average learning achievement in the class taught using the application of the Project Based Learning learning model is 68.86 and the class taught using the application of conventional learning models is 61.37.

Keywords: Project Based Learning, Conventional, Learning Achievement

1 INTRODUCTION

Education is a well-organized system within a fairly broad scope of tasks. That is, everything related to physical development, health, abilities, thoughts, emotions, will, and social issues, including matters of belief and faith [6]. Through education, students can optimize quality resources so that they can advance the nation. One of the success standards of a nation can be shown by the achievement of educational goals. Indonesia's national education goals can be used as a reference to produce the best possible education system. There is great potential in the project-based model to produce a more interesting and significant educational process [4]. The success of education in the process is influenced by various factors, one of which is the role of teachers because teachers have a major role in education. Teachers have a huge responsibility in shaping the young generation, especially making professional students [1].

The use of models in learning is a very important role, because without the right model it will affect the success of the learning [2]. Learning activities carried out by teachers will be very successful if these activities prioritize good interaction and communication between teachers and students. The effective learning process depends on how the teacher can choose the appropriate learning strategy to be used in learning. One of them is choosing a learning model that suits the conditions and needs of students.

In learning, every student in creative really needs [3] a teacher needs to use learning strategies to help achieve goals well. To achieve the maximum creation of learning objectives, teachers must be able to provide a safe and interesting learning environment [5]. Teachers are required to have various readiness in mastering material, mastering class conditioning, making learning tools or media, using learning models, teaching variations so that student learning outcomes can improve. In order to achieve good learning objectives, it is necessary to use the appropriate model. Teachers must think of a suitable model to increase student involvement and skills during the learning process.

Based on an interview with Hanifathul Hidayat, S.Pd. a mathematics teacher at Ihsaniyah High School in Tegal city, the lecture and assignment methods are the two methods currently used at the school. Students' learning styles still involve memorizing formulas, and never engaging in hands-on exercises to determine mean, median, or mode based on their own data. So it is difficult for students to apply these concepts in real life. This causes low learning achievement in math subjects. So it is necessary

to make improvements or choose the right learning model to improve mathematics learning achievement..

Based on observations made at Ihsaniyah High School in Tegal city, conventional learning models are still applied in the classroom, where students still learn in the classroom by following the teacher's instructions to listen, take notes, and complete tasks. However, when students want to convey ideas or ask questions, students tend to feel shy. This is due to the fact that teacher influence has a significant impact on learning. As a result, teachers should implement a slightly different learning model which is the Project Based Learning model. The aim is to involve more students in learning.

Learning math is quite difficult for some students who do not like math lessons. Because math lessons have strong calculations so many students complain of dizziness when studying math. So that in learning mathematics it is necessary to choose the right learning model so that students can like math lessons.

In learning statistical material using a teacher-focused learning model with a lecture approach, students only pay attention to what the teacher says and analyze so that students' knowledge of the material is still weak because many students do not understand it. This material is a component of the way of thinking problem solving in the real world. The Project Based Learning model is expected to give students a stronger understanding of what they are learning.

The Project Based Learning model is always referred to as a project-based learning model when solving a real problem. According to [5] Project Based Learning is "a learning process where students participate directly in project preparation".

2 METHODOLOGY

The type of research used in this study is experimental research. The research design used was post-test only control group design. In this study the population was all grade X students, the samples taken in this study were class X-3 as the control class and class X-4 as the experimental class taken by paying attention to the average value of the students' semester test of the two classes which were relatively the same, namely class X-3 with an average value of 61.14 and class X-4 with an average value of 61.11.

This teaching module is made with 3 meetings. In addition, in the teaching module there are student worksheets used for experimental and control classes. Student worksheets contain exercises or tasks that students must do in groups during the learning process. At the end of the learning activities, learning achievement tests were carried out for both classes, the test results were then analyzed using descriptive statistical analysis. Before the sample prerequisite test was carried out using the normality test and homogeneity test.

3 RESULTS

3.1 Descriptive Analysis

The implementation of learning using the Project Based Learning model in the experimental class was carried out in 3 meetings. Each learning stage is in accordance with the learning steps, goes well and smoothly in accordance with what is planned in the teaching module. Learning activities are supported by teaching materials and student worksheets. Student activities in project activities in groups when discussing material and working on worksheets went well. The teacher's job is only to monitor students in understanding the project and solving problems when one group is having difficulty.

In the control class, which is the class that uses the conventional learning model, teaching and learning activities also take place for 3 meetings. The learning process was in accordance with the steps in the teaching module. After learning in both classes according to the teaching module for each class, at the 4th meeting a learning achievement test was conducted in both classes. The test was conducted using the final test questions. The test results for each class are as follows:

Table 1. Student Learning Achievement Results

Qualifications	Value	Number of Students	
		Experiment Class	Control Class
Very good	$90 \leq x$	1	0
Good	$75 \leq x < 90$	6	2
Fair	$60 \leq x < 75$	27	17

Deficient	$40 \leq x < 60$	2	16
Very Poor	$x < 40$	0	0

From the learning achievement table above, it can be seen that in the experimental class there are 1 student with very good ability and 6 students with good ability. While the control class only has 2 students who have good abilities. In the experimental class there were 27 students who had sufficient ability and for the control class there were 17 students. In the experimental class there were 2 students whose abilities were lacking while the control class had 16 students. From the calculation of the average value of student learning achievement of experimental and control classes, the results are presented in the following table:

Table 2. Average Student Achievement

Class	Average
Experiment	68,86
Control	61,37

Table 2 shows that the mean score of experimental class students is higher than the mean score of control class students. The difference in the average value of the two classes is 7.48. Thus, from table 1 and table 2 it can be concluded that using the application of the Project Based Learning learning model provides good results compared to the application of conventional learning models.

3.2 Hypothesis Test Results

Before hypothesis testing, it is necessary to first analyze the prerequisites, namely the normality test of learning achievement in both classes using the Liliefos test formula which is presented in the following table:

Table 3. Normality Test Results

No	Variable	L_0 Maks	$L_{table}(a = 5\%)$	Conclusion
1	Experiment Class	0,1347	0,1454	Normal
2	Control Class	0,0927	0,1478	Normal

From the table above, it can be seen that $L_{count}$for math learning achievement data is smaller than L_{table}. Because $L_{count} < L_{table}$, Ho is accepted, meaning that the sample comes from a normally distributed population.

Furthermore, the homogeneity test was conducted to determine whether the two variances were homogeneous or not. The test results are presented in the following table:

Table 4. Homogeneity Test Results

	X^2	Table $X^2(a = 5\%)$	Conclusion
Learning Achievement Test	0,23	3,84	Homogeneous

Based on the table above, it can be seen that ${X^2}_{count}$ for math learning outcomes data is smaller than ${X^2}_{table}$. Because ${X^2}_{count} < {X^2}_{table}$ then Ho is accepted meaning that the sample comes from a population that has homogeneous diversity.

3.3 Independent Samples Test Results

After it is known through the prerequisite test that the samples taken are normal and homogeneous, it can be continued with the hypothesis test using the Independent Samples Test, the results are in the following table:

Table 5. Independent Samples Test Results

	t_{count}	Table $t\ (a = 5\%)$
Learning Achievement Test	3,570	1,645

From the table above, the Independent Samples Test results show that $t_{count} > t_{table}$ sso Ho is rejected, meaning that there is a difference in the average learning achievement of students taught with the application of the Project Based Learning learning model and the conventional learning model on statistics material.

3.4 Discussion

The implementation of research in the experimental class and control class was 3 meetings and 1 final test. In learning, both classes were given different treatments, namely the experimental class was taught with the application of the Project Based Learning learning model while the control class was taught with the application of conventional learning models.

On the results of data analysis obtained that there is a difference in the average learning achievement of students taught with the application of the Project Based Learning learning model while for the control class taught with the application of conventional learning models on statistics material. Classes taught with the application of the Project Based Learning learning model are better than classes taught with the application of conventional learning models.

It can be seen in the difference in the average value of student learning achievement, namely for the class taught with the application of the Project Based Learning learning model obtaining an average value of 68.86 higher than the class taught with the application of the conventional learning model which only obtained an average of 61.37. After obtaining the average learning achievement, statistical calculations were carried out to determine whether there was a difference in learning achievement through the Independent Samples Test. The results of the test show that $t_{count} > t_{table}$ so it can be concluded that there is a difference in the average learning achievement of students taught with the application of the Project Based Learning learning model and the conventional learning model on statistics material.

4 CONCLUSIONS

Based on the research results described above, it can be concluded that the average student learning achievement in the experimental class is 68.86 higher than the control class which is 61.37. And there is a difference in the average learning achievement of students taught with the application of the Project Based Learning learning model and conventional learning models on statistics material as evidenced by the Independent Samples Test.

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