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Project-Based Learning Implementation in Higher Education for Econometrics Science

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A B S T R A K

Ekonometrika menjadi studi yang esensial dalam jurusan Ekonomi Pembangunan. Dengan kemampuan ekonometrika yang memadai dapat meningkatkan kemampuan mahasiswa untuk memproses data dan menganalisis ekonomi. Kegiatan kuliah yang monoton dan kesulitan mahasiswa dalam dunia kuliah dikaitkan dengan teori yang diajarkan dalam situasi nyata. Salah satu cara dalam peningkatan kemampuan praktis mahasiswa yaitu melalui model pembelajaran yang inovatif melalui Project-based Learning (PjBL). Dalam PjBL mahasiswa dituntut untuk aktif sepanjang proses pembelajaran. Dosen akan memimpin proses, memberikan umpan balik kepada mahasiswa dan menilai kinerja pembelajaran. Penelitian ini adalah penelitian kuasi-eksperimental yang melibatkan sampel dari 59 orang yang diambil oleh teknik pengambilan sampel acak sederhana. Data yang dikumpulkan dianalisis menggunakan tes ANOVA satu kali. Bukti empiris menunjukkan secara bersamaan perbedaan yang signifikan dalam hasil belajar dan kemampuan pemecahan masalah pada mahamahasiswa sarjana yang menggunakan metode PjBL dibandingkan dengan metode konvensional. Studi ini menyimpulkan bahwa model PjBL secara efektif meningkatkan kemampuan untuk berpikir aktif dan memecahkan masalah bagi mahasiswa dalam kursus Ekonometrika.

A B S T R A C T

Econometrics became an essential study in the Department of Development Economics. With adequate econometric skills, it can improve students' ability to process data and analyze the economy. Monotonous lecture activities and student difficulties in the world of lectures are associated with theories taught in real situations. One way to improve students' practical abilities is through innovative learning models through Project-based Learning (PjBL). In PjBL, students are required to be active throughout the learning process. Lecturers will lead the process, provide feedback to students and assess learning performance. The study was a quasi-experimental study involving samples from 59 people taken by a simple random sampling technique. The collected data were analyzed using a one-time ANOVA test. Empirical evidence shows simultaneously significant differences in learning outcomes and problem-solving abilities in undergraduate students who use the PjBL method compared to conventional methods. The study concluded that the PjBL model effectively improves the ability to think actively and solve problems for students in Econometrics courses.

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1. INTRODUCTION

Econometrics is an essential science in lectures, especially in the Department of Development Economics, because it provides many uses and can be implemented in various fields of life. Econometrics consists of 3 theoretical fields important in economics, namely economic theory, mathematics, and statistics. Overall, in Econometrics, students will understand how to prove various economic theories using existing data. In other words, Econometrics has a target to improve students' ability to process data. Data processing is needed by students in the short and long term. In a short time, proficiency in Econometrics is expected to facilitate students in completing the preparation of the final project. Meanwhile, in the long term, being proficient in Econometrics is expected to be the basis for students to develop economic analysis skills that they can use in the world of work.

In the Econometrics course activities that students will take, students will face various kinds of basic Econometric theories vital for students to know. In the learning process in general, the entire lecture time of students is used to listen and record material. So far, lecture activities that tend to be monotonous harm students, such as boredom and laziness, especially in training students to answer questions if not instructed by the lecturer. Students also find it very difficult to relate the theory being taught to real-world situations. Theoretically, students can understand what is obtained from learning activities, but in practice, students will find it challenging to apply these theories in the actual data processing. Considering the very importance of improving practical skills in students, it is urgent to strive for an innovative learning model.

Learning process using the Project-based Learning will influence the students to participate actively by expressing their Econometric ideas, then will lead to their enthusiasm.

In the Project-based learning, the students have to be expressed their idea clearly, participate actively and explore the challenge diligently during the learning process. At the same time, the lecturer leads the process, provides feedback to students, and assesses learning performance. The tendency of passive students is raised through Project-based Learning activities (KİMSESİZ, 2017; Mulyadi, 2016, Supriadi et al., 2018) ;. In applying Project-based Learning in lectures, students will be proficient in theories and experienced in data analysis and implementation obtained through project completion. In addition, the Project-based Learning method will ameliorate disciple' ability to solve problems directly. Then the solution involves project work that is indirectly active and trained to act and think creatively, improve collaborative skills, and increase enthusiasm. In line with the research of Condliffe, Visher, Bangser, Drohojowska, & Saco (2017), and (Gunawan, et.al., 2017) which say that this model is bringing an upside cognivity capacity.

Students will be fully involved and required to do activities individually or in groups. Innovative learning related to the implementation of Econometrics in this proposal uses research on problems and Project-based Learning, which has stages that distinguish it from other learning models. The stages of implementing Project-based Learning conducted by students based on the explanation of (Yulianto et al., 2017), include: (1) Setting basic questions, (2) Make project designs, (3) Draw up a plan, (4) Reviewing project progress, (5) Assessment of project results, (6) Experience assessment. With such a learning process, it is hoped that students will understand the Econometric theory and apply what they have learned.

Project-based learning is a basic constructive teaching method and depends on the search process and the ability to develop solutions according to each other's way of thinking and views (Nabawi, et.al., 2018). This method will allow students to work with concepts from the material provided and then be able to discuss them with groups and give presentations from the results of these discussions. Questions and products are important components of this project because the questions will lead students to learning activities. In contrast, the product will be the embodiment of solutions from the learning activities carried out. Learning activities in Project-based Learning require collaboration from groups. Project-based learning allows disciple to involve with activities planning freely, collaborate on some issues, and in the final analysis they will present their findings to others (Wayan Rati, Kusmaryatni, and Rediani, 2017).

Nurmi et al., (2020) affirmed that this teaching materials could contribute to students, including students, to participate actively and be enthusiastic in participating in the learning process. The research results also support this by Habók & Nagy (2016), which also found that PjBL would require students to be active in learning activities. The majority of students have a positive attitude about Project-based Learning-based teaching materials (Chu et al., 2011). Project-based learning makes learning meaningful (García, 2016). In general, student learning outcomes using Project-based Learning-based teaching materials increased significantly (Nurmi et al., 2018). A learning process can be said to be successful if the learning can motivate students and generate an effective learning process (Afriana et al., 2016). In

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particular, by the end of certain assignment or class, the learning outcome of a dynamic classroom approach, the disciple understands the knowledge deeply.

Project-based Learning brings students to find solutions to existing problems and gain problem-solving skills, communication, and teamwork skills. This method requires students to solve problems using current theories. Students must also learn to align what they know for their future profession to conclude that Project-based Learning places students as the main characters in the educating process. Project-based Learning can improve students' skills in determining their future profession because, through this method, students gain a lot of experience in the real world of work.

Project-based Learning becomes a feasible method to be applied. A statement supports it in the journal (Chen & Yang, 2019) in their article, which states that project-based Learning has become a more effective method in recent years. Two things can cause this. First, in recent years studies on project-based learning methods have increased, making it easier for teachers to learn and apply this method. Second, during the last decade, teachers and several organizations have paid attention to this Project-based Learning method to develop this method more effectively. It is in line with the research of (Dole et al., 2015) and (Dole et al., 2017). The transformation of teachers and students, which previously were teacher-centered to learner-centered, resulted from project-based Learning, which makes educational methods more mature.

Project-based Learning has a complex process and also requires collaboration. Otherwise, it can have a positive impact on students, including university students. Moreover, the method is considered to have a more positive impact on students than other traditional methods. By means of (Chen & Yang, 2019), students who participate in Project-based Learning have higher academic achievements than students who participate in traditional instruction. The research results by (Rati et al., 2017) also show that there is a significant difference in students' skills who take Project-based Learning and conventional learning methods. The study also found that the creativity of students who applied to learn with the Project-based Learning method was in the category very high.

The processes in the Project-based Learning method will help develop students in critical thinking because disciples are required to competent at provide solutions to existing problems. Of course, this is done collaboratively so that it encourages students to work together. Project-based learning can also increase student confidence because students will learn to convey their ideas and present the results of the discussions that have been carried out. In addition, Project-based Learning will improve the ability of each individual to collect data and analyze it.

According to (Isabekov & Sadyrova, 2018), developing and implementing curriculum and programs are break in the clouds which have been impacted. However, educational staff should be upgraded to modern methods for broader social and systemic change. This innovational learning is one approach that allows students to fully utilize the potential students to increase motivation and develop independent learning, analytical and problem solving, and critical thinking and teamwork skills. The skills mentioned above are widely regarded as required capability for the common labor market. It is in line with the background mentioned in the previous chapter. Implementing practice in the Econometrics course using research on problems and Project-based Learning impacts the short term and in a long time, which can be implemented in the modern world of work due to the the disciple's readiness in facing challenges in labor market. However, this Project-based Learning learning process has problems in its implementation. Project-based learning requires active participation from students so that they can find solutions to existing problems. Therefore, if students are less involved in participating in implementing this method, the learning process will not be optimal.

Based on research conducted by Nurfathurrahmah et al., (2021) on implementing the Project-based Learning process model can enhance the disciple's educating activities and improve learning outcomes aspects of insight, attitudes, skills, or abilities of students in PBTIK courses. It is in line with research conducted by (Zakiah & Fajriadi, 2020) that the learning process using Project-based Learning can explore students' creativity and thinking skills. Through project submission, they are encouraged to explore more from planning process, realizing the product (building insight, understanding, skills, product development), and presenting and evaluating it. So that the assessment can be carried out wholly and objectively, not only making an assessment based on the final result.

2. Methods

This type of quasi-experimental research has a control group but cannot fully control external variables that affect the implementation reffering to Sugiyono (2017). Therefore, the researcher used two sample groups in this experimental study, namely the experimental and control groups. In addition, this

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study used a non-equivalent post-test-only control group design. The research design is presented in Figure 1.

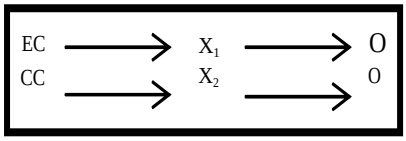

Figure 1. Non-equivalent research design post-test-only control group design

The data population in the study was three Econometrics classes with 105 students. The study uses purposive random sampling with 59 respondents as subjects of analysis. Selecting the number of respondents based on the student's basic competence is measured by the quick test before the experiment starts. Besides, the standard number of test samples of 30, and the number of test samples has been more to meet standards. There are two types of instruments used to collect data: the creative thinking ability questionnaire and the Econometrics learning outcome test. The collected data was then analyzed using parametric statistics in the form of ANOVA. Still, previously the prerequisite tests were carried out, namely: normality test of data distribution and homogeneity of variance test.

3. Result and Discussion

Based on the data collected, a prerequisite test is carried out, consisting of tests for normality and homogeneity of variance with a significance level of 0.05. Normality test results obtained as presented in Table 1 below:

Tabel 1. Normality Test

		Kolmogorov-Smirnov			Shapiro-Wilk		
LEARNING METHODS		Statistic	df	Sig.	Statistic	df	Sig.
trans-Result	WITHOUT_PJBL	.123	59	.026	.963	59	.071
	WITH_PJBL	.090	59	.200	.957	59	.037

Based on the normality test results using the residual standard, the Kolmogorov-Smirnov significance value is > 0.05, which means that the data is normally distributed. Similarly, the homogeneity test results also showed that the data was homogeneous so that it met the prerequisite test. Furthermore, an ANOVA checks the difference between two groups by comparing the means of different samples. Finally, the practical class was treated using a project-based learning model. The results can be presented as follows:

Tabel 2. Anova Test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	695.370	1	695.370	3.473	0.065
Intercept	715971.114	1	715971.114	3575.860	.000
Learning Methods	695.370	1	695.370	3.473	.065
Error	23225.924	116	200.223		
Total	739892.408	118			
Corrected Total	23921.294	117			

Table 2 exhibits the comparison results between experimental and regular class. The results depict that the difference in learning outcomes between the control class and the experimental class is existing. Thus, it proves that learning outcomes in classes that use project-based learning are different from classes that do not use project-based learning methods. Furthermore, the evaluation result from Google Form is shown below:

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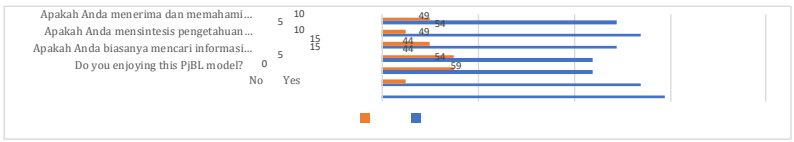
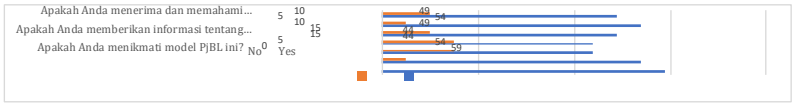


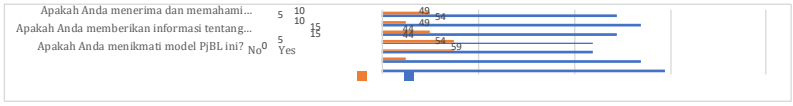
Graph 1. Student Enjoy Using PjBL

Graph 1 shows that all of the students are enjoying using Project Based Learning for Econometrics. The reason is collaborative planning making the students feel responsible with the project. The project will engage to them with the way they encounter the problems and present the response of driving question.



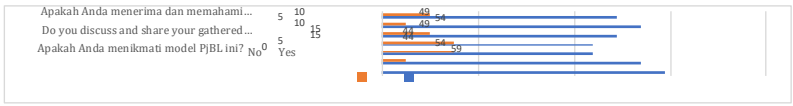
Graph 2. Student's Motivation Using PjBL

Graph 2 shows that the majority of students are motivated to learn when using PjBL. Of the total respondents, 92% feel motivated to study further and are interested in studying Econometrics courses.



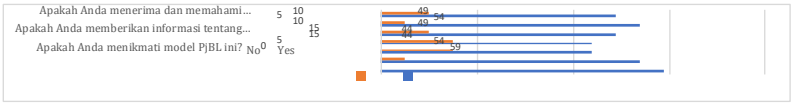
Graph 3. Student's behaviour on project work

Graph 3 shows that 75% of students will collect information related to the project they are working on. Usually, students look for information through the internet. Thus, students will seek information from various sources.



Graph 4. Experiential Learning Ability

After collecting information from various sources, 75% of students will receive and acquire the data obtained. The students will then use this information in the work process until the completion of the project.



Graph 5. Construct Knowledge Ability

Students seek and receive information from various sources, but they also relate it to existing projects and knowledge or theories. As a result, nearly 83% of students synthesize the results of the projects. Moreover, they have completed with existing science and theory.

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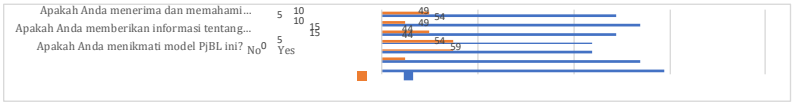
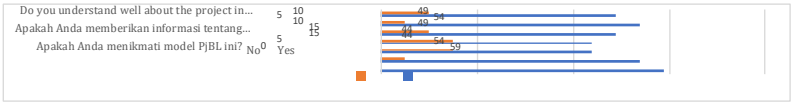


Graph 6. Students involved actively and shared goal through collaboration

Based on graph 6, it is known that 92% of the total responses like high activities and learning involvement in their activities. Thus, implementing the PjBL model is very suitable and encourages high student involvement in learning and activities.



Graph 7. The students' understanding on PjBL

After using active and dynamic model, 83% of students understood the Econometrics material that was taught well. It is evidenced by the higher learning outcomes in classes that use PjBL than conventional classes without PjBL. The presentation of the results above provides empirical evidence that implementing the project-based learning model can upgrade student's ability and willingness to study creatively. It is readily apparent from the Econometric marks in the class that uses PjBL, which is higher than the conventional class that does not use PjBL. These results confirmed (Rati et al., 2017), who found differences in student learning outcomes who took PjBL with conventional methods. It is also supported by (Chen & Yang, 2019), which proves that students in classes that use PjBL have higher academic achievements than traditional classes. Finally, this innovative and fun education model has a positive impact on students' cognitive capacity (Gunawan, et.al., 2017).

The difference in learning outcomes is that students must think actively and creatively to solve the problems given in their project assignments. Students are motivated to explore the material and seek knowledge from various sources to complete their projects. It can be seen in the results of the study, which showed that 92% of students were motivated to learn when using PjBL, and 75% of respondents actively searched for information on the internet related to the project they were working. According to the research results of (Afriana et al., 2016), learning is successful when students are motivated to generate an effective learning process.

Furthermore, students will receive and synthesize the information they have obtained with their completed projects and existing theories. It can be seen from the study results, which showed that 75% of students received and acquired information from various sources that they obtained through the internet. Meanwhile, 83% of students will relate the projects they have completed to existing science and theory. In line with (Nabawi, et.al., 2018)which states that with PjBL students will seek and be able to develop solutions in their way and point of view.

When using PjBL, students must be active and creative in finding information to complete their projects. As a result, students are automatically required to have high learning activities. The high activity and learning involvement turned out to be favored by students, which reached 92% of the total respondents. These results indicate that students will be more interactive when involved in the educating process and completing the given project. As equally found by (Nurmi et al., 2020), PjBL increased active participation and student enthusiasm in the learning process.

When students have high involvement in learning, students will automatically learn and synthesize their knowledge with existing theories. Finally, students will have a good level of understanding. Evidently, out of 59 respondents, 83% of them have a good understanding after implementing PjBL. It shows that there has been a change from teacher-centered to learner-centered according to (Dole et al., 2017). Students feel they have been freely developed their creativity in solving problems. Students can think critically and try to solve the problem in their way. In line with (Zakiah & Fajriadi, 2020), students explore creativity and critical thinking skills through PjBL. In solving the problem, students develop their understanding from the various information they have obtained.

Finally, 100% of students enjoy and feel happy when using the PjBL model. An attractive learning model for students will increase their active role. Students are actively involved in collecting information

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and receiving this information as material for completing a given project. Then, students will relate what they have learned when completing the project with existing theory. When students feel uncomfortable, they are not enjoying the class and tend to be passive, resulting in low learning outcomes.

4. Conclusion

The research results and the explanation above show that the Project-Based learning model can effectively refine critical thinking skills and the active role of students in problem solving, especially for students in Econometrics courses. In addition, student learning outcomes using the PjBL model are higher than conventional methods. Students are also motivated and enjoy learning using the PjBL model. Finally, students can understand Econometric material in their way. Thus, students are proficient in theory and can implement the theory to bring the succesful conclusion in the real world.

In the future, it is hoped that educators, especially lecturers, can apply this PjBL model as a technology-based learning model that attracts students, especially in subjects that require high critical thinking skills. Thus, students will enjoy the class, motivate to learn better and solve problems in the real world.

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