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The Effect of Problem Based Learning and Problem Solving Method on Students' Critical Thinking Skill

(Quasi Experimental Study on Economic Subject with Basic Competency "Analyzing International Trade Concept and Policy" in Grade XI SMA Negeri 9 Cirebon)

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ABSTRACT

This research started from the phenomenon of low critical thinking skill of grade XI IPS students in SMAN 9 Harjamukti Cirebon. Many factors influence, one of them is the learning method. The purpose of this research is to find the differences in students' critical thinking skill before and after using Problem Based Learning (PBL) learning method and Problem Solving (PS) learning method. This research is an experimental study using the Quasi Experiment method. The form of design of quasi experiment used is Nonequivalen Control Group Design. The research subjects are class XI IPS 1, XI IPS 2 and class XI IPS 4 in SMAN 9 Harjamukti Cirebon. Data collection tools for students' critical thinking skill are obtained by providing tests in the form of description questions. The test that will be used is done validity test, reality test, difficulty level test and differentiating test. Data processing techniques use normality test, homogeneity test, Gain and for hypothesis test using paired samples t-test and independent sample t-test. Based on the results of the study, it can be concluded that there are differences from students' critical thinking skill using Problem Based Learning (PBL) and Problem Solving (PS) learning method is higher than the analytical capability of students who use conventional methods and there are differences in students' critical thinking skills between class that use Problem Based Learning (PBL) learning method and class that use Problem Solving (PS) learning method. Learning using Problem Solving (PS) learning method is more effective in improving students' critical thinking skill than learning using Problem Based Learning (PBL) learning method and conventional method.

Keywords: Problem based learning (PBL), problem solving (PS), students' critical thinking skill

INTRODUCTION

The decline in the quality of human resources is not separated from a problem in education such as the weak learning process. According to Wina Sanjaya, (2014, p.1) one of the problems facing the education world is the problem of weak learning process. In the learning process of children less used to developing their thinking skills but the child is directed to improve the ability to memorize information, the child is guided to remember all the information without being obliged to understand the information he or she remembers to be connected to his daily life, as a result the protégé does not have the skills when graduating from school, but they become theoretically smart. The learning system is memorized, considered less effective for students Ali Mohammad Siahi Atabaki, et al, (2015, p. 94).

Students' ability to think critically can be seen in their students' basic competencies in analyzing, synthesizing, and evaluating. Students' basic competencies in analyzing, synthesizing, and evaluating describe students' ability to think critically. Students' basic competency skills can be seen from their replay scores, one of which is seen from pas scores. Based on the results of observations or pre-research in SMAN 9 Harjamukti Cirebon city shows the pas value of students is still

low or still below the KKM set at 77. The following can be seen in table 1.1 data recapitulation of the odd semester PAS value class XI IPS SMAN 9 Cirebon shown in the following table:

TABLE 1
RECAPITULATION OF LAST SEMESTER SCORE GRADE XI IPS POST-SEMESTER IN ECONOMICS SUBJECTS IN SMAN 9 CIREBON
YEAR 2019/ 2020

NO	Class	Total of Students	Minimum Standard (KKM)			
			≤77	(%)	≥77	(%)
1.	**XI IPS 1**	35	20	57,14	15	42,86
2.	**XI IPS 2**	35	16	45,71	19	54,29
3.	**XI IPS 3**	36	14	38,89	22	61,11
4.	**XI IPS 4**	33	21	63,64	12	36,36
	Jumlah	139	71	205,38	68	194.62

Source: Data of score in semester 3 majoring in IPS on Economic subject in SMA Negeri 9 Harjamukti Cirebon

The data shows that there are problems in the learning process of students in this school can be seen from many students whose PAS scores are low or below KKM. This is due to the lack of students in understanding economic learning materials because the learning activities that teachers often do in SMAN 9 Cirebon use more lectures in the process so that the ability of students in thinking is not trained, while the ability to think in students is an important aspect in helping students to solve a problem. The ability to think that every student should have is critical thinking ability. So the need for efforts to make students more critical to dealing with the changing world is increasingly rapid and the complexity of Desmond Adair, & Martin Jaeger, (2016, p. 23)

Savery (2006, p. 13) states that critical thinking skills are an important skill for identifying problems and setting parameters for the development of solutions that can be built through PBL. According to previous research on problem based learning method, namely Tomas Ucol Ganiron. Jr, (2014, p. 223) examines the influence of problem based learning methods on critical thinking abilities, that Problem Based Learning can improve high-level thinking skills. In addition to problem based learning methods there are also other methods that can be used in improving students' critical thinking skills, namely problem solving method. According to Syaiful Bahri Djamarah, &amp, Aswan Zain, (2014, p. 91) the Problem Solving method is not only a teaching method, but also a method of thinking, because in Problem Solving can use other methods that start by looking for data until drawing conclusions. Problem solving method is one method that directs students to focus together or group work in solving a problem.

Based on the description in the background above, the objective in this study is to compare the critical thinking abilities of students between those taught using the Problem Based Learning (PBL) method and students who study using the Problem Solving method.

METHOD

This research uses quasi experimental design method that aims to find out the influence of Problem Based Learning method and Problem solving method on students' critical thinking skill of economic subject. The type of research design used in this study is the Non Equivalent (pretest and postest) Control Group Design research design. This research was conducted at SMAN 9 Cirebon Year of Study 2019-2020. The subject of class XI IPS 1 research with a total of 35 students as an experimental class 1 taught by Problem Based Learning (PBL) method, class XI IPS 4 with a total of 33 students as an experimental class 2 taught by problem solving (PS) method and control class is class XI IPS 2 with a total of 35 students using conventional method.

TABLE 2
NON EQUIVALENT RESEARCH DESIGN (PRETEST AND POSTEST) CONTROL GROUP DESIGN

Calss	Pretest	Perlakuan	Posttest
Experiment class I	Q_1	X_1	Q_2
Experiment class II	Q_3	X_2	Q_4
Control class	Q_5	X_3	Q_6

Source: Sugiyono, (2017, pp. 79)

Description:
This research grouping is divided into 3 groups, namely:
Group 1
Q_1 = Initial test (before treatment) on experiment group I
X_1 = Treatment of problem based learning methods in experiment class I.
Q_2 = Final test (after treatment or treatmen) in the experiment group

Group 2
Q_3 = Initial test (before treatment) on experiment group II.
X_2 = Treatment of Problem Solving method in experiment class II.
Q_4 = Final test (after treatment or treatment) in the experiment group
Group 3
Q_5 = Initial test (before treatment) in experiment group III.
X_3 = Treatment of conventional methods or lectures in experiment class.
Q_6 = Final test (after treatment or treatment) in the experiment group

In this study, normality test was created to find out the results of normality test which is the first test of normality of pretest data and posttest data critical thinking ability of students in PBL, PS and control classes (conventional).

TABLE 3
RESULT OF NORMALITY TEST OF PRETEST AND POSTTEST SCORE STUDENTS' CRITICAL THINKING SKILL

Test of Normality							
KELAS		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
RESULT	Pretest (Eksperimen PBL)	.098	35	.200*	.975	35	.596
	Postest (Eksperimen PBL)	.131	35	.138	.973	35	.542
	Pretest (Eksperimen PS)	.129	33	.175	.956	33	.195
	Postest (Ekperimen PS)	.088	33	.200*	.963	33	.308
	Pretest (Konvensional)	.139	33	.104	.956	33	.194
	Postest (Konvensional)	.147	33	.068	.967	33	.391
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

Based on a table of 3 normality test data processing results derived from pretest data and Postest experiment class on students' critical thinking abilities with Problem Based Learning (PBL) method obtained a significant value (sig) pretest of 0.596, and from the postest of 0.542. The Problem Solving (PS) method obtained a significant value (sig) pretest of 0.195, and from the postest of 0.308, the conventional method experiment class students obtained a significant value (sig) pretest of 0.194, and from a postest of 0.391, this means that of the three data the value was $\alpha \geq 0.05$. then it can be concluded that the normality test data derived from the Shapiro-Wilk test of pretest scores and posttest scores of critical thinking abilities of students with problem based learning (PBL) methods of Problem Solving (PS) and Conventional methods is entirely distributed normally.
Based on the homogeneity test is carried out using the Levene test and generates a probability value (sig)= 0.338 > α = 0.05. From the acquisition of the sig value when viewed based on the significance of the value α = 0.05 it can be concluded that the homogeneity test data derived from the pretest value and posttest value of critical thinking ability of students with problem based learning (PBL) method, Problem Solving(PS) method, Conventional method varies homogeneously.

RESULT

Test Results of Differences in Critical Thinking Skill of Students Before and After Using Problem Based Learning (PBL) Learning Method

The results of the test comparative critical thinking skill of students before and after learning with the application of Problem Based Learning learning methods can be seen in table 4 below.

TABLE 4
DIFFERENCE TEST IN STUDENTS' CRITICAL THINKING SKILLS IN EXPERIMENT CLASS WITH PROBLEM BASED LEARNING (PBL) METHOD

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	PRE_PBL - POST_PBL	-31.314	5.676	.959	-33.264	-29.364	-32.636	34	.000

In table 4 using paired sample t-test obtained probability value (Sig.) = 0.000< 0.05 = α, then H0 is rejected and H1 is accepted. Thus, there are differences in pretest scores and posttest scores of students' critical thinking abilities using problem based learning (PBL) learning methods in experiment class 1.

These differences can be further reinforced by the average value of n-gain critical thinking skills in problem based learning (PBL) learning method which can be seen in table 5 below:

TABLE 5
N-GAIN STUDENTS' CRITICAL THINKING SKILL IN EXPERIMENT CLASS PROBLEM BASED LEARNING (PBL) METHOD

Data	Score Average	Improvement	N-Gain	Indeks N-Gain	Interpretation
Pretest	41,31429	31,3143	0,53714	**0,3 ≤ G ≤ 0,7**	**Average**
Posttest	72,628571				

Based on table 5 it can be noted that there was an increase in students' criticaloikir ability prior to the use of Problem Based Learning (PBL) learning methods in experiment class 1 with an average increase of 31.3143, and it is also known that the average n-gain of 0.53714, thus it can be concluded that there are differences in students' critical thinking abilities before and after using problem based learning (PBL) learning methods in experiment class 1 with moderate category.

Test Results of Differences in Critical Thinking Skill of Students Before and After Using Problem Solving Learning Methods (PS)

The results of the critical thinking skill comparison of students before and after learning with the application of Problem Solving learning method can be seen in table 6.

TABLE 6
DIFFERENCE TEST IN STUDENTS' CRITICAL THINKING SKILLS IN EXPERIMENT CLASS WITH PROBLEM SOLVING (PS) METHOD

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_PS - POSTTEST_PS	-30.424	3.072	.535	-31.514	-29.335	-56.886	32	.000

Based on the difference test results through paired samples test in table 6 above obtained the value of sig p-value. (2-tailed) of 0.000 indicates that the value of the sig p-value. (2-tailed) is lower than a=0.05 so H0 is rejected and H1 is accepted. So the conclusion is that in the

experimental class of ps method there are differences in the critical thinking ability of students before and after the implementation of treatment with problem solving (PS) method. These differences can be further reinforced by the average value of n-gain critical thinking skills in problem solving (PS) learning methods that can be seen in table 7 below:

TABLE 7
N-GAIN STUDENTS' CRITICAL THINKING SKILL IN EXPERIMENT CLASS PROBLEM SOLVING (PS) METHOD

Data	Score Average	Improvement	N-Gain	Indeks N-Gain	Interpretation
Pretest	40,85714	28,6857	0,51114	0,3 ≤ G ≤ 0,7	Average
Posttest	69,54286				

Based on table 7, it can be noted that there was an increase in students' critical thinking skill prior to the use of Problem Solving (PS) learning methods in experiment class 2 with an average increase of 28.6857, and it is also known that the average n-gain of 0.51114, thus it can be concluded that there are differences in students' critical thinking abilities before and after using problem solving (PS) learning methods in experiment class 2 with moderate category.

Test Results of Differences in Critical Thinking Skill of Students Before and After Using Problem Solving Learning Method (PS)

The results of the test comparative critical thinking skill of students before and after learning with the application of control classes with Conventional learning methods can be seen in table 8 as follows:

TABLE 8
STUDENTS' CRITICAL THINKING SKILL IN EXPERIMENT CLASS WITH KONVENSIONA LMETHOD

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_KON - POSTTEST_KON	-27.212	6.264	1.090	-29.433	-24.991	-24.956	32	.000

Based on the difference test results through paired samples test in table 8 above obtained the value of sig p-value. (2-tailed) of 0.000 indicates that the value of the sig p-value. (2-tailed) is lower than a=0.05 so H0 is rejected and H1 is accepted. So the conclusion is that in the experiment class of Conventional learning methods there are differences in the improvement of critical thinking skills of students before and after the implementation of treatment with conventional learning methods.

These differences can be further reinforced by the average value of n-gain critical thinking skill with conventional learning methods that can be seen in table 9 below:

TABLE 9
N-GAIN STUDENTS' CRITICAL THINKING SKILL IN EXPERIMENT CLASS WITH CONVENTIONAL METHOD

Data	Score Average	Improvement	N-Gain	Indeks N-Gain	Interpretation
Pretest	34,4	25,6571	0,40229	0,3 ≤ G ≤ 0,7	Average
Posttest	60,05714				

Based on table 9, it can be noted that there was an increase in students' critical thinking skill prior to the use of Conventional learning methods in the control class with an average increase of 25.6571, and it is also known that the average n-gain of 0.40229, thus it can be concluded that there are differences in students' critical thinking skill before and after using conventional learning method in control classes with moderate category.

1.4 Differences in Critical Thinking Skill Between Problem Based Learning And Conventional Method

In this 4th hypothesis test researchers used the Tuckey Multiple comparison test. Hypothetical test data processing using tuckey multiple comparison test is intended to see and assess the differences of each student's critical thinking skill in the experiment class with problem based learning method with conventional learning method.

TABLE 10
RESULT OF TUCKEY-HSD (MULTIPLE COMPARISONS) TEST
DIFFERENCE OF STUDENTS' CRITICAL THINKING SKILL BETWEEN PROBLEM BASED LEARNING AND CONVENTIONAL

Multiple Comparisons						
Dependent Variable: Hasil berpikir kritis Tukey HSD						
(I) Learning Method	(J) Learning Method	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Problem Based Learning	Problem Solving	-.00498	.01730	.955	-.0461	.0362
	Conventional	**.11048***	**.01730**	**.000**	**.0693**	**.1516**

There are differences in students' critical thinking skill between classes that use Problem Based Learning learning method and classes that use conventional method. This can be seen from the difference in the mean value of PBL and conventional of 0.11048 and has a significant value smaller than 0.05 which is 0.000. Thus it can be concluded that there are significant differences between classes that use the PBL method and classes that use conventional method that can be seen after treatment and produce an average score of experiment scoring of the PBL method that is greater than in the control class using conventional methods.

1.5 Differences in Critical Thinking Ability Between Conventional Problem Solving Method

The differences in each student's critical thinking skill in the experiment class with problem solving and conventional method can be seen from table 11.

TABLE 11
RESULT OF TUCKEY-HSD (MULTIPLE COMPARISONS) TEST
DIFFERENCE OF STUDENTS'S CRITICAL THINKING SKILL BETWEEN PROBLEM BASED LEARNING METHOD AND CONVENTIONAL

Multiple Comparisons						
Dependent Variable: Hasil berpikir kritis Tukey HSD						
(I) Learning Method	(J) Learning Method	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Problem Solving	Problem Based Learning	.00498	.01730	.955	-.0362	.0461
	Conventional	.11545*	.01755	.000	.0737	.1572

There are differences in students' critical thinking skills between classes that use Problem Solving learning method and classes that use conventional method. This can be seen from the difference in the mean value of conventional PS mean which is 0.11545 and has a significant value smaller than 0.05 which is 0.000. Thus it can be concluded that there are significant differences between classes that use PS method and classes that use conventional method. This shows that there is a difference in critical thinking skill between experimental classes using PS method and control classes that use conventional method because PS scores are higher in students' critical thinking skill than conventional grades.

Difference in Critical Thinking Skill Between Problem Based Learning And Problem Solving Method

The differences between each student's critical thinking skill in the experiment class with the Problem Based Learning method and the Problem Solving method can be seen from table 12.

TABLE 12
RESULT OF TUCKEY-HSD (MULTIPLE COMPARISONS) TEST
DIFFERENCE OF STUDENTS'S CRITICAL THINKING SKILL BETWEEN PROBLEM BASED LEARNING AND PROBLEM SOLVING METHOD

Multiple Comparisons						
Dependent Variable: critical thinking result Tukey HSD						
(I) Learning Method	(J) Learning Method	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Problem Based Learning	Problem Solving	-.00498	.01730	.955	-.0461	.0362
	Conventional	**.11048***	**.01730**	**.000**	**.0693**	**.1516**

There are differences in students' critical thinking skill between classes that use Problem Based Learning method and classes that use problem solving method. This can be seen from the mean value of mean difference (l-Jn) of 0.00498 as well as a significant value of 0.955. This value is greater than $\alpha = 0.05$. Thus it can be concluded that between the PBL method and the PS method there is no significant difference, although the mean value of PS is greater than the mean value of PBL but has a Mean Difference (l-Jn) value of 0.00498, this indicates that there is a difference but the difference is not very significant or small.

DISCUSSION

From the data, experimental classes using the Problem Based Learning method experienced improved critical thinking skill of students in the moderate category. The results of this study are in accordance with the results of the study presented by (Amen, 2017, p. 34) that 1) problem based learning model affects the critical thinking ability of grade XI students of Sma Negeri 6 Malang, the critical thinking ability of the experimental class is higher than the control class.

Furthermore, according to the results of Fajar Prasetyo & Firosalia Kristin research, (2020, p.26) that there is a significant difference in the influence of mo-del Problem Based Learning and Discovery Learning on the critical thinking skills of grade 5 students. Ahmad Pharisee, et al, (2017, p. 286) the Problem Based Learning (PBL) learning model can improve students' critical thinking skills. According to Marhamah Asyari, et al (2016, p. 42) explains that (1) The learning process in the environment certainly through the application of integrated PBL with GI through Lesson Study stimulates the critical ability of students to think for the learning process and is revised several times during the reflection stage of each cycle. In addition, Lesson Study activities are evaluated by students who are having learning problems through the reflection stage. (2) A learning process that actively engages students through GI-integrated PBL Implementation learning may encourage students to think critically by giving arguments or opinions, stating problems, practicing to induce and conclude, and conducting evaluations.

According to Ahlam El-shaer, & Hala Gaber, (2014, p. 82) There has been a statistically significant increase in critical thinking of post-PBL students than before intervention. Also, the confidence items of critical thinking have a high percentage of change after curiosity and maturity interventions. This was shown to statistically increase the average value of total knowledge gain and retention of the experiment group from the total average score of knowledge acquisition and group control retention. There was no statistically significant correlation between the total

knowledge of the students of the experiment group and their critical post-intervention thinking. Izzah Al-Fikry, et al (2018, p. 21)

In the study conducted in the experiment class using the Problem Solving method, the results of the study showed that there were differences in the critical thinking ability of students before and after the implementation of treatment with the Problem Solving (PS) method. Furthermore, according to ristiasari research, Priyono, & Sukaesih, (2012, p. 38) that the problem solving learning model with mind mapping affects the critical thinking ability of students of Grade VII SMP Negeri 6 Temanggung. The application of problem solving learning model with mind mapping can develop critical thinking skills of grade VII G students in ecosystem material learning at SMP Negeri 6 Temanggung. The increase in students' critical thinking skills in the experiment class is greater than the control class.

Rahmawanty, (2017, p. 209) that there is an influence of problem solving learning methods on the critical thinking skills of mathematics. These results are in line with the results of Rachmawati's research, (2018, p. 99) There is an influence on improving critical thinking skills in students who use the Problem Solving method and in students who study using the group investigation method.

Whereas according to Turmudi (2009, p. 30) that by using problem solving in mathematics, students know how to think, habits to persevere, and high curiosity, and confidence in unusual situations, which will serve them well outside of their math classes. This opinion is in line with that expressed by Djamarah, (2014, p. 91) which states that the Problem Solving method is not only a teaching method, but also a method of thinking, because in problem solving can use other methods that start by looking for data to draw conclusions. According to Djamarah, (2014, p. 92) the advantages of Problem Solving method is that this method stimulates the development of students' thinking skills creatively and thoroughly, because in the learning process, students do a lot mentally by highlighting problems in various ways in order to find solutions.

CONCLUSION

Based on the research that has been done on the Influence of Problem Based Learning Methods and Problem Solving Methods on Students' Critical Thinking Ability (Quasi Experimental Study on Basic Competency Economics subjects Analyzing International Trade Concepts and Policies in Grade XI AT SMA Negeri 9 Harjamukti Cirebon) can be drawn the following conclusions:

1. There are differences in the critical thinking skill of students before and after the implementation of treatment with problem based learning (PBL) method. This can be seen after the implementation of problem based learning (PBL) method, the results show that students' grades are a significant improvement compared to posttest grades thus the Problem Based Learning (PBL) method can affect the increase in critical thinking of students.
2. There are differences in the critical thinking skill of students before and after the implementation of treatment with problem solving method. This can be seen from posttest results that in the experiment class of Problem Solving (PS) method there are differences in the critical thinking skill of students after the implementation of treatment with problem solving (PS) method. Thus, the Problem Solving (PS) method can affect the increase in critical thinking of students because this method can stimulate the development of students' thinking skill critically and thoroughly, because in the learning process, students do a lot of analysis by highlighting problems in various ways in order to find solution.
3. There are differences in students' critical thinking skill between classes that use Problem Based Learning method and classes that use conventional method. In this study the Problem Based Learning (PBL) method was more effectively used in

teaching learning activity than using conventional method. Thus it can be concluded that Problem Based Learning (PBL) learning method is more able to improve students' critical thinking skill than Conventional method.

4. There are differences in students' critical thinking skill between class that use Problem Solving learning methods and class that use conventional method. The average score of students using problem based learning (PBL) method is higher than the average score of students with conventional method. Thus it can be concluded that problem solving (PS) learning method is more able to improve students' critical thinking skill than conventional method.

5. There are differences in students' critical thinking skill between class that use Problem Based Learning method and class that use problem solving method. Problem Based Learning method and class that use problem solving method can both improve critical thinking skill but class that use problem solving method has higher critical thinking skill than class that use problem based learning method even though the differences are very small, but this proves that students with class that use problem solving method have higher critical thinking skill than class that use problem based learning method.

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