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Comparative Study of Problem-Based and Project-Based Learning on Economic Learning Outcomes in Classes XA and XB at State High School 2 Tondano

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Abstract: The purpose of this study is to determine the comparison of Economic Learning Achievement Using the Problem Based Model. Learning and Project Based Learning on the Learning Achievement of Economics Class XA and XB of SMA Negeri 2 Tondano. This study uses a quantitative method with a quasi- experimental research design or one- way group pretest-posttest. The sample of this study was 25 students of class XA and XB of SMA Negeri 2 Tondano in the 2024/2025 academic year. Data collection was carried out through descriptive tests Pretest and Posttest. The results of the study showed an increase in Learning Achievement in Economics subjects which was higher in the Problem Based model. Learning where the Pretest Value is 39.6 and the Posttest Value is 86.4, while in the Project Based Model Learning obtained a Pretest Value of 38.2 and a Posttest Value of 84.6. Overall, the Problem Based Model Learning shows more improvement which includes student enthusiasm, the formation of heterogeneous groups, information organization, and the ability to work together in problem solving. As for the Project Based Model Learning enhancement includes student engagement, active participation, problem awareness, ability to work together, and project presentation. Both models are seen each has its own advantages and is able to improve student learning achievement at SMA Negeri 2 Tondano.

Keywords: Learning outcomes; Problem based learning; Project based learning.

INTRODUCTION

Education in Indonesia has become the right of every citizen as regulated in Article 28 C of the Constitution which states that everyone has the right to develop their potential to utilize science and technology, art, and culture for the sake of improving the quality of life and welfare of the wider community. The learning process itself is an effort made to obtain a complete change in behavior as a result of personal experience through interaction with the surrounding environment.

Economics is one of the general subjects in high school that studies the behavior of individuals and society in an effort to meet their unlimited needs with limited means of satisfying needs. Along with the development of the era and science, a science called economics emerged.

Scholar Piaget and Vygotsky played an important role and contributed greatly to the field of cognitive development theory. The philosophy of Constructivism in learning provides a paradigm foundation in developing

students' knowledge abilities independently. Piaget's epistemology began with an interest in the development of human views not only in educational psychology, but also in most pedagogical theories. Piaget presented a theory about the process of developing human thinking through an analysis of the process of organizing knowledge. According to Piaget, humans are born with active biological organisms. Humans live as organisms exploring by continuously controlling the environment (Chi Hyun et et al. , 2020).

One of the developments that will be experienced by children is cognitive development. This cognitive development approach is based on the assumption or beliefs that cognitive abilities are fundamental and guide children's behavior. In the middle ages where scientific progress began to rise, cognitive development in humans began to be studied. The psychology figures who discussed this cognitive development were Jean Piaget and Lev Semyonovich Vygotsky in (Madaniyah et et al. , 2021).

Experiential Kolb is used to distinguish between cognitive learning theories that tend to emphasize cognition more than affective, and behavioral learning theories that eliminate the role of subjective experience in the learning process. Meanwhile, according to Kolb in Armstrong (2008:5) the experiential model Kolb can be defined as a learning process where knowledge is created through changes in the form of experience and is caused by a combination of understanding and transforming experience. In line with the opinion put forward by Cahyani (2010:1) that the experiential learning model Kolb also does not only provide insight into the knowledge of concepts. But, it can also provide real experience to build skills through the assignment of feedback processes by conducting evaluations in learning that function to find out the results of the application with what should be done in the learning process.

The process of learning economics in high school so far still has weaknesses or problems, especially in class X. First, the learning pattern applied is still centered on the teacher (teacher oriented) so that here students are less given the opportunity to develop their creativity and have not been directly involved in the learning process, Second, the low interaction between students that is established during the learning process because students are less interested in the delivery of material that is sometimes only focused on the teacher, Third, the lack of student understanding of the material given because students are less enthusiastic in paying attention to the delivery of material by the teacher. These weaknesses have an impact on the low learning outcomes of students from class XA and class XB where there are several students who have not achieved good and very good grades, resulting in low learning outcomes in Economics subjects in class XA and XB of SMA Negeri 2 Tondano.

From the existing problems, it is necessary to conduct a study to answer the problem. The temporary hypothesis answer obtained is: There is a significant comparison of the application of the Problem Based learning model. Learning and Project Based Learning on the learning outcomes of economics students in grades XA and XB of SMA Negeri 2 Tondano. It is stated that:

H a : There is a comparison between Problem Based learning models Learning and Project Based model Learning on student learning outcomes in Economics subjects at SMA Negeri 2 Tondano.

H0: There is no comparison between Problem Based learning models Learning and Project Based Learning on student learning outcomes in Economics subjects at SMA Negeri 2 Tondano.

In previous research by Redina Simbolon, Comparison of Project Based Models Learning with a Problem Based Model Learning To determine learning outcomes and learning activities, it was found that the results of this study indicate that the Problem Based model Learning is superior in increasing student motivation and learning outcomes compared to the Project Based model. Learning because it can directly encourage student motivation which can automatically also improve student learning outcomes and also provide a means to demonstrate and explain to students through projects worked on in the learning process. Different from the Problem Based model Learning that only raises certain themes in determining the problem.

Likewise, previous research conducted by Nur Adiyah (Comparison of Learning Outcomes Using the Problem Based Model) Learning , Project Based Learning , and Discovery Learning by Paying Attention to Learning Activities in Class XI Social Sciences Students Sman 1 Sungkai Utara, North Lampung Regency, 2018/2019 Academic Year) found that:

1. There are differences in economic learning outcomes between students who use cooperative learning models such as Problem Based Learning , Project Based Learning , and Discovery Learning .
2. The average economic learning outcomes of students with high learning activity who use the Problem Based learning model Learning is higher than students who are taught using the Project Based learning model Learning .
3. The average economic learning outcomes of students with low learning activities who use project-based learning models are higher than the average economic learning outcomes of students who are taught using problem-based learning models.

Furthermore, research conducted by Zulista Anisa (Comparative Study of Economic Learning Outcomes Using the Problem Based Model) Learning

and Project Based Learning by Paying Attention to Adversity Intelligence in Class X Students of Sma Negeri 1 Seputih Agung in the 2015/2016 Academic Year) found that:

1. There is a significant difference in economic learning outcomes between students who use the PBL and PjBL learning models .
2. The economic learning achievement of students who use the PBL learning model is higher than that of students who use the PjBL model, especially for students who have a high level of adversity intelligence .
3. Students with high adversity intelligence show better economic learning outcomes when using the PBL learning model.
4. Student economic learning outcomes with adversity levels intelligence is higher in learning using the PBL model compared to students who use the PjB model.

So it can be concluded that learning is a process carried out by humans to gain knowledge, increase skills, and change behavior. In general, there are three types of learning objectives, namely:

1. To obtain knowledge, this is marked by the ability to think, because the ability to think and the selection of knowledge cannot be separated. The ability to think cannot be developed without knowledge and vice versa the ability to think will enrich knowledge.
2. Concept and Skill Instillation, concept instillation requires skills, both physical skills and spiritual skills. Physical skills are skills that are observed so that they will focus on the appearance or movement skills of someone who is learning, including in this case the problem of Technique or repetition. While spiritual skills are more complicated because they are more abstract, concerning the problem of appreciation, thinking skills and creativity to complete and formulate a concept.
3. Formation of attitudes, the formation of mental attitudes and student behavior cannot be separated from the problem of instilling values, based on values, students will be able to grow awareness of the ability to practice everything they learn.

Learning Outcomes

Learning outcomes are behavioral changes that occur continuously in a person's life. These behavioral changes have a significant and beneficial impact on life and the subsequent learning process.

Learning outcomes are the results obtained by students after participating in learning activities. The results achieved by students can be in the

form of abilities, both related to aspects of knowledge, attitudes, and skills that students have after receiving learning experiences, as stated by (Rahman, 2021)

Bloom's Taxonomy theory classifies learning outcomes broadly into three domains, namely the Cognitive, Affective, and Psychomotor domains. Anderson and Krathwohl revised Bloom's Taxonomy by adding a knowledge dimension and changing the cognitive category to be more action-oriented, such as understanding and creating. This revision makes Bloom's Taxonomy more relevant to be applied in modern learning that emphasizes 21st century skills (Mahmudi et al. , 2022). Here are 3 Domains of Bloom's Taxonomy including :

1. Cognitive Domain: The cognitive domain is related to intellectual learning achievements consisting of six aspects, namely knowledge or memory, understanding, application, analysis, synthesis, and evaluation. The first two aspects are called low-level cognitive and the next four aspects are called high-level cognitive.
2. Affective Domain: The affective domain includes attitudes consisting of five aspects, namely acceptance, response or reaction, assessment, organization, and internalization of attitudes. Such as feelings, interests, attitudes, emotions, and values. The affective domain shows educational goals that are directed at the ability to behave in facing reality or problems around it.
3. Psychomotor Domain: The psychomotor domain is a domain related to learning outcomes of skills and the ability to act. The psychomotor domain has six aspects, namely; a) Reflex movements, b) Basic movement skills, c) Conceptual ability, d) Harmony or precision, e) Complex movements, f) Expressive and interpretive movements.

A learning model is a pattern or certain learning steps that are applied so that the expected learning outcomes or competencies can be achieved quickly and more effectively and efficiently. Meanwhile, (Jamal M.Pd.I , 2020) argues that a learning model is a guideline for educators in planning classroom learning, starting from preparing learning devices, media and aids, to evaluation tools that lead to efforts to achieve learning objectives. From this opinion, it can be concluded that a learning model is a framework or learning pattern used in a learning process to achieve certain goals.

Problem Based Learning (PBL)

Problem Based Learning (PBL) is a learning model that trains students to solve real problems with a learner-centered approach. The goal is for students to be able to build their own knowledge, develop critical thinking and problem-solving skills, and increase independence and self-confidence (Mohammad Wahyu & Wuri, 2017). Who said that the Problem Based Model Learning is "a

form of learning based on the constructivism paradigm which prioritizes students in learning and is oriented towards the learning process.

According to (Aris, 2014), the PBL model has the following advantages and disadvantages:

Benefits of Problem Based Learning (PBL)

a. Encourage students to be able to solve problems in real life
b. Students have the ability to create their own knowledge through learning activities.
c. Problem-centered learning creates unrelated subject matter, so it does not need to be studied by students. This can reduce the burden on students in memorizing and storing information.
d. Students who are accustomed to using several sources of knowledge from the internet, observation, literature, and interviews and scientific activities occur between students in groups.

Weaknesses of Problem Based Learning (PBL)

a. PBL cannot be used for all subjects, in some cases, teachers play an active role in delivering the material. PBL is more appropriate for learning that requires specific problem-solving skills.
b. In classes with a high level of student diversity, it will be difficult to group the tasks given by the teacher.

Table 1. Problem Based Learning (PBL) Learning Syntax

No.	Stage	Activity Teacher
1	Participant orientation educates on problem	Teacher explains objective learning,explain logistics Which required, presenting a phenomenon or demonstration or story for to grow up problems, motivating students to engage in details problem Which selected.
2	Arrange students in Study	The teacher helps students to define and arrange study assignment Which to hook with problem That.
3	Guiding investigation group	Teacher encouragement participant educate for gather information Which in accordance with the, conduct an experiment to get explanation and damage problem.

4	Develop and serve results Work	Teacher help participant Didi in the planning and preparation work in accordance like report, video recording, and model and alsohelp participant they for share task with his friend.
5	Analyze and evaluate the processdetails problem	The teacher helps students to do reflection or evaluation for investigation they and process which they use.

Understanding Project Based Learning (PjBL)

Project Based Model Learning (PjBL) is a learning model that is centered on student activities and is able to provide opportunities for students to express their ideas and provide students with the freedom to be creative but remain under the control and supervision of the teacher until students are able to produce a product, as stated by (Surono, Kristin, & Anugraheni, 2019). According to (Widiasworo , 2017) "Project Based Learning" Learning " is also often referred to as project-based learning. Project-based learning is a learning method mediated by projects/activities. Students explore, evaluate, interpret, synthesize and inform, resulting in various forms of learning outcomes.

Table 2. Project Based Learning (PjBL) Syntax

No.	Stages	Teacher Activities
1	Determination Project	Teachers and studentsdetermine Topics or theme project
2	Design step - step residence project	Teacher makes it easier participant educate For For designing steps settlement project together with its management
3	Schedulingimplementation project	Teacher give guidanceto participant educate Working on scheduling all activity Whichown design it
4	Completion project with facilitation and monitoring Teacher	Teacher makes it easier and monitor participant educate in the carry outdesign project which own made
5	Preparation of reports and presentations/ publication of results project	Teacher makes it easier participant educate For serve and publish results work
6	Evaluation process and resultsproject	Teachers and students in endlearning process to do reflection oppose activity andresults project assignment

The purpose of this study is to determine the comparison of economic learning outcomes using the problem- based model. Learning (PBL) and Project Based Learning (PjBL) on Economic Learning Achievement of Class XA and XB of SMA Negeri 2 Tondano. Where it is expected that after the implementation of the learning method in question will improve the learning outcomes of the Economics subject..

RESEARCH METHODOLOGY

Experimental Methods and Design

The research method used was quasi -experimental with a pretest-posttest design. control group. This method involves two groups, namely the experimental group that receives a certain treatment and the control group that does not receive treatment. Data were collected through an initial test (pretest) and a final test (posttest) to measure differences in learning outcomes before and after treatment. Quasi -experiments were chosen because they allow testing of cause-and-effect relationships in real-world conditions without full randomization of research subjects. The population in this study used class XA consisting of 25 students and XB consisting of 25 students. In the data collection process, a test method was used where the questions on the test sheet were related to the material on Economic Activities in the Economics subject for class X at SMA Negeri 2 Tondano.

Research Design

Table 3. Research Design

Group	*Pre-exam*	VariablesFree (X)	*Post-test*
K	Y_1	X_1	Y_2
	Y_1	X_2	Y_2
	Y_1	X_1	Y_2
	Y_1	X_2	Y_2

Information:

K = Group
X1 = Treatment with the PBL model
X2 = Treatment with the PjBL model
Y1 = Pre-test
Y2 = Post-test

In this research, two classes are focused as objects that will be applied or implemented with the Problem Based Learning Model. Learning with Project

Based Learning is used in Economics subjects in class XA and XB is a class that researchers will use to find data where later researchers will provide Pre-test and Post-test questions that aim to see how students' abilities are in working on and answering the questions and comparing them before and after the PBL and PjBL learning models are applied or implemented. Therefore, this research design uses a quasi- experiment or is included in the form of one group pre-test and post-test.

Research Flow

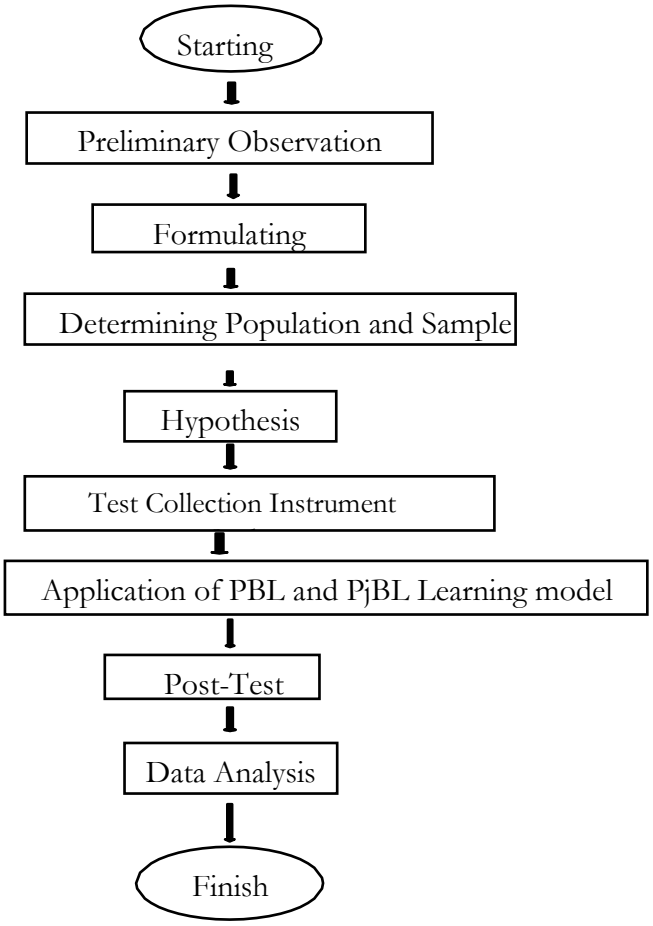

Figure 1. Research Flow

Based on the research design above, it can be explained that the researcher conducted observations at the research location, where with the observation it would be easy to find and also see the problems. So that from the initial stage of observation that is seen, a temporary conclusion will be obtained

regarding the impact of the model to be applied. So from determining the sample from the population observed later it will make it easier for researchers to apply and implement the learning model that will be applied later. Furthermore, compiling the instruments or tools that will be used in the research, in this research the instrument that will be used is a test question. This is used to see the abilities of students.

If the research instrument has been prepared, then the researcher at this initial stage will give a test in the form of pre-test questions, this is done before the learning model is applied to determine the abilities of students. In the next stage, the researcher begins to apply learning with a learning model with a module that has been prepared. Furthermore, when the learning process is complete, the researcher will give a test in the form of post-test questions to see the abilities of students when learning with the PBL and PjBL models is applied. At this stage, the researcher will see whether there is a comparison of learning outcomes before applying the PBL and PjBL learning models with after applying the model.

Data Analysis Techniques

Evaluation

The data obtained in the form of multipple choice tests from the pretest and posttest are then processed by giving a raw score to each student's answer. The raw score results obtained from the pretest and posttest are then calculated in total to get the final score. for measure resultsStudy student that is using the formula as following:

$$\text{Score} = \frac{B}{N} \times 100$$

Information :

B = Number of items answered correctly

N = Number of multiple-choice items

N Advantage

Before conducting a hypothesis test, at this stage the researcher will first calculate the N-gain. N-Gain is an analysis of learning outcome tests that usually contain pretest and posttest scores . This study uses pretest and posttest scores , the difference between the two scores can certainly show the difference in student knowledge at the beginning and at the end of learning. The formula for calculating the N-Gain score is as follows:

$$N - Gain\ (g) = \frac{Nilai\ Posttest - Nilai\ Pretest}{Skor\ maksimal\ ideal - Nilai\ Pretest}$$

Table 4. N-Gain Category

Category	Percentage (%)
Low	< 40
Enough	40 – 55
Tall	56 – 75
Very Tall	>76

Hypothesis Testing

In this study, the researcher used the Paired Test Samples T test . Hypothesis testing is used to test the hypothesis that has been carried out in this study, namely that there is a difference in student learning outcomes using the Problem Based model. Learning (PBL) and Project Based Learning (PjBL) in Economics subjects in class XA and XB of SMA Negeri 2 Tondano. Hypothesis testing is described as the null hypothesis (H0) against the hypothesis (H) . Statistically, the hypothesis can be formulated as follows:

Ha : There is a comparison between the PBL learning model and the PjBL learning model on student learning outcomes at SMA Negeri 2 Tondano in the subject of Economics.

H0 : There is no comparison between the PBL and PjBL learning models on student learning outcomes at SMA Negeri 2 Tondano in the subject of Economics.

1) If the Sig (Significant) value > 0.05 then Ha is accepted.

2) If the Sig (Significance) value < 0.05 then Ha is rejected.

RESULTS AND DISCUSSION

The implementation of this research was carried out or conducted on students in class XA and XB at SMA Negeri 2 Tondano. This research was conducted in class XA using the Problem Based learning model. Learning (PBL). Before implementing learning activities with the PBL Model, the researcher first gave a pre-test in class.

Furthermore, the implementation of the research carried out by the researcher in class XB used the Project Based learning model. Learning (PjBL). Before implementing learning activities with the PBL Model, a pre-test is first

given to the class, after giving the pre-test, learning is continued with the PjBL model. Next, a series of tests were carried out, including:

Table 5. Normality Test on model Learning PBL

Test from Normality						
	Kolmogorov-Smirnov [And]			Shapiro Wilk		
	Statistics	df	Sig	Statistics	Df	Sig
Pre-exam	.165	25	.076	.919	25	.048
Post-exam	.224	25	.002	.907	25	.026
A. Lilifors Meaning of Correction						

The results of the data analysis in the table above use the *normality test* . *Shapiro- Wilk* Because to taste Which used not enough from 100 participant educate. Results data on model PBL show That The significance value for the Pretest variable is 0.48 and the Posttest variable is 0.26. With by using an error rate of 0.05, the decision that can be taken is that H0 [is] rejected. With Thus it can be concluded that the Pretest and Posttest variables in the PBL learning model originate from distributed population normal.

Table 6. Normality Test on learning model PjBL

Test from Normality						
	Kolmogorov-Smirnov [And]			Shapiro Wilk		
	Statistics	df	sig	Statistics	Df	Sig.
Pre-exam	.166	25	.073	.897	25	.016
Post-exam	.205	25	.008	.903	25	.022
A. Liliphorus Meaning Correct						

Thus, the results of data analysis for the PjBL model show the value meaning For variable Pre-exam as big as 0.016 And variable Post-exam as big as 0.022. With with an error rate of 0.05, then the decision that can be taken is that H0 [is rejected]. Therefore, It can be concluded that the Pretest and Posttest variables in the PjBL learning model also come from from the population that normally distributed.

In terms of normality distribution , the results of data analysis show that both the Problem Based learning model and the Problem Based learning model are good. Learning and Project Based Learning has Pretest and Posttest variables that come from a normally distributed population . Both models obtain significance values that do not exceed the 0.05 error rate when the normality test is carried out. Shapiro-Wilk.

Table 7. N-Gain Test Results on the PBL Learning Model

Information Statistics					
	N	Minimum	Maximum	Means	Std Deviation
Get	25	.60	1.00	.8429	.10412
Legitimate N (based on list)	25				

Table 8. N-Gain Test Results on the PjBL Learning Model

Information Statistics					
	N	Minimum	Maximum	Means	Standard. Deviation
Get	25	.64	1.00	.8206	.10292
Legitimate N (based on list)	25				

Based on the results of the N-Gain test on the Problem Based-Learning (PBL) and Project Based-Learning (PjBL) learning models in class XA and XB of SMA Negeri 2 Tondano, it can be seen that the average N-Gain value in PBL is 84 while in PjBL it is 82. These results indicate that the PBL model provides a slightly higher increase in knowledge compared to the PjBL model and has succeeded in providing a positive impact on students with the frequency of student grades in the very high category for PBL and PjBL.

The results of the data analysis obtained in this study are as follows:

1. The results of the Normality Test obtained a significance value for the Pretest variable in the PBL model of 0.48 and the Posttest variable of 0.026, and in the PjBL model of 0.16 and the Posttest variable of 0.022. By using an error rate of 0.05, the decision that can be taken is that H0 is rejected. So it can be concluded that the Pretest and Posttest variables in both PBL and PjBL learning models come from a normally distributed population.
2. Based on the results of the N-Gain test in classes XA and XB at SMA Negeri 2 Tondano, the Problem Based learning model Learning (PBL) showed a higher increase in knowledge with an average N-Gain value of 84, compared to the Project Based model. Learning (PjBL) which has an average value of 82. However, both models have succeeded in providing a positive impact on students with the frequency of student scores being in

the high category. Therefore, both PBL and PjBL are worthy of providing a positive impact on learning at SMA Negeri 2 Tondano.

3. The results of the Paired T test showed a significant difference between the posttest scores on the PBL learning model and the posttest scores on the PjBL learning model. The average score difference of 1.80000 and a significance value of 0.214, using an error rate of 0.05, showed that the scores on the PBL posttest were consistently higher. The implication is that the application of the project-based approach learning (PBL) provides a positive contribution to learning outcomes compared to posttest conditions. PjBL. These findings support the consideration of further integrating PBL into learning strategies to improve student learning outcomes.

CONCLUSION

Based on the results of research and analysis of economic learning data using the Problem Based learning model Learning (PBL) and Project Based Learning (PjBL) in class XA and XB of SMA Negeri 2 Tondano, it can be concluded that there is a significant increase in student learning outcomes. Specifically, it can be seen in the PBL and PjBL learning models showing a significant increase from pretest to posttest scores, with PBL showing a consistently higher increase based on paired t-tests. These findings support the recommendation to further integrate the problem-based learning (PBL) approach into learning strategies, as it provides a higher positive contribution to learning outcomes compared to PjBL.■

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