

The Implementation of Project Based Learning Model Towards the Learning Outcome of Subject Wood Structure I

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ABSTRACT

This study aims to compare student learning outcomes using two different tasks in the Project Based Learning (PBL) learning model in a wooden structure course 1. The research method used is Quasi Experiment with pretest-posttest design conducted in 4 meetings. The subjects of this study were 36 UNJ Civil Engineering study program students, who were divided into two groups and then given a pretest related to material about the roof truss. Then the first group (experimental class) 18 people were given the task of making a roof truss construction model while the other group (control class) compiled a report planning the roof truss construction. Then both groups were given a post test. The results showed that based on the independent T test, obtained -3.11 and the value of the T table was 2.306 so it can be said that there was no difference in learning outcomes with two different assignments in the Project Based learning model.

Keywords: PBL, Learning Outcome, Wood Structure

1. INTRODUCTION

The challenges faced by tertiary institutions in learning in the 21st century are to deliver students the ability to: think critically and be oriented to problem solving, work collaboratively with network schemes, easily adaptable in social and academic environments, develop initiatives and entrepreneurship, deliver oral thoughts effectively and communication of writing, access and analysis of information and developing imagination. One form of learning innovation that has received much attention is Project Based Learning (PBL).

[1] suggested the use of project-based learning model to the dimensions of the concrete procedural knowledge and skills, thus encouraging higher-order thinking skills of student to produce a work contextual. Project-based learning model has become one of the main learning model as a response of school to the challenges of the 21st century [2],[3]. PBL is one of the best methods for developing broad learning capabilities among students [4],[5]. It promotes student interest in science and improves their understanding of science content [6]. In this method, the inquiry process is organized around a project, an output that motivates student activity.

Learning involves accomplishing complex tasks whose output is usually an "artifact", a concrete product such as a model, a picture, or a presentation. Students present their product before an audience (presentation), explain it, and reflect on the learning process. In this method, the teacher constructs tasks, asks challenging questions, as well as directs and encourages the development of information and social skills.

In project-based learning, students will actively learn to improve their competence. because the learning process will be centered on students [4]. This opinion is in line with [6] which stated that project-based learning (PBL) is known as a collaborative, progressive, student-centered, interactive, active and deep learning approach, especially for technical education.

Learning resources in the project-based learning model are multidimensional. Project assignments are raised from real problems by providing opportunities for students to improve their abilities and understand the implementation of the competencies learned. According to [5] Project-based learning (PBL) also provides an opportunity for students to study traditional academic content more deeply and understand how it is applied in the real world.

There are several opinions from experts regarding the application of PBL in universities. In the case of engineering courses, PBL addresses the ability to extend what has been learned in one context to another [7]. Furthermore, according to [8] states that design is considered as one of the central functions of engineering practice and project-based learning. The achievement of evaluative skills on design is an important and challenging factor for students; because design involves various decisions by validating assumptions and justifying the choices made [9]. Hence, according to [7] in PBL students can practice solution design in realistic conditions and PBL is very valuable for that.

One of the programs that implement PBL is wooden structure 1 which is a compulsory subject in the building engineering education study program, engineering faculty, Jakarta State University. The choice of project based learning teaching is justified because, as stated previously, it is students centered process that meets students' needs and encourages them to become more involved in their own learning process [10]. This course aims to plan and calculate the needs of building roofs and various types of industrial building structures that meet the regulations and standardization in force in Indonesia. One of the materials applying the PBL model is the construction of roof truss. The purpose of the material is students can calculate roof truss construction correctly and making a roof truss construction model and a report planning the roof truss construction.

2. METHOD

This research was conducted at the Civil Engineering Study Program, Jakarta State University. The subjects of the study were Civil Engineering students of the Faculty of Engineering UNJ who took wood structure courses 1 academic year 2019/2020. The research sample consisted of 36 students, with the experimental class and the control class. The sample was conducted using a purposive sampling technique. Data analysis used a quantitative approach and included tests of validity and reliability. For pre-test and posttest obtained normal distribution, the statistical test used is the parametric statistical test. The design used in this study is quasi-experimental (pretest-posttest) design that shown in figure 1.

The class was divided into 2 groups, namely group 1 making mockups and the group compiling reports. In group 1 (mock-up group) students were assigned to analyze the reduction scale, the dimensions of the wood used, the grafting tools used, drawing on the sketch up program, as well as analyzing the structure in the SAP2000 program and designing a sketch roof truss for the mockup. The results of this assignment are intended as a pre-test. In group 2 (report group) students are assigned to calculate the load, plan the rafters, determine the pull and stress, and determine the joints and cubic

then make a report from the calculation of the roof truss. The results of this assignment are intended as a pre-test. After both groups finished completing their projects, students were given a post-test.

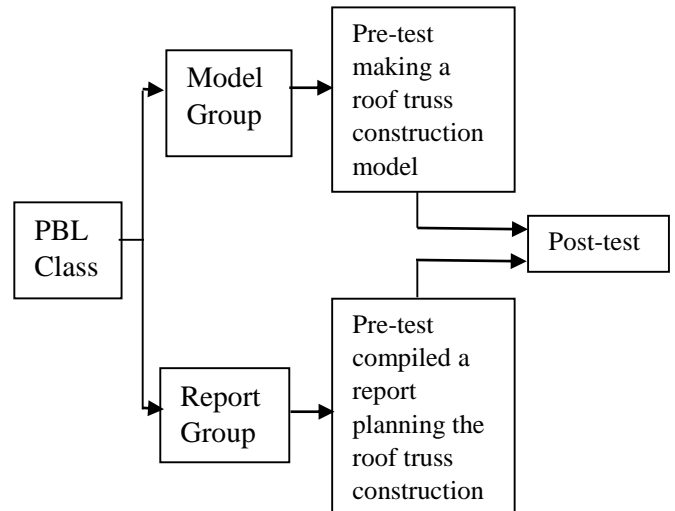


Figure 1 Method

Hypothesis

Ho : there is no difference in learning outcomes between the task of designing a roof truss construction model with the task of planning a roof truss construction on a learning model based on project

Hi : there is difference in learning outcomes between the task of designing a roof truss construction model with the task of planning a roof truss construction on a learning model based on project

The normality and homogeneity tests were carried out with SPSS 22. Based on the results of the normality analysis, the value was obtained (0.100 > 0.05). So it can be concluded that the data are normally distributed. For the homogeneity test the value was obtained (0.735 > 0.05). So it can be concluded that the data is homogeneous.

The data tested is proven to be normally distributed and comes from a homogeneous population, so that it qualifies for hypothesis testing using the independent sample t test. Based on the independent T test with the help of SPSS, the results obtained were -3.11 and the T table value was 2.306 (df = 8), thus account α table then H0 was accepted and H1 is rejected, meaning that there is no difference in the average learning outcomes of Wood Structure 1 using project reports and using mock projects.

3. RESULTS AND DISCUSSION

As previously noted, the purpose of the study was to compare student learning outcomes by using two different assignments in the Project Based Learning

(PBL) in wood structure courses 1. The analysis of the data, as presented shows that there is no significant difference between "pre" and "post", thus there is no difference between the learning outcomes between the project assignment making the roof truss and the project assignment compiling a report calculating the roof truss.

Based on these results it can be said that there is no difference in learning outcomes with the two treatments in project-based learning, meaning that the application of project-based learning must be carried out with careful planning. According to [11] the main point of the PBL model is how the teacher or instructor facilitates students to work individually or in groups to find out the real problem solving of the project being studied. The teacher's role is only as a facilitator, because student-centered learning (SCL) [12]. Assessment as part of class activities is an important process to see the competencies achieved. PBL is a method that can show and demonstrate their understanding of the learning process and students' critical reflection) [13]. Therefore, the teacher must know the progress of students, step by step the learning process through evaluation and portfolios. This is in line with the opinion [14] which states that the PBL model presents a number of characteristics. The learning process focuses on self-study groups that discuss and analyze specific cases [14]. The role of the teacher helps students to understand project problems, develop potential solutions, implement solutions to meet specifications and criteria, and whenever possible to build new knowledge [15].

Indeed, it seems that PBL success depends on the familiarity of the teacher with the method and on the frequency of its use. [16] state that whether or not students' attitudes towards PBL and traditional teaching methods change depending on the amount of time students experience PBL, especially because attitudes cannot change very quickly. In order for PBL to bring about changes in individual attitudes, sufficient time must be given for students to experience this method. They explained that PBL was only used for their studies, and only for a short time, and that this was the first time students experienced this kind of learning. The results of this study are in line with [17], who revealed that students who study science with project-based teaching strategies feel the climate of learning in their classrooms is significantly more satisfying and enjoyable, with greater teacher support, and with significantly more teacher-teacher relationships positive student.

Based on these results, there are several things that need to be considered in the application of PBL, especially in the Wood Structure 1 course. First, errors in the pre-test treatment were made from the assignment value data. After all the material is finished, students are given a final test as a post test. Second, mistakes in making questions, the level of difficulty of the tasks carried out by students is different. The task of making a

roof truss construction model used product assessment, while the compiled a report planning the roof truss construction used cognitive assessment.

Based on the explanation above, it can be assumed that the researcher made a mistake in determining the type of question and the researcher's decision to make the task as a pre-test. However, the implementation and performance appraisal have been carried out in accordance with the project in each group. Based on these results it can be said that the application of project-based learning must be carried out with careful planning. Starting from the material, assignments to performance appraisal. This is the first time the implementation of PBL has been carried out in the Wood Structure 1 course and in a short time. However, this PBL model has provided good experience and learning for both lecturers and students. As [17], stated that students who studied science with project-based teaching strategies felt the learning climate in their classrooms was significantly more satisfying and enjoyable, with greater teacher support, and positively related to teacher-student relationships

4. CONCLUSION

Based on the results and discussion of this research that has been presented, the result of research showed that there are no differences in learning outcomes with two different assignments in the Project Based learning model.

Implementation of the project-based learning model (PBL) must be designed as well as possible with steps it is very effective to improve students' productive competence. This is illustrated by the ability to identify and formulate problems, and design projects to solve real-world problems, the ability to make project proposals, be skilled in doing projects and be able to prepare project reports.

ACKNOWLEDGMENTS

The author would like to thank for the support of the civil engineering education study program at UNJ for their invaluable assistance with making this research.

REFERENCES

- [1] Kemdikbud, "Peraturan Menteri Kebudayaan Republik Indonesia No.58 Tahun 2014 tentang Kurikulum 2013 Sekolah Menengah Per Menteri Pendidik. Nas., 2014, doi: 10.1093/eurheartj/eh160.
- [2] D. Filippatou With in and the context S.of student Kaldi,- " centered learning, project-based teaching method has become increasingly prominent as a

- response of schooling to the challenges of the Int 21,” *J.Spec. Educ.*, vol. 25, no. 1, pp. 17–26, 2010.
- [3] Y. Çakici, “An of the Investigation Effect of Project - Based Learning Approach on Children’s learning Achievement strategies and affects Attitude the in Science,” *Tojsat* vol.3, no. 2, pp. 9–17, 2013. *Learn. Environ. Res.*, vol. 19, no. 3, pp. 383–395, 2016, doi: 10.1007/s10984-016-9212-y.
- [4] M. Barak “From ‘doing’ to ‘doing with learning’: reflection on an effort to promote self-regulated learning in school.” *technological projects Eur.J.Eng.Educ.in*, vol. 37, high no. 1, pp. 105–116, 2012, doi: 10.1080/03043797.2012.658759.
- [5] I. Terasawa, “Challenge-Based Learning Study: A Project on a Wireless Communication System at Technical High School,” *High. Educ. Stud.*, vol. 6, no. 1, p. 110, 2016, doi: 10.5539/hes.v6n1p110.
- [6] E. Langbeheim,-based “A courseprojecton Newton’s laws for talented junior high-school students,” *Phys.Educ.* vol.50, no. 4, pp. 410–415, 2015, doi: 10.1088/0031-9120/50/4/410.
- [7] C. L. Dym, A. M. Agogino, O. Eris, D. D. Frey, and L. J. Leifer, “Engineering design IEEE thinking, teaching, and learning,” *Eng. Manag. Rev.*, vol. 34, no. 1, pp. 65–90, 2006, doi: 10.1109/emr.2006.1679078.
- [8] S. Palmer and W. Hall,project-based “An evaluation of learning initiativeEur .inJ.Eng. engineering Educ.,vol. education,” 36, no. 4, pp. 357–365, 2011, doi: 10.1080/03043797.2011.593095.
- [9] T. Kunberger, “Revising a design course from a lecture approach to a project-based learning approach,” *Eur. J. Eng. Educ.*, vol. 38, no. 3, pp. 254–267, 2013, doi: 10.1080/03043797.2013.800020.
- [10] M. T. D. Mohedo and A. V. Bújez, “Project based Teaching as a Didactic Strategy for the Learning and Development of Basic CompetencesProcediain - FutureSoc.Behav.Sci. , Teachers,” vol. 141, pp. 232–236, 2014, doi: 10.1016/j.sbspro.2014.05.040.
- [11] N. Jalinus, R. A. Nabawi, and A. Mardin, “The Seven Steps of Project Based Learning Model to Enhance Productive Competences of Vocational.Ictvt,pp. 251Students,”– vol. 102, no. 256, 2017, doi: 10.2991/ictvt-17.2017.43.
- [12] H. Barrows, “Is it truly possible to have such a thing as dPBL?,” *Distance Educ.*, vol. 23, no. 1, pp. 119–122, 2002, doi: 10.1080/01587910220124026.
- [13] E. De Graaff and ristics A.of Problem Kolmos,- “Character Based Learning,” *Int.J.Eng.Educ.* vol. 19, no. 5, pp. 657–662, 2003.
- [14] H. Roessingh and -WBased. Learning Chambers, “Project and Pedagogy in Teacher Preparation: Staking Out the Theoretical Mid-Ground,” *Int.J.Teach. Learn. High. Educ.*, vol. 23, no. 1, pp. 60–71, 2011.
- [15] K. J. Chua, “A comparative-timeand study on first experienced project-based learning students in an engineering design module,” *Eur.J.Eng. Educ.*, vol. 39, no. 5, pp. 556–572, 2014, doi: 10.1080/03043797.2014.895704.
- [16] S. Karaçalli and F. Korur,-Based “The Effects of Project Learning on Students’ Academic Achievement, Attitude, and Retention of Knowledge: The Subject of ‘Electricity in Our Lives,’” *Sch. Sci. Math.*, vol. 114, no. 5, pp. 224–235, 2014, doi: 10.1111/ssm.12071.
- [17] M. Hugerat, “How teaching-based science using project