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Abstract. *This research aims to determine the effect of implementing the Project Based Learning model on the biology learning outcomes of class X SMAS PGRI Sungguminasa students on environmental change material. This type of research is a quasi-experimental (Quasi-experimental). The population in this study were all class X students at SMAS PGRI Sungguminasa with a research sample of 53 students using total sampling technique. Data collection techniques use test methods and data analysis through Anacova analysis. The research results show that the learning outcomes using the Project Based Learning model obtained an average value of 78.20. Meanwhile, the conventional learning model obtained an average value of 64.29. The results of the anacova test analysis obtained a sig value = 0.000 <0.05. This means that there is a significant difference between the post-test scores of classes taught with the PjBL model and the post-test scores of classes taught with the conventional model, PjBL learning outcomes are greater than conventional learning outcomes. This shows that there is an influence of the Project Based Learning model on the biology learning outcomes of class X students at SMAS PGRI Sungguminasa.*
Keyword : *Project Based Learning (PjBL), learning outcome.*

Andi Annisa Putri Ramadhani
Universitas Negeri Makassar
Indonesia

Andi Faridah Arsal
Universitas Negeri Makassar
Indonesia

Muhiddin Palennari
Universitas Negeri Makassar
Indonesia

The Influence of The Project Based Learning (PjBL) Model on Biology Learning Outcomes of Class X Students of SMAS PGRI Sungguminasa on Environmental Change Material

Andi Annisa Putri Ramadhani
Andi Faridah Arsal
Muhiddin Palennari

Introduction

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students are able to actively develop their potential to have knowledge, religious spiritual strength, personality, noble morals, self-control, intelligence and skills needed for themselves, society, nation and State (Law No.20 of 2003 concerning SISDIKNAS). Education not only seeks to achieve learning outcomes but is also about how to obtain the results or learning processes that occur in children. Education is not just about providing knowledge or training students' skills, education also functions to develop the self-potential that students already have. Students are not empty glasses that must be filled, but they already have something or knowledge, a little or a lot, have been actualized or still have potential. Students have the ability to grow and develop themselves. Learning is a process carried out to gain knowledge and experience in permanent changes in behavior and direct interaction abilities that occur as a result of interactions between individuals and their environment. Learning is a condition that is created from relationships or interactions that occur between various factors and components which include teachers, students, methods, media, curriculum, facilities and other necessary components. In the learning process, it is necessary to apply appropriate models, methods and learning materials so that they can support the learning process so that the learning process runs well. With the learning process, it is hoped that in the future there will be changes for the better, including increasing students' skills, knowledge and behavior after the learning process. One effort to increase students' interest in learning is by implementing learning models. Jagantara, et.al (2014) stated that Project Based Learning is a learning model that is able to increase students' interest and learning

outcomes in biology learning.

The PjBL model is a learning model that gives students the time and opportunity to solve/resolve a given problem, either individually or in groups, depending on environmental conditions in relation to the material provided. Project-based learning is a learning model that prioritizes student experience, increases creativity and helps students find new ideas and create works/products based on concepts, theories or information they receive. (Natty, et.al, 2019).

Research Methods

The research design used was Quasy Experiment. This experiment was carried out without selecting samples randomly. the design is in the form of a nonequivalent control group design. The group will first be given a pre-test, then given treatment and finally given a post-test. The specific design is explained in the following table.

Tabel 1. Desain *Pretest-Posttest Control Group Design*

Group	*Pre-test*	Perlakuan	*Post-test*
Eksperimen	O1	X_1	O2
Kontrol	O3	X_2	O4

Keterangan:

O1 : *Pre-test* kelompok eksperimen
O2 : *Post-test* kelompok eksperimen
O3 : *Pre-test* kelompok kontrol
O4 : *Post-test* kelompok kontrol
X_1 : Penerapan model PjBL
X_2 : Penerapan model konvensional

The population in this study were all students in class class X at SMAS PGRI Sungguminasa. The technique used in sampling is the total sampling technique. The variables in this research are the independent variables, consisting of the Project Based Learning (PjBL) learning model and the dependent variables, namely student motivation and learning outcomes. This research uses descriptive statistical analysis methods and inferential analysis. To test the research hypothesis, use Anocova analysis with the Statistical Package for Social Science (SPSS) 26.0 for Windows. Before carrying out data analysis, the data obtained is first assumed to be normality and homogeneity tests.

Results and Discussion

A. Descriptive Analysis

Pre-test and post-test results data for PjBL Class and Conventional Class can be seen in the SPSS output results in Table 02.

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Table 2. Descriptive Pre-test and Post-test of PjBL Class and Conventional Class

	Pre-test		***Post-test***	
	PjBL	Konvensional	PjBL	Konvensional
Rata-rata	42,00	42,50	78,20	64,29
Varian	102,083	87,963	99,750	67,989
Std. Deviation	10,104	9,379	9,987	8,246
Minimum	20	25	55	50
Maksimum	65	60	95	80

Based on Table 02, it can be seen that the average pre-test score for the PjBL class is 42.00 and the conventional class is 42.50. This shows that initially the two samples had equal abilities. However, after being given treatment using the PjBL model, different knowledge competency results were obtained, as seen from the post-test score for the class taught using the PjBL model, which increased to 78.20, higher than the post-test score for the conventional class, namely 64.29. Changes in learning outcomes for PjBL and conventional class students can be seen in Figure 01.

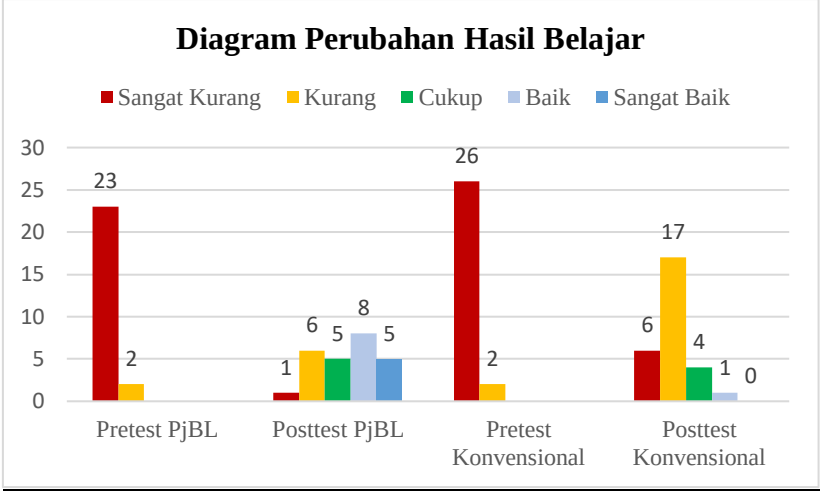

Figure 01. Diagram of Changes in Learning Outcomes

B. Inferential Analysis

1. Normality Test

The normality test in the PjBL and conventional classes is intended to determine whether the data studied comes from a population that has normal distribution values or not. This test uses criteria based on Kolmogorov-Smirnov. The normality test results for the PjBL and conventional classes can be seen in the SPSS output Table 03.

Table 3. Normality Test for PjBL Class and Conventional Class

	kelompok	*Kolmogorov-Smirnov*						
		PjBL			**Konvensional**			
		Statistic	df	Sig.	Statistic	df	Sig.	**Keterangan**
Nilai Tes	*pre-test*	0,156	25	0,120	0,141	28	0,164	Normal
	post-test	0,152	25	0,140	0,142	28	0,158	Normal

Based on Table 03, it is known that the significance value for the PjBL class pre-test is 0.120 > α = 0.05 and for the post-test data, the significance value is 0.140 > α = 0.05 in accordance with the normality test decision making criteria based on Kolmogorov-Smirnow, so the pre-test data test and post-test for the PjBL class were normally distributed. Likewise, the significance value for the conventional class pre-test was 0.164 > α = 0.05 and the conventional class post-test significance value was 0.158 > α = 0.05, also normally distributed.

2. Homogeneity Test

This test is intended to determine whether the data studied has a homogeneous variance, in this case the data from the PjBL class pre-test and conventional class pre-test as well as the PjBL class post-test and conventional class post-test. This test was carried out with the help of SPSS and used the Levene Test criteria. The Levene-test testing criteria are if the Levene-Test significance value is > α = 0.05, meaning it meets the homogeneity test. However, if on the contrary the significance of the Levene – Test < α = 0.05, then the data is not homogeneous. The output results of the homogeneity test can be seen in Table 04 below.

Table. 4 Pre-test and Post-test Homogeneity Test for PjBL and Conventional Classes

Test of Homogenity of Variance			
Based on Mean			
	Levene Statistic.	**Sig.**	**Keterangan**
Pre-test	0,070	0,792	Homogen
Post-test	1,474	0,230	Homogen

Source: Researcher's primary data.

From Table 4, the levene-test value obtained based on the mean pre-test for the PjBL and conventional classes is 0.070 with a significance value of 0.792 > α = 0.05 and the levene-test value obtained based on the mean post-test for the PjBL and conventional classes amounting to 1.474 with a significance value of 0.230 > α = 0.05. So, as is the basis for decision making in the homogeneity test, it can be concluded that the data variance from the pre-test and post-test for the PjBL and conventional classes is the same (homogeneous).

3. Hypothesis testing

Hypothesis testing was carried out to determine whether the learning outcomes of students in the experimental group were significantly different from the learning outcomes of students in the control group. Thus the statistical hypothesis is formulated as follows:
H0 = no influence, Sig value> (0.05)
H1 = there is an influence, Sig value <(0.05)
with the test criteria being if Sig.count < (0.05) then H1 is accepted and H0 is rejected, meaning there is an influence on students' biology learning outcomes between PjBL classes and conventional classes. The results of the analysis can be seen in Table 05.

Table 5. Anacova Test for PjBL Class and Conventional Class

Sumber	**Jumlah kuadrat**	**Df**	**Kuadrat Tengah**	**F**	**Sig.**
Intercept	3596,626	1	3596,626	158,622	0,000
Pre-test	3096,005	1	3096,005	136,543	0,000
Kelas	2704,555	1	2704,555	119,279	0,000
Acak	1133,709	50	22,674		
Total	272825,000	53			

Source: Researcher's primary data.

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The results of the Anacova test analysis in Table 05 show a sig value = 0.000<0.05. This means that there is a significant difference between the post-test scores of classes taught with the PjBL model and the post-test scores of classes taught with the conventional model, PjBL learning outcomes are greater than conventional learning outcomes. Based on these results, it can be concluded that there is an influence of implementing the PjBL model on student learning outcomes.

Discussion

Based on the results of the descriptive analysis, it appears that the two samples initially had equal abilities, this can be seen from the pre-test results. However, after being given treatment by providing the PjBL model, different knowledge competency results were obtained, seen from the scores of students who took part in learning using the PjBL model, which were higher compared to the scores of students who took part in conventional learning. This shows that the PjBL model influences student learning outcomes. However, to prove and conclude this, inferential analysis is then carried out.

Based on the results of the inferential analysis, it was found that there was a significant influence of the PjBL model on the learning outcomes of class X students at SMAS PGRI Sungguminasa. This is reinforced by statistical results which show that the average value of the class taught using the PjBL model is higher than the class taught using the conventional learning model with the average value of biology learning outcomes for students taught using the PjBL model being 78.20 while the the average class taught with the conventional learning model is 64.29. The results of this data analysis are also supported by research conducted by Fatwati (2014) stating that the development of learning tools for environmental pollution concepts using the PjBL model can improve student learning outcomes. The success of student learning outcomes is an important indicator of the achievement of learning objectives.

The PjBL model can foster motivation and creativity which influences student learning outcomes. This can be seen when the teacher gives a project, students are very motivated to work on and design the project given by the teacher into an attractive product, this is an achievement of the PjBL syntax, namely "designing a product". In line with Wena's (2010) opinion, project-based learning can increase students' learning motivation as evidenced by several research reports on project-based learning which state that students are very diligent, try hard to create interesting projects and complete projects, students feel more enthusiastic. in the learning process, and delays in the learning process are very minimal so as to improve student learning outcomes.

PjBL learning also trains students to be more active, this can be observed during the initial activities, namely the teacher asks students questions related to problems related to the project given. In group discussions, cooperation can be established between students so that students are actively involved in learning and understand the material being studied. Thus, collaboration in group discussions and project work can make students understand the material better and increase students' understanding. This is in line with Rusman's (2017) opinion that the project encourages students to be more active in developing and practicing communication skills. In this way, several PjBL syntaxes, namely "basic questions" and "monitoring activity" have been achieved so that the application of PjBL in learning influences learning outcomes. This is in accordance with the opinion of Irman & Warkito (2020) who state that the syntax in this model can stimulate students' involvement in learning so that later learning will be more meaningful for them.

Learning with the implementation of PjBL makes learning more interesting for students in participating in learning, student activity becomes high. By giving projects to students, such as recycling waste in the school environment, students become more interested and students who

were initially afraid to express opinions or convey the results of discussions become brave in expressing their opinions. This activity is related to the PjBL syntax, namely "evaluation of learning experiences". By providing projects, students become more competitive, creative and focused in participating in learning, thereby improving their learning outcomes. This is in line with the opinion of Santyasa, et.al (2021) that PjBL learning has an impact on improving learning outcomes, the response to learning is good, and the learning atmosphere becomes more enjoyable, so that students and educators enjoy the learning process.

The positive results obtained in applying the PjBL model were also written about by Çakici and Turkmen (2013). They concluded that there were significant differences between classes taught with PjBL and classes taught without PjBL. The post-test score of the class taught using the PjBL model was higher than the score of the class taught without PjBL. They also concluded that this learning model was able to improve student learning outcomes in science material. The PjBL model makes the learning process fun and meaningful. An increase in learning outcomes using the PjBL model can also be seen in research conducted by Susilowati, et.al (2013), stating that the PjBL learning model has a positive effect on student learning outcomes. This can be seen in the difference in the average score of the class taught using the PjBL model which is higher than the class taught without PjBL.

Through PjBL learning, students' learning motivation will increase. This can be seen from the enthusiasm of students in participating in the learning process which continues to increase, they seem focused on working on their respective projects to get maximum results, in accordance with what was planned at the initial stage. They follow each step carefully until they reach the final result, so that they will get a deep impression and the new knowledge they gain will be stored in their memory. This is what causes a significant increase in scores after students are taught using the PjBL model.

Conclusion

Based on the results of descriptive and inferential analysis, it was found that there was a significant influence on the application of the PjBL model on the learning outcomes of class X students at SMAS PGRI Sungguminasa. This is reinforced by statistical results which show that the average value of the class taught using the PjBL model is higher than the class taught using the conventional learning model with the average value of biology learning outcomes for students taught using the PjBL model being 78.20 while the the average class taught with the conventional learning model is 64.29.

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Andi Annisa Putri Ramadhani	Biology Departement of Universitas Negeri Makassar, Indonesia E-mail: a.icaptri@gmail.com
Andi Faridah Arsal	S.Si., M.Si. Lecturer of Biology Departement of Universitas Negeri Makassar, Indonesia E-mail: a.faridaharsal@gmail.com
Muhiddin Palennari	S.Pd., M.Pd. Dr. Prof. Lecturer of Biology Departement of Universitas Negeri Makassar, Indonesia E-mail: muhiddin.p@unm.ac.id