



Effectiveness of Project-Based Learning to Increase Students Learning Outcomes and Students Learning Activity on Electric Motors Installation at Vocational High School

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Abstract

This study aimed to see the effectiveness of the project-based learning model in improving learning outcomes and learning activities in the Electric Motor Installation subjects. This research was a research with a Quasi-Experiment approach. The research subjects were all students of class XI of the Department of Electricity at SMK N 5 Padang, which totaled 57 students. The study design used a non-equivalent control group design. The research subjects were class XI students of the Department of Electricity at SMK N 5 Padang by dividing the two groups as experimental groups and control groups. Data collection used test instruments and non-test instruments. Data analysis was carried out by descriptive and parametric analysis. The results obtained from this study can be concluded that the project-based learning model effectively improves learning outcomes and student learning activities in the Electric Motor Installation subjects.

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INTRODUCTION

Based Vocational School (Vocational High School) a formal educational institution that has the aim of preparing experts or professionals at the secondary level can occupy positions as an operator who has expertise in the field of knowledge and skills have an attitude in accordance with the expertise of vocational specialization (KKNI, 2013).

Since the beginning, students have been educated to commit to specific skills that match directly with certain business interests. Vocational students are equipped with practical skills and work experience (such as on-the-job training) in certain specificities such as buildings, electronics, and electricity, machinery, automotive, TKJ, business management, catering, fashion, tourism and others. Vocational schools are projected to be skilled actors and human resources ready for use. All that cannot be separated from the participation of educators.

As a teacher, especially productive subjects are required to carry out interactive learning, inspiring, fun, challenging, and motivating students to participate actively, as well as providing sufficient space for initiative, creativity and independence in accordance with the talents, interests and physical and psychological development of participants' students (Ministerial Regulation No.41 of 2007 concerning Process Standards).

A learning process is said to be good, if the process can generate effective learning activities. The main requirement for successful teaching is the result, but it must be remembered that in assessing or translating the results' must be careful and precise with regard to the process, because in this process students can be involved in activities / activities (Hamalik, 2008: 90).

The importance of learning activities or student activeness in subjects Electric Motor Installation is based on the nature of the subject itself, most students in Vocational Schools consider Electric Motor Installation subjects to be complicated and difficult to understand, so we need a way of coping so that these subjects get a high response from students. Therefore,

student activities are needed to be able to understand and master the material provided.

The problems allegedly related to the low learning outcomes are 1) Students are less active and enthusiastic during learning in class, both during discussions and during practice. Basically, students have great potential in learning and practice because many students have courage, curiosity and high creativity, only they have not been able to explore the knowledge they should get. They are just waiting for instructions from the teacher to do something; 2) Less interesting lessons, in the implementation of the teacher providing material only with lectures and practice implementation is only limited to simulations on the computer, but students are still lacking interest and are considered monotonous.

Students' understanding of the concepts of the material being taught will be less understood because students do not feel very well what the teacher is conveying in class and this is felt to be ineffective in the learning process, such as some students talking to their friends, many students who excuse themselves out of class time; 3) Students are lazy to do homework on the grounds they do not have textbooks. Less serious in making practice reports, reports made do not meet the specified format standards. Most students only copy reports from their friends; 4) The learning approach is still not in accordance with the teaching provisions, the learning process seems to be still monotonous, because the attitude of students is less active. Where students as loyal listeners when the teacher conveys the concept of learning material. And practice is only limited to computerized simulations, without any real objects. So that students feel bored by just sitting still, listening, simulating, as if there is no time spent thinking and creating to real objects as effectively as possible.

The difficulty of students in learning Electric Motor subjects depends on the way the teacher teaches the relevant subject to students. Efforts are made to dispel the notion that the subject of Electric Motors is the need for more creative, innovative, and meaningful learning

with learning methods that are not only implemented in one direction but here the teacher provides opportunities for students to participate more actively in learning.

In an effort to improve student learning outcomes and activities, it is necessary to have innovations in learning that are relevant to the situation of students and the Electric Motor Installation material being studied, such as project-based learning. Project-based learning has the potential to improve science process skills (KPS) and student activities and problem-solving skills (Kaldi, Filippatou, & Govaris, 2011).

According to Thomas (Wena, 2011: 144), project-based learning is a learning model that provides an opportunity for teachers to manage learning in the classroom by involving project work. This learning emphasizes student-centered teaching with project assignments. Project-based learning gives students the opportunity to work more autonomously, to develop their own learning, be more realistic and produce a product (Mohamad, Embi & Nordin, 2015).

This project-based learning model has a great potential to provide a more interesting and meaningful learning experience for students. The results of research in America show that project-based learning has shown satisfying results (Chandrasekaran, 2012), with the Project Based Learning method bringing students more creative thinking (Fini, Awadallah, Parast, & Abu-Lebdeh, 2017).

Efforts to increase student creativity and the quality of learning and teaching Electric Motor Installation need to change the old paradigm that the teacher is the manager. Teaching activities use things that are not teacher centered but are more student centered. So, it is considered important to do research on the Effectiveness of Project Based Learning Models in improving student learning outcomes in subjects Electric Motor Installation.

METHOD

This research is a Quasy Experiment study, with the design of experimental control

design research. The purpose of this research is to examine the problems regarding the behavior of a particular person or group in a particular location with a careful review of a treatment and assess the extent of the impact of the treatment and eliminate the negative aspects of the behavior being studied.

Table 1. Design Chart of Experimental Control Design Research

Group	Pretest	Treatment	Posttest
Eksperimental	O ₁	T	O ₂
Control	O ₁	-	O ₂

The research subjects were students of class XII Electricity SMK N 5 Padang who were registered in the even semester of the 2018/2019 school year. After choosing two classes taken from four classes XII of SMK N 5 Padang as a sample, the two classes are one experimental group class and one control group class. The experimental class is a class whose learning uses the Project Based Learning learning model, while the control class is a class whose learning uses lecture and discussion learning. The experimental class is class XII Electric-1 and the control class is class XII Electric-2. As the object of research is the implementation of learning to install components and circuit installations of electric motors based on PLC (Programmable Logic Controller).

RESULTS AND DISCUSSION

Students Learning Outcomes

First to do is test the learning outcomes of the experimental group and the control group, testing this hypothesis is done using the formula of independent sample t-test. This test serves to determine whether there are effectiveness of project based learning models in improving student learning outcomes. The research hypothesis is as follows.

H₀: There is no effectiveness of project-based learning in improving student learning outcomes in the experimental group compared to the control group.

H_a: There is effectiveness of project-based learning in improving student learning outcomes

in the experimental group compared to the control group.

The results of testing this hypothesis can be seen in Table 2 below.

Table 2. T-test Results Learning Outcomes Experiment Group and Control Group

Independent Sample T-test	
T	Exact Sig. [2*(1-tailed Sign.)]
1.355	0.005

Based on the t-test results of the learning outcomes in Table 2 the significance results obtained from the two groups if divided by 2 then equal to 0.005 which means less than 0.05 (sig 0.005 < 0.05). It can be concluded that there is a significant difference between the learning outcomes of the control group and the experimental group. The average value of the learning outcomes of the control group was 56.93 while the average value of the learning outcomes of the experimental group was 84.73.

The pretest and posttest scores serve as a reference in seeing the effectiveness of using project-based learning models in improving student learning outcomes in subjects Electric Motor Installation. If students have achieved the learning objectives and the student's value is greater than the minimum completeness value that has been set then the learning can be said to be effective.

The pretest value in the experimental group is included in the high category with a percentage value of 32%, while the pretest value in the control group is also included in the high category with a percentage value of 43%. Posttest value in the experimental group included in the high category with a percentage value of 32%, while the posttest value in the control group included in the low category with a percentage value of 43%.

The gain score can also illustrate the effectiveness of the project-based learning model. In the experimental group, the Gain score indicates that there are no students in the low category, while the Gain score in the control group is 1 student who falls into the low category, even a comparison of the average of

the experimental group and the control group can also be seen the difference.

Based on hypothesis testing, it appears that the value of t is greater than table, this means that learning using project-based learning is more effective in improving student learning outcomes compared to conventional methods. This is because project-based learning is a student-centered learning model, so students are taught to learn independently and the teacher only acts as a facilitator.

In projects students are required to actively advise as problem solvers, decision makers, researchers and document makers. Students in planning/constructing, problem solvers, deciding/conducting investigations, providing opportunities for students to learn autonomously at the specified time.

Project-Based Learning originates from John Dewey's idea of the concept of "Learning by Doing" which is the process of learning outcomes by doing certain actions in accordance with his actions, especially the mastery of children about how to do something that consists of a series of behaviors to achieve a goal (Musa et al., 2012). Project based learning is an educational approach that focuses on the creativity of thinking, problem solvers, and interactions between students and peers to create and use new knowledge. Through project-based learning, students will work in teams or individuals, discover the skills of planning, organizing, negotiating, and making consensus on the issue of the task to be worked on, who is responsible for each task, and how information will be collected and presented scientifically. Project-based learning models that are constructed from the principles of constructivist learning are thought to be able to foster values to be built on soft skills such as: problem solvers, creativity, innovation, teamwork, communication skills and presentations.

Students Learning Activities

The second is to do the testing of learning activities of the experimental group and the control group, this hypothesis testing is carried out using the formula of independent sample t-

test. This test serves to determine whether there is effectiveness of project-based learning models in improving student learning activities. The research hypothesis is as follows.

H0: There is no effectiveness of project-based learning in increasing the learning activities of students in the experimental group compared to the control group

Ha: There is effectiveness of project-based learning in increasing the learning activities of students in the experimental group compared to the control group. The results of testing this hypothesis can be seen in Table 3 below.

Table 3. T-test Results of Experimental and Control Groups Learning Activities

Independent Sample T-test	
T	Exact Sig. [2*(1-tailed Sign.)]
1.352	0.005

Based on the t-test results of the learning outcomes in Table 3 obtained significance results from the two groups if divided by 2 then equal to 0.005 which means less than 0.05 (sig 0.005 < 0.05). It can be concluded that there is a significant difference between the learning activities of the control group and the experimental group. The average value of the control group psychomotor was 83.67 while the average value of the experimental group psychomotor was 85.30.

The assessment of student activities was carried out in the two research groups, namely the experimental group and the control group. Assessment of student activity is seen from the psychomotor assessment of the two research groups, this assessment aims to see student activities during the learning process takes place. In the experimental group, the results of students' psychomotor scores had a percentage of 52% and included in the high category, with a percentage of 100% for competent student qualifications. While in the experimental group, the results of students' psychomotor scores have a percentage of 47% and fall into the category of inadequate, with a percentage of 16% for competent student qualifications. The average value of the experimental group students was 85

while the mean value of the control group students was 77.5.

Based on the psychomotor testing table which shows that the value of t is greater than t table, so it can be concluded that H0 is rejected and Ha is accepted. This explains that learning in the experimental group using the project-based learning model is more effective than the control group using conventional methods. Project based learning is a learning model that emphasizes the concept of material to students. Before practical activities are carried out, students must be strong and ready in planning everything so that in making the project students already know what they have to do. The activity report also students must actively work on as part of the learning evaluation activities. This project-based learning can improve the mindset of students in completing projects that have been given by the teacher where learning theory is directly applied in practice, so that these activities can improve students' memory and practical abilities.

The learning model mechanisms and procedures are arranged according to the learning weights. Course specifications are obtained from learning outcomes formulated in curriculum documents. The formulation is adjusted to the project-based learning model. In the project-based learning model of classroom settings in activities that are learning activities that are designed to create a conducive atmosphere that allows students to carry out physical activities that maximize the use of the five senses in various ways, media, and meaningful experiences in finding ideas, ideas, concepts and/or principle in accordance with the competence of the course.

CONCLUSION

The effectiveness of using the Project Based Learning model in the cognitive domain has a score of 0.8 included in the high category, while the effectiveness of using the Teacher Centered learning model in the cognitive domain has a gain score of 0.7 included in the medium category. The use of Project Based

Learning models is more effective in increasing the psychomotor domain compared to Teacher Centered learning models, the effectiveness can be seen from the value of the comparison between t-count and tables.

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