Eduscape : Journal of Education Insight
E-ISSN : 3026-5231
Volume. 1 Issue 1 April 2024
Page No: 66-77

Comparison of Students' Critical Thinking Abilities Using Project-Based Learning Cycle Models and Conventional Models

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Received : January 15, 2024
Accepted : January 24, 2024
Published : April 30, 2024

Citation: Mayasari., Syuhada, S., & Arief, H.(2024). Comparation of Student's Critical Thinking Abilities Using Project-Based Learning Cycle Models and Conventional Models. Eduscape : Journal of Education Insight, 2(2), 66-77. https://doi.org/10.61978/eduscape.v2i2

ABSTRACT: This Exploration began eith a learning problem in the economic education course, a problem that's known so far is that the learning process is pupil - centred, but the learning conditioning carried out are limited to group donations followed by conversation and debates with no follow-up. Closes with the lecture's evidence, where learning becomes monotonous. For this reason, there's a need for invention in learning to ameliorate this situation by using a design project-based learning cycle model compared to conventional models. This research uses quantitative methods with a pure experimental approach (true experimental design). A total of 115 students as a population were taken using simple random sampling techniques. So, the exploration sample for the experimental class (R002) was 58 scholars and the control class (R001) was 57 scholars. Pretest-Posttest Group Design as a data analysis tool in this exploration. The exploration that has been conducted shows the results: 1) There's a description of the differences in scholars' critical thinking capacities prior to and after using the design project based learning cycle model in educational economics courses; 2) There's a description of scholars' critical thinking capasities prior to and after using conventional learning models in educational economics courses; 3) original critical thinking capacities show that scholars' critical thinking capacities prior to using the project based learning cycle model and conventional learning models in educational economics courses are significantly different; and 4) Final critical thinking capacities which show scholars' critical thinking abilities after using the project based learning cycle model and conventional learning models in educational economics courses are significantly different.

Keywords: Critical Thinking Abilities, Project-Based Learning Cycle Models, Conventional Models

INTRODUCTION

The educational economics course is a course that examines the economic aspects of education, which explains how education can run effectively and efficiently. This course discusses education as a human investment that will produce human resources, so that education is seen as an industry in which there are inputs, processes and output results. Therefore, economic aspects such as demand and supply in education, costs and benefits in education, returns to education, and

education financing are part of the study. Referring to the study material, it can be understood that the aspects studied in this course are aspects that basically occur in real life, especially in the implementation of education. Of course, in every aspect studied there are various complex and interconnected problems that occur in its implementation and these various problems need to be studied, understood and sought solutions by students in this course, of course. So that the objectives of this course can be achieved effectively, of course students need to have good academic skills and one of those academic skills is the ability to think critically.

Critical thinking generally refers to making choices based on information and communication attained through reflection and respectable logic(VanLaar etal.,2020). This includes the capability to suppose reflectively and come up with skillful measurements of information or communication that's applicable in a particular environment (Gut, 2010). Critical thinking also means analyzing and evaluating the capability, identifying questions and activating drawing reasonable or logical conclusions (Mahanal et al., 2019). Critical thinking requires introductory knowledge of a particular field in order to form an independent and reasoned point of view or opinion (de Oudeweetering & Voogt, 2018). Critical thinking is one of the introductory and intellectual requirements that must be fulfilled by every human being (Aizikovitsh-Udi et al., 2015). Critical thinking is not only able to increase students' academic abilities, but can also design students to become professionals in work life. Students should have critical thinking skills because students with critical thinking skills are more effective at solving problems (Saputra et al., 2019; Wahidin & Romli, 2020).

According to Chukwuyenum (2013) indicatorsof critical thinkingare: a. Interpretation (conclusion of someone's view of something); b. Analysis, (observing object activities by describing the composition of the object and rearranging its components to be studied or studied in detail) c. Evaluation (assessment or assessment) d. Conclusion (end of an explanation), f. Self-regulation (aspects of cognitive, physical, social and emotional development are well developed). Furthemore Fatmawati (2014) Furthermore, Fatmawati (2014) stated that there are several indicators of critical thinking including: a) being able to formulate the basis of the problem, b) being able to show the facts needed to solve the problem, c) being able to determine logical, relevant and accurate arguments, d) able to recognize differences in different points of view and e) can determine the consequences of statements on decisions.

There is another way to ameliorate scholars' critical thinking, videlicet through innovative learning, which leads to constructivist learning. Sari & Prasetyo (2021) believes that a more innovative learning system can increase students' critical thinking power. During the learning process, students should be taught how to make interrelated connections between generalities and how to produce connections between knowledge and practice (Novak & Cañas, 2006), and these conditioning can be eased by learning models (Cantor et al., 2015).

Critical thinking can be handed through direct learning. Preceptors can apply pupil-centered learning models to support shcolars to develop critical thinking (Fuad et al., 2017; Mahanal et al., 2016). One of the learning models based on constructivism is the learning cycle (Imran et al., 2019). The learning cycle model consists of five stages: introduction (inclusion), research, explanation, refinement and evaluation (I. N. Sari et al., 2016). Meanwhile, Windiarti (2014) notes that the learning cycle model consists of 7 stages; receive (gather background information from students), participate (ideas, curricula and experiences), explore (investigate), explain (illustrate), develop (apply), evaluate (assess), expand (develop). The learning cycle model is designed to motivate the learning of student (Pratiwi, 2016). Which will also includes scholars in active learning because it's pupil-centered model (Astriani & Istiqomah, 2016). The learning cycle model offers scholars the occasion to amiliorate your knowledge through active learning. The efficacity of the

learning cycle is student participation in learning (Budiman et al., 2019). Through active learning, which takes place in the assimilation, adaptation and association of cognitive structures (Imran et al., 2019). Several studies show that the learning cycle model can ameliorate pupil learning issues (Budiman et al., 2019; Rejeki et al., 2015; I. N. Sari et al., 2016), abstract appreciation (Pratiwi, 2016), and critical thinking chops (Hartawati et al., 2020; Latifa et al., 2017).

Windiarti (2014) states that the stages of the Learning Cycle 7E learning model can be described as 1) Elicit (acquiring students initial knowledge), which is the phase to find out the extent of previous information from students about the lesson asking questions that foster learning motivation. student; 2) Engage (ideas, learning plans and experiences), is the phase where students and teachers will give each other information and experiences about the questions that have been given in face elicit, 3) Explore (investigate), is the phase that brings students to gain knowledge based on experience related to the learning concept to be studied, 4) Explain, which is a phase which contains an invitation for students explain the initial concepts and definitions they received in the research phase; 5) Elaborate (apply), which is a phase that aims to bring scholars to explain delineations, generalities and chops to problems, giving exemplifications from experience; 6) Evaluate, is the evaluation phase of the learning outcomes that have been carried out, in this phase various formal and non-formal assessment strategies can be used; and 7) Extend, which is a phase aimed at thinking, searching, finding and exemplifications examples of the operation of the studied generalities.

The learning cycle offers scholars the occasion to a miliorate your knowledge through active learning. Several studies show that the learning cycle model can ameliorate scholars' critical thinking (Hartawati et al., 2020; Latifa et al., 2017). From the exploration results (Mayasari et al., 2023) this shows that there are differences in pupil learning issues using conventional and learning cycle models. Therefore, this assignment is used to determine the critical thinking capability of scholars in the learning process.

Project-based learning is another learning model that can edge scholars' critical thinking (Almulla, 2020). A typical form of cooperative and inquiry-based learning methods, characterized by active pupil participation and comparative learning, can be set up in PjBL or project-based learning (Loyens et al., 2015). In addition, the PjBL model is related to the gospel of constructivism so that scholars can reconstruct their knowledge in real life through their own gests. Learning using the PjBL model generally directs scholars to work together to break a specific problem, develop a product for a specific target followership, and also estimate the design and its development process (Kokotsaki et al., 2016).

An effective way to develop scholars' bents in the 21st century by prioritizing critical thinking and problem solving, interpersonal communication, information and media knowladge collaboration, leadership and platoon work, innovation and creativity is to apply the PjBL approach in the learning process (Häkkinen et al., 2017). PjBL's reference focuses on inquiry-based learning style that involve scholars in creating knowledge by asking them to complete meaningful systems and develop real products (Brundiers & Wiek, 2013). There are six characteristics of PjBL according to Krajcik dan Shin (2014) videlicet asking questions, fastening on learning objects, sharing in learning conditioning, uniting between scholars, using scaffolding technology, and creating real products.

In recent years, the fact is that economic education students' critical thinking abilities during the learning process are still considered low. Based on experimenters' compliances learning in educational economics courses is centered on scholars, but learning conditioning are still mixed

with conventional models which are limited to group donations followed by conversation and ending with underpinning by the lecturers. The conventional learning model focuses more on one-way communication, namely the teacher is the only one giving lessons and students only listen and note down what the teacher says (Delida dan Sofyan, 2014). Conventional learning is learning in which the coaching and studying process. is carried out very monotonously and verbally, namely in the delivery of learning material it still relies on lectures or in the terms used in this research, it is a teacher-centered teaching and learning process (Fahrudin, Ansari, dan Ichsan, 2021).

Compliances were formed during the argumentation, utmost scholars asked questions only as a formal demand to be active in class, and the statements/responses that scholars gave during the discussion were limited to information that they searched for on the internet without understanding the verity of the discussion what they said and the discussion process took place only as a question and response without scholars engaging in heated debates in the learning process. This indicates that the thinking ability of students in economic education study programs is still low. For this reason, there needs to be innovation in learning to improve this situation. Specifically, this exploration wants to see the impact of the learning cycle learning model which is integrated with the project-based learning model which is believed to be able to hone students' critical thinking skills. To see the impact of this model, it will be compared with the conventional learning model that has been used so far. This treatment is planned to be appertained to educational economics courses.

METHOD

The exploration systems used is a quantitative method with an experimental design as stated by Creswell (2014:295), that an experimental design is used when you want to determine the possible causes and influence of the independent and dependent variables, meaning that you try to control all variables that impact the results except the independent variable. In this experimental study, there were two classes, videlicet an experimental class and a control class with different treatments. There are two learning process treatments in this research, namely the treatment in the experimental class using a project-based learning cycle model, while the treatment in the control class uses a conventional model.

This experimental exploration uses a pure experimental design, the experimenter can control all external variables that influence the course of the experiment. In this way, the quality of implementing the research design (internal validity) can be high. The main characteristics of a pure experimental design can be seen from the samples used for the experimental and control groups which are taken randomly from a predetermined population. A aggregate of 115 scholars were named aimlessly from the total population using the simple arbitary slice systems by aimlessly opting figures from a list of odd and indeed figures. So the sample for the experimental class is an odd number of 58 scholars who'll be included in class R002 and an indeed number control class of 57 scholars who'll be included in class R001.

The data analysis used in a true experimental study is Pretest-Posttest Group Design. While conducting the test, descriptive test, normality test or N-Gain score, homogeneity test and t- test (Paried sample test) were conducted to answer research questions 1 and 2 and questions and hypotheses 3 and 4 using the t-test (independent sample t test) with SPSS version 25 software.

RESULT AND DISCUSSION

1. Results of exploratory data analysis

In the form of numerical data, direct observations of the pretest and posttest results of students in educational economics courses grouped into experimental classes (project-based learning cycle) and controlclasses (convensional) for student assignment. Critical thinking ability when the trainingwas done with two classgroups. Pretest and posttest scores are tabulated forthe next step. Data calculation and analysis, such as viewing the results of respondent characteristics, descriptive analysis, normality, homogeneity, and hypothesis test. Sample data as identifying difference in critical thinking skills in classes of students in educational economics courses in treatment (project-learning cycle) or in experiments with control classes (conventional).

1) Results of descriptive analyses

The respondents were students who completed the financial education course of the financial education course FKIP 2023/2024 of the University of Jambi. In the descriptive analysis, the characteristics of the respondents are examined based on respondents and gender in the following table:

Table 1. Characteristics of Respondents Based on Student Gender

Economic Education Study Program Class 2023/2024

No.	Gender	Quantity (Students)	Percentage (%)
1.	Man	20	17,39%
2.	Female	95	82,61%
	Total	115	100%

Source: processed data 2023

Descriptive analysis seen from the characteristics of the respondents in the table above explains that the number of respondents in this study were students of the economics education study program who contracted economics education courses consisting of a total of 20 male students or 17.39% and a total of women 95 students or 82.61%.

Statistically, the descriptive analysis in this research aims to compare learning with a project-based learning cycle model and learning with convensional (traditional) models. Pre-test and post-test are used to determine research results, where these results provide a picture of students' critical thinking abilities during teaching and learning activities in educational economics courses. Processed data on pretest and posttest scores for educational economics courses obtained minimum, maximum, mean and standard deviation scores to determine the description of experimental class and control class data, the following results can be seen in the table below:

Table 2. Statistic Deskriptive
Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pretes-Eksperimen	58	57	84	71.48	6.847
Posttes-Eksperimen	58	61	88	74.81	5.379
Pretes-Kontrol	57	48	80	69.26	7.207
Posttes-Kontrol	57	60	82	73.21	4.574
Valid N (listwise)	57				

Output: SPSS version 25

From the results of the data processing calculations, it is clear that the values obtained when calculating the experimental class pretest (using the project-based learning cycle model) include a minimum value of 57 and a maximum value of 84 with a mean of 71.48 and Std. Deviation 6.847. Meanwhile, the experimental class post-test calculation results (project-based learning cycle model) obtained a minimum score of 61 and a maximum score of 88 with a mean of 74.81 and a standard deviation of 5.379. In contrast to the control class (conventional model), the value obtained is slightly lower than the experimental class. The control class (conventional knot) attained a minimal score of 48, a maximum score of 80 and a mean of 69.26 and a standard deviation of 7.207. Meanwhile, the minimal score attained for the post-test results was 60, the maximum score was 82, the mean was 73.21 and the standard deviation was 4.574.

2) Analysis of the Results of normality analysis

normality test can be seen from whether the data obtained in the research is normally distributed or not, which can be seen in the following table:

Table 3. Normality Test
Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Kelas	Statistic	Df	Sig.	Statistic	df	Sig.
Kemampuan Berpikir Kritis	Pre-Test Eksperimen (LCBP)	.162	58	.101	.931	58	.063
	Post-Test Eksperimen (LCBP)	.186	58	.100	.916	58	.081
	Pre-Test Kontrol (Konvensional)	.104	57	.192	.954	57	.132
	Post-Test Kontrol (Konvensional)	.147	57	.103	.952	57	.093

Hypothesis analysis is used to answer four (4) exploration questions and suppositions. To respond exploration questions and suppositions1 and 2, the results of the Pretest-Posttest Group Design with the paired sample test formula were used. The results are shown in the following table:

* This is lower bound of the true significance.
a. Lilliefors Significance Correction

Based on calculate the normality of the data of this study, the result in the above table shows that the value of critical thinking ability of students who received experimental or control treatment was sig>0.05. This indicates that the obtained data is normally distributed. If the Kolmogorov-

Smirnov representation of the results of these calculations indicates the critical thinking skills of students when they receive an experimental classroom approach using the project-based learning cycle (PBLC) model, both the pretest and post test are normally distributed with significance values. 0.101 and 0.100 > 0.05. Similarly, those who received the control treatment with conventional models, and pre-and post-test, were typically with significant values of 0.192 and 103 >0.05

3) Homogeneity Analysis Result

This study uses the test of homogeneity because we want to see that the material in this study comes from homogeneous or the same data. The results of the homogeneity test are presented in the following table:

Table 4. Homogenity Test
Test of Homogeneity of Variance

		Levene Statistic	Df1	Df2	Sig.
Kemampuan Berpikir Kritis	Based on Mean	.540	1	113	.464
	Based on Median	.207	1	113	.650
	Based on Median and with adjusted df	.207	1	100.686	.650
	Based on trimmed mean	.516	1	113	.474

Output: SPSS version25

The table above shows the results of homogeneity values in the experimental (project learning cycle) and control (consensual) classes on the value of educational economics courses. This value is obtained from the mean with sig 0.464, the value based on the median sig 0.650 based on the median and customized df sig 0.650 and the value based on the trimmed mean sig 0.474. To find out whet her the data obtained has a homogeneity value, based on this value it can be seen that the average is 0.464. This value is a significant result greater than 0.05. This means that the distributed data is homogeneous.

4) Hypothesis Test Analysis Results

Hypothesis analysis is used to answer four (4) exploration questions and suppositions. To respond exploration questions and suppositions 1 and 2, the results of the Pretest-Posttest Group Design with the paired sample test formula were used. The results are shown in the following table:

Table 5. Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretes-Eksperimen (LCBP) - Posttes-Eksperimen (LCBP)	-3.328	6.982	.917	-5.163	-1.492	-3.630	57	.001
Pair 2	Pretes-Kontrol (Konvensional)-Posttes-Kontrol (Konvensional)	-3.947	8.528	1.130	-6.210	-1.685	-3.495	56	.001

The first thesis shows that the description of scholars' critical thinking before and after using the project based learning cycle model in educational economics courses is significantly different. This statement is indicated by a significance value of 0.001 < 0.05 and t count -3.630 > 1.658 from the t-table. So it can be concluded that the first question or the first hypothesis Ho is rejected and Ha is accepted. Likewise, the second hypothesis shows that the descriptive results of students' critical thinking before and after using traditional learning models in educational economics courses are significantly different. This is indicated by a significance value of 0.001 < 0.05 and t count -3.495 > 1.658 from the t-table. This it can be concluded that the second hypothesis Ho is rejected and Ha is accepted.

Also, the results of the Pretest-Posttest Group Design were used to answer research suppositions3 and 4 using the independent sample test formula, the results of which are shown in the following table:

Table 6. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Kemampuan Berpikir Kritis Awal	Equal variances assumed	.005	.942	1.693	113	.003	2.220	1.311	-.377	4.817
	Equal variances not assumed			1.693	112.469	.003	2.220	1.311	-.379	4.818
Kemampuan Berpikir Kritis Akhir	Equal variances assumed	.540	.464	1.717	113	.009	1.800	.932	-.246	3.446
	Equal variances not assumed			1.719	110.725	.008	1.800	.930	-.244	3.444

Output: SPSS version 25

The processed data presented in the table above shows that students' critical thinking abilities before using the project based learning cycle model and traditional learning models in educational

economics courses are significantly different. This statement is supported by the data that has been obtained which has a significance value of 0.003 <0.05 and a calculated t of 2,220 > 1,658 from the t-table. So it can be concluded that the third hypothesis Ho is rejected and Ha is accepted. There is also a significant difference in students' final critical thinking abilities in demonstrating critical thinking abilities after using the project-based learning cycle model and traditional learning models in educational economics courses. This is supported by data obtained from calculations with a significance value of 0.009 < 0.05 and obtained t count -1,800 > 1.658 from the t table. So it can be concluded that the fourth hypothesis Ho is rejected and Ha is accepted.

Based on the exploration results, it is known that the first question and hypothesis shows that there are differences in the picture of scholars' critical thinking before and after using the predicated knowledge learning cycle design model in educational economics courses. This was attained from data analysis with a significance value of 0.001 < 0.05 and t count -3.630 > 1.658 from the t table. The results of this exploration are in line with research by Sariet.al (2022) which states that the operation of the Learning Cycle 7E model has a significant influence on scholars' critical thinking. In line with the research results of Novianti et al (2014) that the operation of the Learning Cycle model to the conception of the mortal digestive system influences scholars' critical thinking.

Calculations for the second hypothesis show that there is a picture of students' critical thinking abilities before and after using traditional learning models in educational economics courses. This is based on the data analysis obtained with a significance value of 0.001 < 0.05 and t count -3.495 > 1.658 from the t table. So the second hypothesis shows that there is a significant difference in student learning outcomes before implementing conventional teaching methods and student learning outcomes after implementing conventional methods.

In addition, the calculation results for the third hypothesis show that students' initial critical thinking abilities before using the project-based learning cycle model and conventional learning models in educational economics courses are significantly different. This is reinforced by the results obtained from data analysis which shows a significance value of 0.003 < 0.05 and t count 2220 > 1.658 from the t table. These results are in line with Jafar's (2021) opinion that there are significant differences in student learning outcomes before implementing conventional teaching methods and student learning outcomes after implementing conventional methods. This is also in line with Andriani's (2018)research results which show that there are differences in problem-based students' critical thinking abilities compared to conventional learning methods.

In the fourth hypothesis, this research shows that students' final critical thinking abilities after using the project based learning cycle model and conventional learning models in educational economics courses are significantly different. This statement is strengthened by the results of data analysis calculations where the significance value is 0.009 < 0.05 and the calculated t ratio is -1.800 > 1.658 from the t table. The results of this research are in line with Jafar's (2021) research, the results of which show that there are significant differences in student learning outcomes before conventional learning methods are applied and student learning outcomes after conventional learning methods are applied. Likewise, the results of research by Isnaini et al (2016), which shows

that there are differences in the critical skills of students who study with the problem-based learning model and those who study with the conventional accounting learning model.

One learning model that applies a constructivist perspective is the project-based learning cycle learning model. The first constructionist point of view is based on the question: "How is knowledge constructed in the minds of students?". Piaget argued that knowledge is constructed as students try to organize experiences in relation to existing cognitive structures. This gives an answer to the question that knowledge is actually built from the knowledge of the student and himself.

Definition of Constructivism: An approach to learning that leads to the discovery of generalities that crop from comprehensions, opinions, and images, and student initiative through personal inquiry, discussion, and reflective writing. In line with Arindawati, (2004:86) said The learning cycle model has a constructivist approach and originally consists of three stages, videlicet exploration, conception preface and conception operation. These three cycles have now evolved into five stages that include engagement, exploration, explanation, development/elaboration and evaluation (Lorsbach). The learning cycle model is a flexible model where teachers can use various forms of learning at different stages (such as discussion, exercise, reading and information), one of the five stages can be changed, but the order of the stages must not to be changed or omitted. With the learning cycle model, teachers can therefore plan a lesson that allows students to boldly express their opinions or thoughts without fear, and it can also improve students' cognitive skills that adapt to students' background knowledge. The learning cycle model is a learning model that can be used to ameliorate the conformation of generalities, the conformation of knowledge in the minds of scholar and the capability of scholar to find information meaningfully and combine old knowledge with new knowledge and apply it in everyday life.

CONCLUSION

Conclusions from this exploration can be offered, involving 1) There are disaggreements in the description of scholars' critical thinking capacities prior to and after using the project based learning cycle model in educational economics courses; 2) Description of scholars' critical thinking prior to and after using conventional learning models in educational economics courses; 3) Basic critical thinking chops show that scholars' critical thinking capacities prior to using the project-based learning cycle model with conventional learning models in educational economics courses are significantly different; 4) Final critical thinking capacities which show scholars' critical thinking capacities after using the project-based learning cycle model and conventional learning models in educational economics courses are significantly different.

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