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Application of Project-based Learning Blended Peer Tutor Model to Improve Learning Outcomes of Drawing with Software in Class XII SMK Ganesha Tama Boyolali

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ABSTRACT
The purpose of this research is to find out; (1) Initial grades of class XII DPIB students at SMK Ganesha Tama before applying the PjBL model combined with peer teaching or peer tutors, (2) Scores after applying the PjBL method combined with peer teaching in class XII DPIB software application subjects at SMK Ganesha Tama, and (3) Differences in learning outcomes on the aspects of knowledge, attitudes, and student skills in the subject of class XII DPIB Software Applications at SMK Ganesha Tama. The research was conducted through experimental quantitative research methods using one sample. Research data were analyzed by means of One Sample T Test. The results obtained from this study are; (1) The initial grades of class XII DPIB students at SMK Ganesha Tama before the application of the PjBL model combined with peer teaching or peer tutors are in the LACK category, (2) The scores after implementing the PjBL method combined with peer teaching in class XII software application subjects DPIB SMK Ganesha Tama are included in the GOOD category, and (3) There are differences in learning outcomes before and after implementing the PjBL model combined with peer teaching or peer tutors in the aspects of knowledge, attitudes, and student skills in the class XII Software Application subject DPIB SMK Ganesh Tama.

Keywords: *SMK, Project-based Learning, Peer Teaching, Learning Outcomes.*

1. INTRODUCTION

SMK or Vocational High School is a school that is oriented towards the industrial world and has the aim of providing provisions to prepare students to be able to become skilled workers and be able to compete in industry at the middle level and also the skills possessed are things that are highly required by the industry [1]. Specifically, vocational education is education that provides students with knowledge and skills for themselves, the industrial world and for the nation-building process [2].

In line with the development of society's view of the world of education, education is faced with a number of complex problems. One of the real problems is that education should be able to produce complete human resources [3]. One of the solutions to overcome the challenges of education in the 21st century is the selection of learning methods that will be applied to students. These learning models include discovery learning, project-based learning, problem-based learning and inquiry learning (Permendikbud no. 13 of 2014).

This PjBL model is a constructivism model that is often applied in education [4]. This is because this model makes it easier for students to get an overview of the final results of their learning process. Project based learning (PjBL) is a model that can create more meaningful learning because this model is believed to be able to move competencies and skills automatically as well as develop concepts and motor skills [5]. The PjBL model is used to replace outdated learning models and is supported by the use of technology in designing learning plans using technology that goes through an integrative process [6].

In this study, which took place at SMK Ganesha Tama Boyolali, the project-based learning (PjBL) model was a model that had been implemented since students

were in grade 11. However, in reality in grade 12 DPIB class this application could not be said to provide maximum results as proven with uneven learning outcomes and student skills in software application and building interior design (APPLIG) lessons. Therefore the researchers tried to insert a peer tutor learning model to improve learning outcomes and maximize the application of the PjBL model at SMK Ganesha Tama Boyolali.

This peer teaching learning model is an excellent model when applied to vocational education which wants its graduates to have relatively the same abilities which of course can increase the prestige of schools in the eyes of the industrial world. However, this model is not a perfect model. So that it has its own advantages and disadvantages as stated by Megawati [7], that the disadvantages of this peer teaching learning model can be minimized by providing training to students who become tutors to provide guidance to colleagues by teaching them material according to the syllabus that has been determined so that coaching objectives can be achieved.

2. METHODS

2.1. Research Design

The research method used is a quantitative experimental method. According to AS Hamdi & E Bahruddin [8]. This research is testing in nature, therefore all the variables to be measured will later be measured with standardized instruments or tests. Variable to be Measured as shown in table 1st, below:

Table 1. Variable to be Measured

Pretest	Treatment	Posttest
T1	X	T2

2.2. Respondents

In this study all students of the Modeling and Building Information Design expertise program were used as subjects. With a total of 70 students. From all students of SMK Ganesha Tama Boyolali, there were 70 students from the Modeling and Building Information Design Expertise program and from the total number of students taken from the class XII students from the Modeling and Building Information Design expertise program, there were 22 students using purposive sampling technique.

2.3. Instruments

In this study there are three instruments used to measure student learning outcomes. This instrument is used during the pretest and posttest in the form of an instrument for observing attitudes, knowledge and skills.

2.4. Data Analysis

All data from the data from this study are data that are quantitative data which will be analyzed in a way that has been formulated with the One Sample T Test which is a comparative test to determine the ratio of certain values. The one sample t test is often also called using the term student t test or one sample t test because this test only requires one sample.

3. RESULTS AND DISCUSSION

3.1. Application of the Blended Peer Teaching PjBL Model

This research was conducted at the Department of Building Modeling and Information Design (DPIB) through a 3D drawing project of a two-story residential house which was carried out in three meetings. Learning activities begin with a pretest and then apply the PjBL Blended Peer Teaching learning model through a project of making 3D images of a two-story residential house in the APLPIG subject and ending with a posttest.

The application of the PjBL Blended Peer Teaching learning model is carried out in eight stages, namely (1) starting with basic questions, pre-testing and determining projects, (2) determining groups based on results (pre-test) and preparing project plans, (3) after the tutor determined, the teacher then conducts training for tutors, (4) arranges project schedules, (5) implements projects, (6) monitors students and project progress, (7) assesses project results, (8) post test and evaluation.

In the first step, at this stage the teacher gives questions about rendering material. Then given a pre-test to find out the extent of students' knowledge of rendering material. After all questions have been answered by students and collected, the teacher and students determine what project to work on.

In the second step, after the pre-test answers are collected and assessed, a number of students will be seen who have high, medium and low scores. The results of these values are used as a reference for the teacher to divide classes according to needs with a balanced portion of students. In this study, students were divided into four groups. The number of groups can be adjusted according to the number of students in the class.

In the third step, students with the best grades in their groups are selected to be mentors for their group mates. Before the implementation of this peer tutoring was carried out, students who were selected to become mentors were first given a brief training on the project to be worked on and during the training process the other students were given instructions for self-study.

In the fourth step, after the group is formed, the teacher and students discuss the project implementation

schedule, then proceed with the fifth stage, namely project implementation. In this stage students have been given the responsibility of completing the project with the help of a friend who was chosen to be the tutor.

In the sixth step, the teacher observes the mentoring process in each group to ensure that the mentoring process and group discussions are going well. At this stage the teacher can also monitor the project work process and ensure that progress is in accordance with what has been mutually agreed upon. In this stage students can also ask the teacher about problems or obstacles that have not been predicted at the beginning.

In the seventh step, the teacher instructs students to collect project results. After all the results of the project are collected, the teacher can assess the results of the project to take the value.

In the eighth step, the teacher gives posttest questions to all students to find out student knowledge then proceed with discussing the questions that have been worked on and then evaluate and reflect on the material together.

3.2. Quantitative Analysis Results

The research results that have been obtained are then processed, first to find out whether the data is normally distributed, then a normality test is carried out, the results are as shown in table 2nd as follows.

Based on the table 3th above, it can be concluded that the mean, minimum, maximum and standard deviation values of the subjects have increased, this is shown from the difference between the pretest and posttest scores. Then in table 4th below below shows the results of the analysis of the Paired-Samples T Test.

This analysis is used to compare changes in experimental subjects before and after being given the PjBL Blended Peer Teaching learning model. This also proves that the hypothesis proposed in this study is accepted or rejected. These results indicate that there was a change in the mean between the pretest - posttest, which means that the subject's language development score has increased when viewed from the mean. Furthermore, in table 5th below, the results of the correlation test of the Paired Samples T Test are shown below.

The output of Paired Samples Correlations in table 5th shows that the correlation between pretest and posttest is 0.349 with a significant value of p = 0.349 > 0.05 which means there is a correlation between pretest and posttest. Then the Paired Samples T Test was carried out to find out the difference between before being given treatment and after being given treatment to the subject which showed a correlation between pretest - posttest. Paired Samples T Test test data, shown in table 6th below.

In the table 6th of the results of the paired samples t

Table 2. Tests of Normality Results Data

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
pretest	.114	22	.200*	.944	22	.238
posttest	.163	22	.132	.932	22	.136

Table 3. Descriptive Statistical Results Data

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
pretest	22	30	75	52.64	14.278
posttest	22	63	96	83.64	7.889
Valid N (listwise)	22				

Based on the results of the data normality test, shown in Kolimogorof-Smienov and Shapiro-Wilk, the pretest and posttest data have a p value > 0.05, which means that the distribution can be said to be normal. The pretest results have a value of p = 0.200 > 0.05, so the pretest results are normally distributed. Then the posttest data is 0.132 > 0.05 which means the data is normally distributed. Table 3th next is the results of descriptive statistics as follows.

test above, it shows t = 9,829 and a significance of p = 0,000, which means that the hypothesis is accepted by showing the difference between learning outcomes before and after using the PjBL Blended Peer Teaching model. So it can be concluded that the use of the PjBL Blended Peer Teaching model has an influence on student learning outcomes.

Table 4. Results of the Analysis Paired-Samples T Test

Paired Samples Statistics					
		Mean	**N**	**Std. Deviation**	**Std. Error Mean**
Pair 1	pretest	52.64	22	14.278	3.044
	posttest	83.64	22	7.889	1.682

Table 5. Paired Samples T Test Correlation Results

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	pretest & posttest	22	.210	.349

Table 6. Measurement Results of Paired Samples T Test

Paired Samples Correlations									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	Internal of the				
					Lower	Upper			
Pair 1	pretest - posttest	-31.000	14.794	3.154	-37.559	-24.441	-9.829	21	0.000

3.3. Discussion

This research resulted in findings that the learning process can affect student learning outcomes. Where the PjBL Blended Peer Teaching learning process shows higher learning outcomes than the conventional model as well as the PjBL model only. And this model can also cover the gaps that arise when using the PjBL model, namely uneven results due to different thinking skills and enthusiasm for learning. This learning model is student-centered, teaching and learning activities in class facilitate students in practicing their potential and guide students to focus on making projects carried out in teams on activities in class and understanding material through discussion and mentoring in groups.

This learning emphasizes the use of the PjBL model which, according to Kokotsaki et al [9] is learning that focuses on students' learning based on conceptual principles, students play an active role in learning to achieve goals through social interaction and knowledge. And it is hoped that this model can improve student learning outcomes, one of which is student learning outcomes in terms of skills, this is in accordance with previous research by Ismuwardani et al [10] which shows that the PjBL model increases learning independence and student skills [11].

In the implementation of PjBL at SMK Ganesha Tama Boyolali, it has not shown maximum results, indicated by poor grades and a low level of understanding of the material. Therefore the authors try to maximize the PjBL model combined with the Peer Teaching model. This model is able to create an interesting and fun learning atmosphere. Because with the Peer Teaching model students can dialogue and communicate with other students about the projects they are working on. In its implementation, the teacher really only acts as a limited facilitator and mentor so that it can form students who are independent, mature and have a high sense of friend loyalty [12].

When carrying out the project, students are fully guided by their mentor who has been appointed by the subject teacher based on the results of the pre-test. The students who were selected to become mentors had previously been provided with materials and skills to complete the project assignments that would be given and then they were given the responsibility to lead their groups. During the meentoring process in this group the teacher supervises the activities of each group so that discussion and cooperation in the group runs efficiently.

The Peer Teaching learning model is one of the learning models that is expected to provide an active role and motivation to students, so that they study the material provided seriously. So it is hoped that by using this learning model, students will more easily absorb the material being taught and in the end students will not experience many difficulties [12].

In this study, there was a difference in the classroom atmosphere when implementing this model with the PjBL model only. Students were seen actively discussing and asking questions about the projects they were working on to their tutors. The progress of project work has also shown good results, as evidenced by all students actively working on projects with the help of tutors.

Based on the results of the researchers' observations, the application of the PjBL Blended Peer Teaching model to the APLPIG subject at SMK Ganesha Tama Boyolali DPIB majoring through a 3D rendering project of a 2-

storey residential house was able to improve student learning outcomes both in terms of knowledge, attitudes and skills. This model is also able to foster responsibility and teamwork principles in solving problems that arise during the project work process.

4. CONCLUSIONS

The results showed that there was an increase in learning outcomes between before and after the implementation of the PjBL Blended Peer Teaching model. This model is effective in improving the learning outcomes of SMK students, especially in rendering 3D images of 2-storey residential houses in the APLPIG subject. Students also don't hesitate to ask their friends who are mentors about the problems they experienced while working on the project so that group discussions come alive.

AUTHORS' CONTRIBUTIONS

The following describes the author's contribution:

1. Budi Siswanto as a researcher.
2. A.G. Tamrin as a research member.
3. Anwar Hidayat Ashari as a research member.
4. Ida Nugroho Saputro as a research member.

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