JURNAL UPI

JPIS (Jurnal Pendidikan Ilmu Sosial)

Journal homepage: https://ejournal.upi.edu/index.php/jpis

The Implementation of PBL (Problem Based Learning) and POE (Predict, Observe, Explain) Models: Their Impact on Critical Thinking Abilities

Ihsan Khoirul Anam[1], Epon Ningrum[2], Iwan Setiawan[3], Herdien Raka Moch Isya[4]

[1,2,3]Universitas Pendidikan Indonesia, Bandung, Indonesia
[4]Insitut Teknologo Bandung, Indoneisa
Correspondence: E-mail: agim1206@upi.edu

ABSTRACT

Learning models that can develop critical thinking skills include the PBL and POE learning models. The purpose of this study was to analyze the effect of using the PBL and POE learning models on critical thinking skills in SMA Negeri 1 Bandung. This study used an experimental research method with a quasi-experimental design (none equivalent groups pretest-posttest design). Data collection was carried out by tests, assignments, and observation sheets. The subjects in this study were students of XI IPS class at SMA Negeri 1 Bandung. The results showed that 1) there were differences in the critical thinking abilities of students in experimental class 1 before and after using the PBL learning model, 2) there were differences in the critical thinking abilities of students in experimental class 2 before and after using the POE learning model, 3) there were differences students' critical thinking skills between experimental class 1 using the PBL learning model and experimental class 2 using the POE learning model, 4) there is an effect of using the PBL learning model on students' critical thinking skills in experiment 1, 5) there is an effect of using the POE learning model on students' critical thinking skills in experimental class 2.

ARTICLE INFO

Article History:
Submitted/Received 22 Jan 2024
First Revised 9 Mar 2024
Accepted 24 Mei 2024
First Available online 21 Jun 2024
Publication Date 30 Jun 2024

Keyword:
Learning Model, PBL, POE, Critical Thinhking Ability

1. INTRODUCTION

In a competitive world that is increasingly fast, of course a country requires superior quality human resources. The better and superior the quality of human resources in a country, the more advanced and stronger civilization in that country will be. Educators in this case have an important role to form good and superior human resources in a country (Lee, A. S., & Jacobs, R. L., 2021; Cheng, H., Fan, Y., & Lau, H., 2023). Therefore, it is undeniable that there is competition between countries in the field of education. In this era of globalization, many countries are improving the quality and level of education to produce good and superior human resources. Through education is expected to create human resources that have good quality. However, the education needed to produce good quality human resources requires good quality education. So that improving the quality of education in a country becomes a very important thing to do (Sudarmo, S., et al., 2021; Tri, N. M., et al., 2021)

The 21st century is known as the period of growth of modern knowledge (knowledge age). This is based on the fact that every aspect of human life in all countries is inseparable from knowledge that is implemented in all fields such as the economy, industry, health, and education. In the 21st century the ability to think critically is one of the important abilities that must be possessed. Therefore from an early age this ability must be introduced to children or students in the school environment. The goal is that students can prepare as early as possible to face challenges in their lives later. Solving problems in the school environment is a way of practicing students in improving critical thinking skills.

Critical thinking skills can be improved by carrying out several activities that are carried out routinely or habitually. (Hassobuh, 2008 ; Paul, 1993) argues that being able to improve students' critical thinking skills can be done by habituation in several activities including: a) increasing intensity in reading activities; b) increase the ability to practice analysis of problems that occur in the surrounding environment and find appropriate solutions to problems that are carried out in discussion forums or independent activities; c) carry out observation/observation activities on a matter until one can find out the advantages and disadvantages of the observed thing; d) increase high curiosity by being more concerned or sensitive to the surrounding circumstances as well as skills in asking and reflecting.

Before carrying out learning, a teacher must first prepare a learning plan that will be carried out. This learning plan is carried out so that learning can be carried out smoothly and the goals that have been set are achieved. In planning the lesson one that must be prepared by the teacher is the learning model. The learning model used by the teacher must be in accordance with the learning material and learning objectives. When a teacher is right in determining the learning model to be used, of course it will make the learning atmosphere fun. This pleasant learning atmosphere will make it easier for students to accept learning material. Based on (Hayati et al., 2016; Supriyatno et al., 2020; Mandernach, 2006) learning geography is one of the materials in which it is necessary to develop critical thinking processes so that students can solve existing environmental problems.

The conventional learning model is not student-centered, so students are less active in learning activities. The use of conventional learning models is also not able to train students in developing problem solving in the surrounding environment.

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

Table 1 Results of Measuring Critical Thinking Ability of Class 11 Students of SMA Negeri 1 Bandung

Critical Thinking Ability Indicato	Class			
	XI IPS 1 36 Students	XI IPS 2 35 Students	XI IPS 3 34 Students	XI IPS 4 32 Students
Give a simple explanation (*elementary clarification*)	58	55	53	48
Build basic skills (*basic support*)	58	45	48	45
Draw conclusions (*inference*)	46	53	54	41
Provides further classification (*advance clasification*)	40	41	43	40
Plan strategy and tactics (*strategy and tactics*)	40	43	45	45
Amount	242	237	243	219
Average	48,4	47,4	48,6	43,8
Category	Medium	Medium	Medium	Medium

Source: Pre Research processed by the authors (2022) and refers to indicators of critical thinking skills according to Ennis, Robert H (1990: 68)

Based on the results of the pre-research above, the category of critical thinking skills (Karim, 2015 ; Zetruslita, 2016) can be said that students' critical thinking skills are still at a moderate level. The selection of PBL (Problem Based Learning) and POE (Predict, Observe, Explain) learning models is based on several scientific reasons. The first reason is based on data from the Global Index of Cognitive Skills and Educational Attainment-overall (Sulistyanto, 2014 ; Knight et al., 2016) Indonesian education is ranked 40th out of a total of 40 countries surveyed. Supported by the results of the TIMSS survey (The Trends in International Mathematics and Science Study) (Sulistyanto, 2014) explains that students in Indonesia have a very low level of ability to think critically by only being able to answer basic questions without linking thought processes critical.

The second reason is because the two learning models are included in the student-oriented learning model (student center). There are various advantages of using a student-oriented learning model, one of which is that the learning material studied by students will be easier to understand so that it can develop the potential of the students themselves. PBL (Problem Based Learning) and POE (Predict, Observe, Explain) learning models are included in the scientific learning model. The scientific learning process is a learning process that improves students' training in solving problems in the environment around students. This problem-solving activity is a form of being able to improve students' intellectual abilities, especially critical thinking skills. PBL (Problem Based Learning) and POE (Predict, Observe, Explain) learning models are contextual. In learning activities, it will be able to attract more students' attention if there is relevance between the material and the situation in the surrounding environment.

The two learning models focus on aspects of symptom analysis and problems that are felt by the community in the surrounding environment. So that this can foster students' critical thinking skills towards the surrounding environment. Both of these models have in common that is superior in honing students' critical thinking skills. Research on the PBL

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

(Problem Based Learning) and POE (Predict, Observe, Explain) learning models regarding critical thinking skills has been carried out by previous researchers. However, research on the comparison of PBL (Problem Based Learning) and POE (Predict, Observe, Explain) learning models on critical thinking skills in geography subjects on Population Dynamics Problems has not been carried out. Therefore, it is necessary to conduct research on "The Influence of the Use of PBL (Problem Based Learning) and POE (Predict, Observe, Explain) Learning Models on Critical Thinking Ability (Experimental Studies in Geography Lessons for Students at SMA Negeri 1 Bandung)".

2. LITERATURE RESEARCH

2.1. PBL Learning Model (Problem Based Learning) and POE Learning Model (Predict, Observe, Explain)

The PBL (Problem Based Learning) learning model is a learning model that is implemented based on factual problems in everyday life. (woods, 2014 and Weiss, 2017) problem-oriented learning is a learning method that incorporates problem topics in everyday life around the student's environment. These problems can be given directly by the teacher or can also be identified together between the teacher and students. In the learning process, students are required to be able to solve these problems. In line with the opinion of (Dignath, C., & Veenman, M. V. 2021) PBL (Problem Based Learning) is a series of learning activities that prioritize solving problems in everyday life using a scientific approach.

One of the innovative learning models is the PBL (Problem Based Learning) learning model. Agree with (Nisa, 2015) the PBL (Problem Based Learning) learning model is an innovative learning model so that it can create active learning conditions for students. The PBL (Problem Based Learning) learning model is said to be innovative because in the learning process students are directed to real problems. Supported by the opinion of (Djonomiarjo, 2020 ; Mayasari, 2022 ; Rerung et al., 2017) learning with the PBL (Problem Based Learning) learning model directs students to real problems to collect and integrate new knowledge.

The POE (Predict, Observe, Explain) learning model is a type of instructional method rooted in constructivist learning theory (Çingil Baris, Ç., 2021; Lee, L. H., & Yeung, Y. Y. 2021). This is because the POE learning model considers that students already possess prior knowledge, which serves as the foundation for developing critical thinking skills. The purpose of the POE learning model is to assess students' abilities to predict a problem, conduct observations related to their predictions, and provide explanations for the predictions they make. Referring to the acronym POE, it is clear that this learning model guides students to make predictions about an issue or phenomenon in their surroundings. The predictions made by students should then be observed from several relevant and reliable sources. Following this, students are expected to explain or communicate their predictions and compare them with the results of their observations.

2.2 Critital Thingking Ability in Learning

Critical thinking ability is a thinking process that is carried out comprehensively or more specifically towards an event. The thought process carried out by individuals must be carried out in a structured manner and continue to be evaluated so that the results of their thoughts become more detailed. Students can also think critically, the goal is that they are

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

more confident with their opinions. (Abidin, 2020) believes that students' critical thinking skills are a structured thinking process carried out by students by formulating and assessing the opinions they believe. In formulating and assessing his opinion, other additional sources of information are needed. Learners can use learning references as support for their opinions to increase their confidence. The analytical thinking process an evaluation is needed which can be done through observation, interaction, and searching for other relevant sources of information (Alsaleh, N. J., 2020; Wolcott, M. D., et al., 2021). Students can also ask questions to strengthen their arguments. The more often asked, students' critical thinking skills will increase.

Based on his understanding, critical thinking is very useful for educated participants in solving problems daily and as a preparation for the future. According to (Nasutuion, 2008) intelligence thinks critical can be a tool to achieve the educational goal, namely that educated participants can overcome complex problems in everyday life. Oleh karena itu, keahlian dalam berpikir kritis analitis menjadi sangat signifikan untuk ditingkatkan dilingkungan pendidikan. McMurarry et al. Active participation of educated participants in learning activities can help enhance their critical thinking capabilities. (Wahyuni and Kurniawati, 2014) teachers have a responsibility to motivate educated participants in order to enhance their critical thinking capabilities that are very useful in solving problems in everyday life. Therefore, teachers should be able to design a learning involving active participation of educated participants or focusing on educated participants to ensure that the ability to think critically educated participants can develop well.

Critical thinking skills are strongly influenced by several factors, factors that influence critical thinking skills include having an open-minded nature, healthy skepticism, intellectual, humble, and having high motivation. With the existence of these factors in students, it will make it easier for students to express opinions. Expressing opinions and being able to accept suggestions from others is one way to practice critical thinking skills.

3. METHOD

Pseudo-experimentation or Quasi-Experiment is the research method used in this study because it has an experimental group that is not randomly selected. In the implementation of quasi-experimental research, the sample groups correspond to the actual conditions. In accordance with the statement (Erwan and Dyah, 2011; Nind, M., & Katramadou, A. 2023) that in a quasi-research there are groups with real conditions or non-random groups.

Research using quasi-experimental methods aims to determine the effect of a treatment on research subjects. In this study, the aim was to determine the effect of the PBL (Problem Based Learning) and POE (Predict, Observe, Explain) learning models on students' critical thinking skills. Based on the opinion of (Santosa., 2017) quasi research uses a causal hypothesis where this research is used to directly test a variable how much it influences other variables. In addition, (Bracio, K., & Szarucki, M., 2020; Guerrero, V. S. M., et al., 2024) reveals that pseudo research puts forward the principle of experiment where this research wants to see a result of the relationship between the variables being analyzed. So that in experimental research carrying out several activities, namely the researcher at least manipulates at least one variable, controls the relevant variables, and makes observations regarding the impact or influence on one or more dependent variables.

In this experimental study, the non-equivalent control group design was used in the form of pretest and posttest. In carrying out research using this design requires 2 experimental

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

groups. In this study there were 2 experimental groups, while the research design to be used can be seen in the following table.

Table 2 Research Design

Kelas	Pre-test	Perlakuan	Post-test
Eksperimen 1	O_1	X_1	O_2
Eksperimen 2	O_3	X_2	O_4

Source: Arifin (2014: 77) and results of the compiler analysis (2023)

4. RESULTS AND DISCUSSION

4.1 Results of Students' Critical Thinking Ability

1. Experimental Class 1 Using the PBL (Problem Based Learning) Model

The results of students' critical thinking skills tests are in the form of pretest and posttest scores. The forms of pretest and posttest are in the form of essay questions totaling 20 questions. Each item contains or has been adapted to indicators of critical thinking in geography subject matter about population dynamics in Indonesia. This is because, the purpose of carrying out the pretest and posttest is to determine the level of students' critical thinking skills. The results of the pretest and posttest of the experimental class 1 can be seen in the following table.

Table 3 The PBL (Problem Based Learning) Learning Model

The PBL (Problem Based Learning) Learning Model						
Value	***Pretest***		**Critical Thinking Ability Level Category**	***Posttest***		**Critical Thinking Ability Level Category**
	Frequency	**Percentage**		**Frequency**	**Percentage**	
80 < Score ≤ 100	0	0	Very high	35	100	Very high
60 < Score ≤ 80	2	5,7	high	0	0	high
40 < Score ≤ 60	32	91,4	medium	0	0	medium
20 < Score ≤ 40	1	2,9	lowly	0	0	lowly
0 < Score ≤ 20	0	0	Very low	0	0	Very low
Amount	35	100		35	100	
Minimum Value	41,6667		medium	88,3333		Very high
Maximum Value	61,6667		high	98,3333		Very high
Average	52,2381		medium	93,381		Very high

Source: Research Data Processing (2023)

The critical thinking ability of students in experimental class 1 during the pretest obtained a minimum score of 41.6667 (moderate) and a maximum score of 61.6667 (high) resulting in an average score of 52.2381 (moderate). Meanwhile, students' critical thinking

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

skills, seen from the results of the posttest, obtained a minimum score of 88.3333 (very high) and a maximum of 98.3333 (very high) so that an average score of 93.381 (very high) was obtained. The increase in students' critical thinking skills is marked by the posttest scores which are above the pretest scores.

Based on the results above, it can be seen that the posttest results of students in experimental class 1 are greater than the pretest results. This can be interpreted that the use of the PBL (Problem Based Learning) learning model can improve students' critical thinking skills.

2. Experiment Class 2 Using the POE Model (Predict, Observe, Explain)

The results of students' critical thinking skills tests are in the form of pretest and posttest scores. The forms of pretest and posttest are in the form of essay questions totaling 20 questions. Each item contains or has been adapted to indicators of critical thinking in geography subject matter about population dynamics in Indonesia. This is because, the purpose of carrying out the pretest and posttest is to determine the level of students' critical thinking skills.

The results of the pretest and posttest of students in the experimental class 2 used the POE (Predict, Observe, Explain) learning model. The results of the pretest and posttest of the experimental class 2 can be seen in the following table.

Tabel 4 POE Learning Model (Predict, Observe, Explain)

POE Learning Model (Predict, Observe, Explain)						
Value	***Pretest***		**Critical Thinking Ability Level Category**	***Posttest***		**Critical Thinking Ability Level Category**
	Frequency	**Percentage**		**Frequency**	**Percentage**	
80 < Skor ≤ 100	0	0	Very high	34	100	Very high
60 < Skor ≤ 80	2	5,9	high	0	0	high
40 < Skor ≤ 60	31	91,2	medium	0	0	medium
20 < Skor ≤ 40	1	2,9	lowly	0	0	lowly
0 < Skor ≤ 20	0	0	Very low	0	0	Very low
Amount	34	100		34	100	
Minimum Value	40		low	81,6667		Very high
Maximum Value	65		high	95		Very high
Average	51,8627		medium	88,4314		Very high

Source: Pretest-Posttest Results of Students' Critical Thinking Ability in Class

The critical thinking skills of students in experimental class 2 during the pretest obtained a minimum score of 40 (low) and a maximum score of 65 (high) resulting in an average score of 51.8627 (moderate). Meanwhile, students' critical thinking skills, seen from the results of the posttest, obtained a minimum score of 81.6667 (very high) and a maximum of 95 (very high) so that an average score of 88.4314 (very high) was obtained. The increase in students' critical thinking skills is marked by the posttest scores which are above the pretest scores.

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

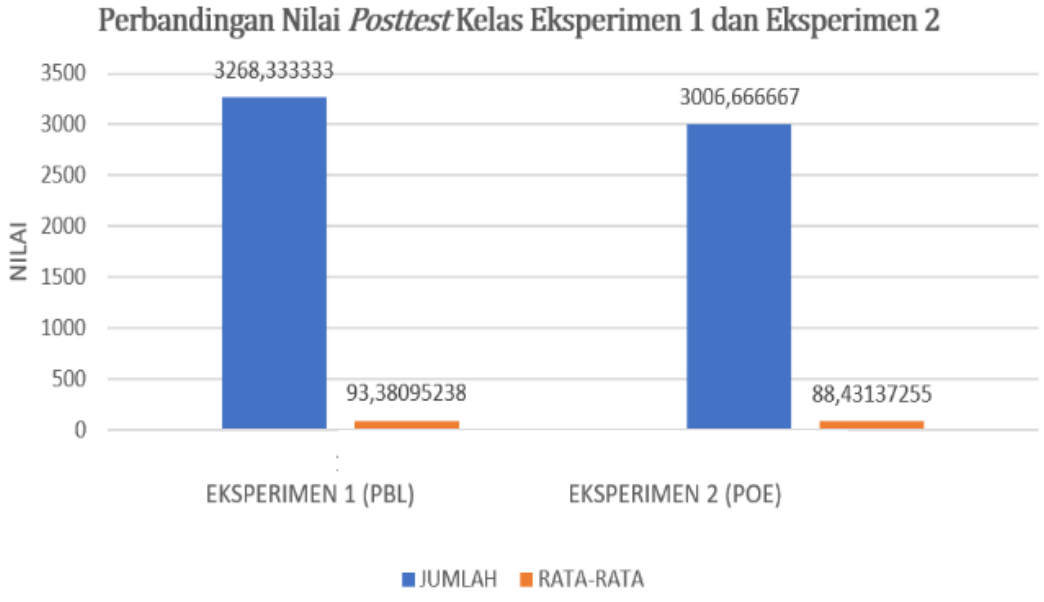
Based on the data above, it can be seen that the posttest results of students in experimental class 2 are greater than the pretest results. This shows that students' critical thinking skills before being given treatment have a moderate level of critical thinking skills. After the treatment was carried out there was an increase in students' critical thinking skills which were at a very high level. This can be interpreted that the use of the PBL (Problem Based Learning) learning model can improve students' critical thinking skills.

3. Comparison of Students' Critical Thinking Ability Test Results in Experiment 1 and Experiment 2 Classes

Based on data processing analysis in the form of pretest and posttest scores for students' critical thinking skills in experimental class 1 and experiment 2, it was found that students in experimental class 1 obtained higher posttest scores than experimental class 2. Therefore, the PBL (Problem Based Learning) learning model can improve students' critical thinking skills higher than the POE (Predict, Observe, Explain) learning model. The comparison of the posttest results of the two classes can be seen in the following diagram.

The results of the critical thinking skills test (posttest) can also be compared based on critical thinking indicators. This comparison shows the ability to think critically based on indicators in experimental class 1 and experiment 2. It aims to know the advantages and disadvantages of experimental class 1 and experiment 2 based on indicators of critical thinking so that recommendations can be given to overcome the deficiencies that exist in experimental class 1 and experiment 2. The results of the critical thinking test (posttest) based on the indicators can be seen in the following diagram.

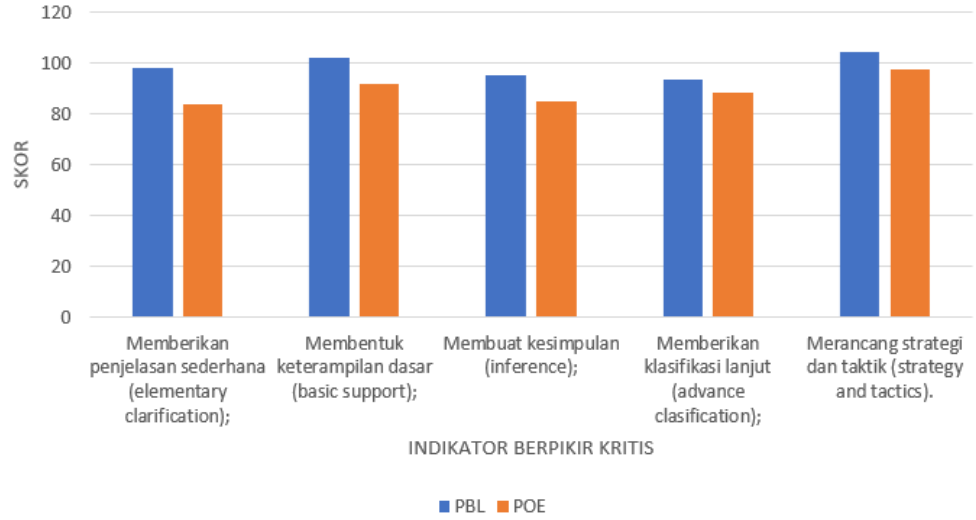
Diagram 1 Comparison of Posttest Scores for Class Experiment 1 and Experiment 2



Source: Research Data Processing (2023)

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

Diagram 2 Comparison of Posttest Class Experiment 1 and Experiment 2 scores based on Critical Thinking Indicators



Source: Research Data Processing (2023)

The Effect of Learning Models on Students' Critical Thinking Ability

1. Experimental Class 1 Using the PBL (Problem Based Learning) Model

LKPD assessment in the form of an assessment of the knowledge, skills, presentation and attitudes of students. In the experimental class 1, the form of LKPD was in the form of essay questions totaling 13 items which included all assessments and were adjusted to improve critical thinking skills. The purpose of giving LKPD to students is to hone students' critical thinking skills during the learning process. The results of student worksheet and posttest assessments in experimental class 1 can be seen in the following table.

Table 5 LKPD and Posttest Class Experiment 1 scores

	Average Value				
	LKPD				
	Knowledge	**Attitude**	**Skills**	**Presentation**	***Posttest***
Gain Score	3433,33333	3420	3419,047619	3425	
Average Score	98,0952381	97,71428571	97,68707483	97,85714286	
Amount	391,3537415				3268,33
Average	97,83843537				93,381

Source: Research Data Processing (2023)

2. Experiment Class 2 Using the POE Model (Predict, Observe, Explain)

LKPD assessment in the form of an assessment of the knowledge, skills, presentation and attitudes of students. In the experimental class 2, the form of LKPD was in the form of essay questions totaling 15 items which included all assessments and were adjusted to improve critical thinking skills. The purpose of giving LKPD to students is to hone students' critical thinking skills during the learning process. The results of the LKPD and posttest assessments of students in the experimental class 2 can be seen in the following table.

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

Table 6 LKPD and Posttest Class Experiment 2 scores

	Average Value				
	LKPD				
	Knowledge	**Attitude**	**Skills**	**Presentation**	***Posttest***
Gain Score	2827,777778	2760	2722,222222	2641,666667	
Average Score	83,16993464	81,17647059	80,06535948	77,69607843	
Amount	322,1078431				3006,666667
Average	80,52696078				88,43137255

Source: Research Data Processing (2023)

Normality Test Results

1.Pretest and Posttest Normality Test

The normality test for this was carried out using data in the form of pretest and posttest scores for students' critical thinking skills in experimental class 1 and experiment 2. This normality test was carried out as a condition for the Paired T-Test. The results of the calculation of the normality test in this study can be seen in the following table.

Table 7 Data Normality Test Results Pretest-Posttest Students' Critical Thinking Ability in Experiment 1 and Experiment 2 Classes

		Kolmogorov-Smirnov[a]		
	kelas	Statistic	df	Sig.
pretest posttest	pretest eks1	,131	35	,138
	posttest eks 1	,127	35	,166
	pretest eks 2	,101	34	,200*
	posttest eks 2	,114	34	,200*

Source: Research Data Processing with SPSS 25 (2023)

Based on the table above, it shows that the pretest significance value obtained for experimental class 1 is 0.138 and the posttest is 0.166. In the experimental class 2, the pretest significance value was 0.200 and 0.200 posttest. It can be concluded from the results of these calculations that the numbers obtained are numbers that all have a calculated value higher than the rtable value at the Sig level. >0.05. That way, the two classes in this study came from normally distributed populations.

2.Test for Normality of Variables X and Y

This normality test was carried out using the data variable X (learning model) and variable Y (critical thinking-posttest) of students in experimental class 1 and experiment 2. This normality test was carried out as a condition for the regression test.

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		35
Normal Parameters[a,b]	Mean	,0000000
	Std. Deviation	3,07027503
Most Extreme Differences	Absolute	,124
	Positive	,093
	Negative	-,124
Test Statistic		,124
Asymp. Sig. (2-tailed)		,195[c]

Source: Research Data Processing with SPSS 25 (2023)

Based on the table above, it shows that the significance value of the normality test for variables X and Y in experimental class 1 is 0.195. It can be concluded from the results of these calculations that the numbers obtained are numbers that have a higher calculated value than the rtable value at the Sig. >0.05. That way, the X and Y variables in the experimental class 1 in this study come from populations that are normally distributed.

Table 9 Results of the Normality Test of Variables X and Y of Experimental Class 2 Students

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		34
Normal Parameters[a,b]	Mean	,0000000
	Std. Deviation	3,29242981
Most Extreme Differences	Absolute	,094
	Positive	,058
	Negative	-,094
Test Statistic		,094
Asymp. Sig. (2-tailed)		,200[c,d]

Source: Research Data Processing with SPSS 25 (2023)

Based on the table above, it shows that the significance value of the normality test for variables X and Y in experimental class 2 is 0.200. It can be concluded from the results of these calculations that the numbers obtained are numbers that have a higher calculated value than the rtable value at the Sig. >0.05. That way, the X and Y variables in the experimental class 1 in this study come from populations that are normally distributed.

Homogeneity Test Results

The homogeneity test in this study used data from the posttest results of students' critical thinking skills in the experimental class 1 and experiment 2. The homogeneity test was carried out to ensure that the two classes in this study had a homogeneous variance. The results of homogeneity calculations in this study can be seen in the following table.

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

Table 10 Homogeneity Test Results for Students' Critical Thinking Ability in Experiment 1 and Experiment 2 Classes

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Posttest	Based on Mean	,083	1	67	,774
	Based on Median	,079	1	67	,779
	Based on Median and with adjusted df	,079	1	66,415	,779
	Based on trimmed mean	,090	1	67	,765

Source: Research Data Processing with SPSS 25 (2023)

Based on the table above shows the value of Sig. 0.774 > 0.05 so that it can be said that the two classes in this study have a homogeneous variance.

Hypothesis Test Results

After carrying out the analysis of normality and homogeneity tests which show that the data is normally distributed and homogeneous. The next step is to test hypotheses 1, 2, 3, 4 and 5 using the parametric statistics of the Paired Samples T-Test, the Independent T-Test, and the Simple Linear Regression test using SPSS version 25 software. The test results are as follows.

1. **Hypothesis 1**

Table 11 Hypothesis Test Results 1

Paired Samples Test									
Paired Differences									
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pretest-Posttest	-41,14286	4,93042	,83339	-42,83652	-39,44920	-49,368	34	,000

The test criterion is that if the value of Sig. <0.05 then H0 is rejected and H1 is accepted, if the Sig value is > 0.05 then H0 is accepted and H1 is rejected. Based on table 4.12, Sig. (2-tailed) 0.000 <0.05, it can be concluded that H0 is rejected and H1 is accepted, which means that there are differences in the critical thinking abilities of students in experimental class 1 before and after treatment using the PBL (Problem Based Learning) learning model.

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

2. Hypothesis 2

Table 12 Hypothesis Test Results 2

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	Pretest-Posttest	-36,56863	4,95673	,85007	-38,29811	-34,83914	-43,018	33	,000

Source: Research Data Processing with SPSS 25 (2023)

The test criterion is that if the value of Sig. <0.05 then H0 is rejected and H1 is accepted, if the Sig value is > 0.05 then H0 is accepted and H1 is rejected. Based on table 4.13, Sig. (2-tailed) 0.000 <0.05, it can be concluded that H0 is rejected and H1 is accepted, which means that there are differences in the critical thinking abilities of students in experimental class 1 before and after treatment using the POE (Predict Observe Explain) learning model.

3. Hypothesis 3

H1: There is a difference between using the PBL (Problem Based Learning) learning method and using the POE (Predict, Observe, Explain) learning model on students' critical thinking skills. H0 : There is no difference between using the PBL (Problem Based Learning) learning method and using the POE (Predict, Observe, Explain) learning model on students' critical thinking skills.

Table 13 Hypothesis Test Results 3

Independent Samples Test										
		Levene's Test for Equality of Variance		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
Posttest	Equal variances assumed	,083	,774	6,045	67	,000	4,94958	,81875	3,31535	6,58381
	Equal variances not assumed			6,040	66,455	,000	4,94958	,81949	3,31363	6,58553

Source: Research Data Processing with SPSS 25 (2023)

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

The test criterion is that if the value of Sig. <0.05 then H0 is rejected and H1 is accepted, if the Sig value is > 0.05 then H0 is accepted and H1 is rejected. Based on table 4.13, Sig. (2-tailed) 0.000 <0.05, it can be concluded that H0 is rejected and H1 is accepted, which means that there are differences in students' critical thinking abilities between using the PBL (Problem Based Learning) learning model in experimental class 1 and POE (Predict, Observe, Explain) in the experimental class 2. The test results show that the PBL (Problem Based Learning) learning model is more effective in improving students' critical thinking skills compared to the POE (Predict, Observe, Explain) learning model.

4. Hypothesis 4

Table 14 Hypothesis Test Results 4

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48,861	1	48,861	5,031	,032[b]
	Residual	320,504	33	9,712		
	Total	369,365	34			

a. Dependent Variable: berpikir kritis

b. Predictors: (Constant), model pembelajaran

Source: Research Data Processing with SPSS 25 (2023)

From the table above, it is known that the calculated F value: 5.031 with a significance level of 0.032 <0.05, so there is an influence of the PBL learning model variable (X) on the critical thinking ability variable (Y). In order to know the percentage of influence of the PBL learning model variable (X) on the critical thinking ability variable (Y) can be seen in the following table.

Table 15 Hypothesis Summary Table 4

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,364[a]	,132	,106	3,11645

a. Predictors: (Constant), model pembelajaran

Source: Research Data Processing with SPSS 25 (2023)

The table above explains the magnitude of the correlation value or relationship (R), which is equal to 0.364. From the table it is obtained that the coefficient of determination (R-Square) is 0.132 which implies that the PBL learning model variable (X) has an influence on the critical thinking ability variable (Y) of 13.2%. Based on the results of the calculation of the coefficient of determination in this study, it is included in the very weak level. Therefore, the relationship between the variables of the PBL learning model (X) to the critical thinking ability variable (Y) is very weak.

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

5. Hypothesis 5

Table 16 Hypothesis Test Results 5

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	47,506	1	47,506	4,250	,047[b]
	Residual	357,723	32	11,179		
	Total	405,229	33			

a. Dependent Variable: berpikir kritis

b. Predictors: (Constant), model pembelajaran

Source: Research Data Processing with SPSS 25 (2023)

Table 17 Hypothesis Summary Table 5

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,342[a]	,117	,090	3,34348

a. Predictors: (Constant), model pembelajaran

Source: Research Data Processing with SPSS 25 (2023)

The table above explains the magnitude of the correlation value or relationship (R) which is equal to 0.342. From the table it is obtained that the coefficient of determination (R-Square) is 0.117 which implies that the influence of the POE learning model variable (X) on the critical thinking ability variable (Y) is 11.7%. Based on the results of the calculation of the coefficient of determination in this study, it is included in the very weak level. Therefore, the relationship between the variables of the POE learning model (X) to the critical thinking ability variable (Y) is very weak.

In this study there were 2 learning models including the PBL (Problem Based Learning) learning model and the POE (Predict, Observe, Explain) learning model. Both models have advantages in improving students' critical thinking skills. The PBL (Problem Based Learning) and POE (Predict, Observe, Explain) learning models are student-centered learning models, in the implementation of learning activities the teacher is only a facilitator. The PBL (Problem Based Learning) and POE (Predict, Observe, Explain) learning models are learning strategies that focus on students and train students' critical thinking skills through direct observation of learning objects (Arsy, 2020; Vilhena and Castellar, 2010). Based on the results of the study that there were differences in students' critical thinking skills in experimental class 1 before and after using the PBL (Problem Based Learning) learning model. The results of this study are in accordance with the results of Fitria's research (2019) there are differences in students' critical thinking skills before and after treatment using the PBL (Problem Based Learning) learning model. The results of this hypothesis test prove that the PBL (Problem Based Learning) learning model can improve students' critical thinking skills in geography subjects related to the subject matter of population dynamics problems. This is because students have received treatment using the PBL (Problem Based Learning) learning model. The advantage of the PBL (Problem Based Learning) learning model is that it is able to develop critical thinking skills because at each stage of learning (syntax) hones and directs students to be able to develop their critical thinking skills. In accordance with the opinion of Rodriguez, (J. M. G., et al., 2020) the advantages of the PBL

DOI: https://doi.org/10.17509/jpis.v32i1.55969
e-ISSN: 2540-7694 p-ISSN: 0854-5251

(Problem Based Learning) learning model through problem solving students are able to develop their critical thinking skills.

Based on the results of the study, it shows that there are differences in the critical thinking abilities of students before and after being given treatment using the POE (Predict, Observe, Explain) learning model in experimental class 2. The results of this study are in accordance with the results of Afriyeni's research (2018) there are differences in thinking abilities students' critical thinking before and after treatment using the POE (Predict, Observe, Explain) learning model. This is because the POE (Predict, Observe, Explain) learning model has the advantage of developing critical thinking skills. According to (Díez, F., et al.m 2020) the advantages of the POE (Predict, Observe, Explain) learning model can encourage students to hone their critical thinking skills.

The PBL (Problem Based Learning) learning model has a higher influence in improving students' critical thinking skills compared to the POE (Predict, Observe, Explain) learning model. In accordance with the opinion of Yeung (2010) learning geography using the PBL (Problem Based Learning) learning model is very efficient and effective in improving students' critical thinking skills. The PBL (Problem Based Learning) learning model can improve students' critical thinking skills by 13.2%. Meanwhile, the POE learning model (Predict, Observe, Explain) was only able to improve students' critical thinking skills by 11.7%. From the test results obtained a difference of 1.5%.

5. CONCLUSION

Based on the formulation of the research problem, the results of data analysis on improving students' critical thinking skills, the results of hypothesis testing, discussion, and research findings, several conclusions can be made in this study including there are differences in students' critical thinking abilities before and after using the PBL (Problem Based Learning) learning model in experimental class 1. There are differences in students' critical thinking abilities before and after using the POE (Predict, Observe, Explain) learning model in the experimental class 2. There is a difference in students' critical thinking skills between the experimental class 1 which uses the PBL (Problem Based Learning) learning model and the experimental class 2 which uses the POE (Predict, Observe, Explain) learning model. The results of the critical thinking skills test showed that the experimental class 1 obtained higher results than the experimental class 2. There is an effect of using the PBL (Problem Based Learning) learning model on students' critical thinking skills in experimental class 1. There is an effect of using the POE (Predict, Observe, Explain) learning model on students' critical thinking skills in experimental class 2.

6. REFERENCES

Abidin, Z. (2020). Efektivitas pembelajaran berbasis masalah, pembelajaran berbasis proyek literasi, dan pembelajaran inkuiri dalam meningkatkan kemampuan koneksi matematis. *Profesi Pendidikan Dasar*, *7*(1), 37-52.

Alsaleh, N. J. (2020). Teaching Critical Thinking Skills: Literature Review. Turkish Online Journal of Educational Technology-TOJET, 19(1), 21-39.

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251

Bracio, K., & Szarucki, M. (2020). Mixed methods utilisation in innovation management research: A systematic literature review and meta-summary. Journal of Risk and Financial Management, 13(11), 252.

Çingil Baris, Ç. (2021). A Review of Studies Conducted with the Prediction-Observation-Explanation (POE) in Biology Education. International Online Journal of Education and Teaching, 8(3), 1797-1816.

Cheng, H., Fan, Y., & Lau, H. (2023). An integrative review on job burnout among teachers in China: Implications for Human Resource Management. The International Journal of Human Resource Management, 34(3), 529-561.

Díez, F., Villa, A., López, A. L., & Iraurgi, I. (2020). Impact of quality management systems in the performance of educational centers: educational policies and management processes. Heliyon, 6(4).

Dignath, C., & Veenman, M. V. (2021). The role of direct strategy instruction and indirect activation of self-regulated learning—Evidence from classroom observation studies. Educational Psychology Review, 33(2), 489-533.

Djonomiarjo, T. (2020). Pengaruh model problem based learning terhadap hasil belajar. *Aksara: Jurnal Ilmu Pendidikan Nonformal*, *5*(1), 39-46.

Guerrero, V. S. M., Guerra, H. S., & Parra, M. (2024). New trends in research designs and literature concerning innovation issues. A methodological approach. Dictamen Libre, (34), 137-146.

Hayati, W. I., Utaya, S., & Astina, I. K. (2016). *Efektivitas Student Worksheet Berbasis Project Based Learning Dalam Menumbuhkan Kemampuan Berpikir Kritis Siswa Pada Mata Pelajaran Geografi* (Doctoral dissertation, State University of Malang).

Karim, K., & Normaya, N. (2020). Kemampuan Berpikir Kritis Siswa dalam Pembelajaran dalam Pembelajaran Matematika dengan Menggunakan Model Jucama di Sekolah Menengah Pertama. *EDU-MAT: Jurnal Pendidikan Matematika*, *3*(1).

Knight, S. E., Van Wyk, J. M., & Mahomed, S. (2016). Teaching research: a programme to develop research capacity in undergraduate medical students at the University of KwaZulu-Natal, South Africa. *BMC medical education*, *16*, 1-8.

Lee, A. S., & Jacobs, R. L. (2021). A review of national occupational standards and the role of human resource development in their implementation. Human Resource Development Review, 20(1), 46-67.

Lee, L. H., & Yeung, Y. Y. (2021). A scoping review of flipped classrooms in K-12 science education: Implications and recommendations for future research and practice. Journal of Computers in mathematics and Science Teaching, 40(1), 65-97.

Mandernach, B. J. (2006). Thinking critically about critical thinking: Integrating online tools to promote critical thinking. *Insight: A collection of faculty scholarship*, *1*, 41-50.

Mayasari, A., Arifudin, O., & Juliawati, E. (2022). Implementasi Model Problem Based Learning (PBL) Dalam Meningkatkan Keaktifan Pembelajaran. *Jurnal Tahsinia*, *3*(2), 167-175..

Nisa, (2015) Implementasi Model Pembelajaran Problem Based Learning untuk Meningkatkan Keaktifan dan Hasil Belajar Siswa pada Mata Pelajaran Pemrograman Desktop Kelas XI RPL SMK Ma'arif Wonosari. yogjakarta: Universitas Negeri Yogyakarta.

DOI: https://doi.org/10.17509/jpis.v32i1.55969
e-ISSN: 2540-7694 p-ISSN: 0854-5251

Nind, M., & Katramadou, A. (2023). Lessons for teaching social science research methods in higher education: synthesis of the literature 2014-2020. British journal of educational studies, 71(3), 241-266.

Paul, R. W. (1993). The logic of creative and critical thinking. *American behavioral scientist*, *37*(1), 21-39.

Purwanto, E. A., & Sulistyastuti, D. R. (2007). Metode penelitian kuantitatif: Untuk administrasi publik dan masalah-masalah sosial.

Rerung, N., Sinon, I. L., & Widyaningsih, S. W. (2017). Penerapan model pembelajaran problem based learning (PBL) untuk meningkatkan hasil belajar peserta didik SMA pada materi usaha dan energi. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *6*(1), 47-55.

Rodriguez, J. M. G., Hunter, K. H., Scharlott, L. J., & Becker, N. M. (2020). A review of research on process oriented guided inquiry learning: Implications for research and practice. Journal of chemical education, 97(10), 3506-3520

Santosa, R. (2017). Metode penelitian kualitatif kebahasaan. Surakarta

Sudarmo, S., Arifin, A., Pattiasina, P. J., Wirawan, V., & Aslan, A. (2021). The Future of Instruction Media in Indonesian Education: Systematic Review. Al-Ishlah: Jurnal Pendidikan, 13(2), 1302-1311.

Sulistyanto, D. (2014, May). Improving Teaching and Research Capacity in Indonesia Education Throught ASEAN Collaboration. In *International Conference on Education and Language (ICEL)* (Vol. 1).

Supriyatno, T., Susilawati, S., & Hassan, A. (2020). E-learning development in improving students' critical thinking ability. *Cypriot Journal of Educational Sciences*, *15*(5), 1099-1106.

Tri, N. M., Hoang, P. D., & Dung, N. T. (2021). Impact of the industrial revolution 4.0 on higher education in Vietnam: challenges and opportunities. Linguistics and Culture Review, 5(S3), 1-15.

Wahyuni, F. R. E., & Kurniati, E. (2014). Efektivitas Metode Pembelajaran Problem Solving Terhadap Kemampuan Berpikir Kritis Siswa Pada Materi Sistem Reproduksi Manusia Di Kelas Xi Sma Negeri 1 Putussibau. *VOX EDUKASI: Jurnal Ilmiah Ilmu Pendidikan*, *5*(2), 91-99.

Weiss, G. (2017). Problem-oriented learning in geography education: Construction of motivating problems. *Journal of Geography*, *116*(5), 206-216.

Wolcott, M. D., & Lobczowski, N. G. (2021). Using cognitive interviews and think-aloud protocols to understand thought processes. Currents in Pharmacy Teaching and Learning, 13(2), 181-188.

Woods, D. R. (2014). Problem-oriented learning, problem-based learning, problem-based synthesis, process oriented guided inquiry learning, peer-led team learning, model-eliciting activities, and project-based learning: what is best for you?. *Industrial & Engineering Chemistry Research*, *53*(13), 5337-5354.

Zetriuslita, Z., Ariawan, R., & Nufus, H. (2016). Students' critical thinking ability: Description based on academic level and gender. *Journal of Education and Practice*, *7*(12), 154-164.

DOI: https://doi.org/10.17509/jpis.v33i1.57767
e-ISSN: 2540-7694 |p-ISSN: 0854-5251