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Improving Geography Learning through Project-based Learning Model

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Abstract--- *The project-based learning (PjBL) model is an Indonesian 2013 curriculum recommended models. The PjBL model is recommended to increase activity and student learning outcomes. This study aimed to analyze the utilization of a project-based learning model to improve the students learning outcomes of XI Social Science class in Senior High School 12 Banjarmasin regarding eco-efficiency utilization of natural resources. It was conducted to improve the learning outcomes of XI Social Science class in Senior High School 12 Banjarmasin students regarding the eco-efficiency utilization of natural resources. This study design was a quasi-experimental with a non-equivalent control group design. Instruments used were a multiple-choice test consisting of 25 questions. The research population was all the XI social science class. The research sample was the students of Class XI 1 and XI 2. Total students in XI 1 is 29 students. The total student in XI 2 was 27 students. Class XI 2 was treated as an experimental class and Class XI 1 as the control class. Data collection used tests and documentation. Research analysis exhibited that the average score of student learning outcomes using project-based learning models is 79.76. On the other hand, the average score of students learning outcomes using the conventional model is 65.93. Independent sample t-test obtained t-count greater than t-table (4.441> 2.004). Students' learning outcomes using project-based learning is higher compared to the conventional model. It indicates that project-based learning can improve students learning outcomes on eco-efficiency utilization of natural resources subject.*

Keywords--- *Geography Learning Outcomes, Project-Based Learning, 2013 Curriculum.*

I. INTRODUCTION

Education is crucial to support the advancement of human development [1]. One of the main capitals for nation development is reliable human resources, as is it challenged by education in the era of industrial revolution 4.0. To obtain a high-quality education, the Indonesian government needs to set a certain school curriculum [2,3]. Curriculum 2013 is a curriculum that emphasizes skill, understanding, and character education. Students are required to be familiar with the material, active in discussions, able to collaborate with friends, as well as being polite and disciplined [4].

The learning process is essentially useful for developing skills and creativity. Geography is a subject possessing a very broad scope, especially in understanding the interaction of humans on the environment. The human role and behaviour affect the environment. Results of preliminary observations in Senior High School 12 Banjarmasin

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determined several factors affecting low geography learning outcomes. The students were not able to develop creative thinking and incapable to construct knowledge presented by the teacher. The teaching method used remained teacher centered.

A geography learning model involving students during the learning process is required. Curriculum 2013 recommends three learning models used. The learning models are model-based learning (problem-based learning), discovery-based learning model (inquiry), and project-based learning model (PjBL). The PjBL is potentially used to overcome the described issue. Project-based learning involves students in the learning process, honing skills, self-contained student learning, and encourages creativity in the learning experience [5].

The PjBL is a strategy that provokes students to think and learn independently. Students solve problems in the real environment by collating issues, forming plans, organizing research, and undertaking a variety of problem-solving strategies. Students develop the motivation and desire to improve skills [6]. Implementation of PJBL models is as follows: the teacher assigns students with a challenging question to students before performing the activity. Teachers and students collaborate in planning projects. It would encourage students' involvement and a sense of ownership on the project [7,8].

The planned project is to be continued with the preparation of the project construction schedule. During the project, teachers monitor student roles in completing the to express their project. Projects carried out in the form of activities. The students do not merely memorize facts. They are expected to connect facts and think. They apply existing knowledge to the real world. Furthermore, the project result will be presented in groups in front of the class. The presentation represents students' achievement and experience throughout the process. The teachers would then evaluate it. [9-11] . The PjBL models are believed to increase student learning outcomes.

The PjBL model is capable to increase activity and student learning outcomes [9, 12,13]. Project-based learning improves student motivation by incorporating a fun atmosphere, improve problem-solving abilities, improve collaboration, and engage students in a complex manner to carry out important work that connects learning in school to the real world [9]. Project-based learning explores new fields, determines new scientific problems and integrates the knowledge of various subjects [14,15] .

Learning environment puts children in control since they define their plans and tests, and work on ventures that they care almost actually, rather than reproducing others try[16]. The PjBL was shown to be an energizing strategy to advance understudies learning, inspiration and self-image, and more noteworthy victory within the registration examinations [17]. The PjBL could be a well-known strategy for conferring considering competencies and making adaptable learning situations. The instructive framework more often than not coordinates gifted understudies to extra-curricular programs to cultivate learning and create considering competencies [18].

Student learning outcomes are a measure of success during the learning process. Learning outcomes of geography subjects in XI-Social Science class in Senior High School 12 Banjarmasin is presented in Table 1.

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Table 1: Average of Geography Learning Outcomes in Academic Year 2018/2019

No.	Minimum Level Criteria	Social Science Class	The Number of Students	Average
1	75	XI 1	29	41.29
2		XI 2	27	39.9
3		XI 3	30	53.5
4		XI 4	24	33.01

Source: Senior High School 12 Banjarmasin in Academic Year 2018/2019

Learning outcomes of geography are relatively low as exhibited in table 1. XI-Social Science class has an average value under minimum level criterion. XI-Social Science data can be used as one indicator of problems in student learning outcomes. The objective of the study is to analyze the utilization of project-based learning models to improve the students learning outcomes of XI Social Science class in Senior High School 12 Banjarmasin regarding eco-efficiency utilization of natural resources.

II. MATERIALS AND METHODS

The research was a quasi-experimental study design with non-equivalent control group design. The design of research has a control group. However, it was not able to function fully in the control group external variables affecting experiment implementation [19]. The study design is exhibited in Table 2.

Table 2: Pre-Test and Post-Test Control Group Design (Quasi-Experimental)

Class	Pre-test	Treatment	Post-test
Experiment	O_1	X	O_2
Control	O_1	-	O_2

Determining the subject of research was conducted using a simple random sampling technique, which requires normal and homogeneous distribution data. The total student in Class XI 1 is 29 students. The total student in Class XI 2 is 27. Class XI 2 was treated as an experimental class and XI 1 as the control class. This class was chosen as the research sample because it has the highest significance normality value (p) = 0.2> 0.05 and has a homogeneous value with the highest significance value, namely XI 2 (p) = 0.277> 0.05 and XI 1 (p) = 0.230> 0.05. It indicates that the data are homogeneous variants. Class XI 2 was made an experimental class because the class had a lower geography exam score than the other classes. The experimental class undergoes education using the PJBL method. The control models used conventional learning. Experiments were carried out in 2 meetings. This research used 25 of multiple-choice tests. The items were declared valid because each indicator in terms of cognitive domain C1-C5 is already represented in the problem. The instrument has a reliability value of 0.927.

III. FINDINGS

The research result exhibited the experimental class pre-test average value of 46.67. The control class obtained a pre-test average value of 48.28. The pre-test value of these two classes is categorized adequately. The experimental class post-test average value was 79.76. On the other hand, the control class post-tests average value is 65.93. The experimental class exhibited higher average improvement compared to the control class. The experimental class gain score value was 32.59. The control class obtained 17.66 gain-score value. It exhibits PjBL improves learning compared to the conventional learning model.

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Table 3: The Average Value of the Pre-Test, Post-Test, and Gain Score

No	Class	Pre-test	Post-test	Gain Score	N-Gain Score (%)
1	Experiment	46.67	79.76	32.59	59.36
2	Control	48.28	65.93	17.66	34.07

Source: Statistics Test Results SPSS version 20, 2019

Based on N-Gain Score average calculation, it exhibited that the average value of the N-Gain Score for the experimental class is 59.36 % (Effective) and the average value of the N-Gain Score for grade control is 34.07 % (Less Effective). The experiment class N-Gain is higher compared to the control class.

3.1 Prerequisites Test Analysis

3.1.1 Normality Test

The normality test is presented in Table 4.

Table 4: Experiment Class and Class Data Control Normality Test Results

No	Calculations Learning Outcomes	Value Sig. (p) $\alpha = 0.05$		Information	
		Experiment	Control	Experiment	Control
1	Pre-test	p = 0.155> 0.05	p = 0.200> 0.05	Normal	Normal
2	Post-test	p = 0.074> 0.05	p = 0.142> 0.05	Normal	Normal
3	Gain	p = 0.200> 0.05	p = 0.086> 0.05	Normal	Normal
4	N-gain	p = 0.070> 0.05	p = 0.200> 0.05	Normal	Normal

Source: Statistics Test Results SPSS version 20, 2019

Analysis prerequisite tests conducted were normality and homogeneity tests before conducting an Independent t-test. The sample t-test data distribution ought to be normal and homogeneous. Data normality test results exhibited a significance level of 0.05. It indicated that the pre-test, post-test, gain, and N-gain scores in the experimental class and the control class are normally distributed.

3.1.2 Homogeneity Test

The homogeneity test is presented in Table 5.

Table 5: Experiment Class and Class Data Control Homogeneity Test Results

No	Calculations of Learning Outcomes	Value Sig. (p) $\alpha = 0.05$	Information
1	Pre-test	p = 0.977> 0.05	Homogeneous
2	Post-test	p = 0.075> 0.05	Homogeneous
3	Gain	p = 0.531> 0.05	Homogeneous
4	N-Gain	p = 0.301> 0.05	Homogeneous

Source: Statistics Test Results SPSS version 20, 2019

The homogeneity test exhibits a significance level of 0.05. It indicates that pre-test, post-test, gain, and N-gain scores in the experimental class and the control class are homogeneous. All data can be tested independently for the sample t-test hypothesis.

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3.1.3 Hypothesis Testing

Hypothesis testing was conducted using inferential statistical parametric tests and independent sample t-test. The hypothesis is received under the following condition: t-count < t-table then H0 is accepted and Ha rejected. Whereas t-count > t-table indicates H0 is rejected and Ha accepted. The project-based learning model is applied to the experimental group. On the other hand, conventional learning was applied to the control class.

Table 6: Hypothesis Assessment Calculation Results

Statistical	**Pre-test**	**Post-test**
t-count	-0.612	4.441
t-table	2.004	2.004
Decision	H0 accepted and Ha rejected	H0 rejected and Ha accepted

Source: Statistical Calculation Results Test Version 20, 2019

The t-table taken from tablet statistic at a significance level of 5% or 0.05 is equal to 2.004. Table 6 exhibits that the t-count of the pre-test is lower than the t-table at -0.612 <2.004. Therefore, H0 is accepted and Ha is rejected. It indicated no significant difference between the average results of experimental class learning and classroom control before being given treatment. On the other hand, the post-test t-count is higher than the t-table 4.441> 2.004. Therefore, H0 is rejected and Ha accepted. It indicated significant differences between the experimental class and the control class. In other words, there is a significant difference between providing learning model application project-based learning and conventional model.

IV. DISCUSSION

Based on the research findings, there is a significant difference between experimental and control class post-test results. The project-based model encourages direct student involvement, independent study to construct knowledge of study material, student-centered learning, and creative thinking skills. According to Fathurrohman [20], direct involvement of students in learning activities will improve achievement or learning outcomes, in particular, the ability of understanding and communication. It is also supported by previous research [8, 21-25].

The hypothesis test results exhibited that there were significant differences in the implementation of the project-based learning model. This is supported by the pre-test and post-test value of the experimental class and control class. The value of the t-count greater than the t-table (4.441> 2.004). It indicates that H0 is rejected and Ha accepted. Therefore, the data is significant, and the use of a project-based learning model can improve student learning outcomes.

The result of the research is supported by [26-28], exhibiting a significant difference in learning outcomes of cognitive competence or knowledge between experimental class and conventional learning control class. The PjBL model in the experimental class produced higher learning outcomes compared to the conventional learning model.

The N-gain or student learning outcomes are as follows: the experimental class with a percentage of 59.36% (Effective) and the control class with a percentage of 34.07% (Less Effective). The learning outcomes of project-based learning is merely at 59.36% as it does not reach 100% effectiveness.

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External factors affecting the effectiveness percentage of learning achievement using the PjBL model are as follows: teachers in the research location had never used the PjBL model on geography classes, the students are not familiar with the PjBL model and never conducted the project-based activity in class. Another factor influencing effectiveness is project cost. The students have a disadvantage in the data collection process. Therefore, they encounter difficulty at the beginning of the project. This is consistent with the weakness of the PjBL model proposed by [29], that the PjBL model difficult to implement due to the teacher generally using a conventional teacher-centered learning model.

The PjBL model is a learning method that revolved around a project. These learning shows have to be be based on challenging questions or issues that include understudies in exercises design, problem-solving, choice-making, or examination; it permits a student to memorize in relative terms [30,31].

Students have a chance to unravel interdisiplinary issues by themeselves and they can react to exercises exterior the school environment [32]. In replying to the guidelines' objectives, students' recognitions of accomplishment, understanding of learning, examining propensities and intuitive with others within the ponder environment are a few of the deciding variables [33].

Learning activities through project exposes students to real problems and obtain concrete experience ensuring students learn actively and encourages creative thinking skills [5]. Another point raised by [34] exhibited that the PjBL model provides a significant impact on student learning outcomes as the stages in the PjBL model encourages students to solve the problem at hand independently and determine the concept through inquiries and data collections.

Eco-efficiency utilization of natural resources is one material that requires students to plan and carry out an activity to exploit natural resources as efficiently as possible. It ensures students can determine the concept, make the concrete experience, and memorize the study material. Thus, the learning material is suitable for use with a model-based project or project-based learning.

The experimental class activities utilizing the PjBL model started from constructing a project plan up to project report containing conclusions and innovation. The first step requires the teacher providing a fundamental question. The fundamental question was provided to mirror real-world situations. Therefore, the students are challenged to determine the answers. On the other hand, the control class students are asked to conduct a discussion without fundamental questions as provided in the experimental class. Therefore, the students merely focused on books and images shared by teachers as exhibited by [35].

The second step in a PjBL model is planning a project. In this step, the teacher and students collaborate in planning a project. It would create a good relationship between teachers and students. The project would encourage student-centered learning. The control class students are asked to directly analyze images shared by teachers. The students' knowledge is limited as they merely comply with teachers' instruction, compared to the experimental class students who actively involved in the learning process by conducting a project to answer the fundamental question provided by the teacher.

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The PjBL model and the demands of 21st-century skills consist of communication, negotiation, and collaboration. Students work on projects that require brainstorming ideas and be a good listener in the group. The PjBL model encourages students listening skills. It would increase collaboration and creativity. Students learn productive communication skills, respect others, and cooperate by collaboratively constructing solutions or ideas. Discussion or negotiation process on determining solution is part of PjBL [6].

The third step in this research project is compiling a schedule of events. In preparing the schedule of the project activity the teacher can teach students a new way of implementing the learning, which encourages student interest. The scheduling timeline and the deadline for completing the project will encourage the student to be disciplined.

The fourth step is the role of a teacher to monitor student activities. The teacher guides the students on how to conduct a group project. The fifth step is presenting the project result. The students presented the results of the work of their project in the form of products. The teacher can measure each student's progress, encourages creativity, and giving positive feedback on the student level of understanding. Feedback offers encouragement to the students on their learning process, despite not providing a perfect outcome. On the other hand, control class students were not tasked to create a product. Therefore, the teacher has not been able to develop students' creativity, as stated by [36,37].

The sixth step or the last step of the PjBL model is to conduct an evaluation. In this evaluation, some representatives of the students were asked to express their feelings and experiences for completing the project. It is conducted to ensure the students know their shortcomings in terms of completing group work. The students gain new experiences from projects that have been carried out, as stated by [5].

At the end of the PjBL model, students make an assessment. They not only assess their learning but also to assess the success of their social interactions. They judge based communication skills, if they are aware of them being a good listener, and if they believe that their ideas heard. Routine self-assessment activity would improve student ability [6].

The PjBL model encourages responsibility, self-reliance, and discipline. Students devise plans and focus on their respective work as a group member. As students become enhanced within the PjBL model, they learn to observe their progress through the daily agenda setting. At the top of every work session, students report whether or not they have their goals for the day or not. Students must use their period time effectively and remain focused to achieve success. Setting goals helps students learn to arrange their own time. Teachers must be arranged with their students. These abilities are basic for future victory at school and life [6].

This contrasts with the control classes that implement the conventional learning model by observing, frequently asked questions, and discussion. The learning process in the control class does not involve students directly in activities or solve real problems. This has led to a significant difference between the control and the experimental class.

Learning theories that support measures of the PjBL process is Piaget and Constructivism Theory [38]. Formulating the problem step in the PjBL process is in line with Piaget's theory in which students are required to

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solve the problems brought to them is to make a formulation of the problem, steps required to solve the problem, ideas to complete a project. The students actively and directly involved in completing a project is in line with the theory of constructivism [39]. Learning that focuses on student-centered can improve geography learning outcomes [40].

Project work itself includes complex tasks supported questions and issues that challenge and requires students to style, solve problems, make decisions, and supply opportunities for college students to figure independently. Learning to use a PjBL model involves students applied and hone students' creativity in making a project. Although all students have the creativity and ideas in conducting the project, at a certain moment the students tend not to have an idea in designing a project.

V. CONCLUSION

The poor geography learning outcomes in Social Science Class XI Senior High School 12 Banjarmasin was solved utilizing project-based learning. The research result indicated that: (1) Students can develop creative thinking by actively running a project and produce useful results. (2) To teach students to conduct a scientific approach by employing a student-centered learning process. The student is responsible for planning, implementing, and reporting project results. (3) Students can construct knowledge to be directly involved in the completion of a project and data collections to solve problems.

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