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THE EFFECT OF PROBLEM BASED LEARNING STRATEGY COMBINED BY JIGSAW TOWARDS CRITICAL THINKING ABILITY

Rayh Sitta Nurmala

Universitas Muhammadiyah Jember, Indonesia
rayhsitta.90@gmail.com

Abstract

The current problem of education is that students are less trained to develop their thinking capabilities. This is because teachers still consider giving information is more important than training the ability to think. One of the learning strategies that can train students to be able to learn independently and train high-level thinking capability is the Problem Based Learning strategy combined Jigsaw. The research aims to know the effect of Problem Based Learning strategy combined by Jigsaw towards critical thinking ability in the tenth grade students of Senior High School in Jember district. The research design was quasi-experiment. Pre-test and post-test non-equivalent control groups design was implemented. The population of this research is all of tenth grade students of senior high school in Jember in the academic year 2014/2015. The sample of this research is the students of 10^{th} Natural Science (IPA) 3 class as the control group, and then 10^{th} IPA 1, 10^{th} IPA 2, and 10^{th} IPA 4 as the experimental group. The technique of collecting sample was done by using simple random sampling. The data was taken by giving essay test. Moreover, the Hypothesis of the test was using Anakova's formula. Before doing the hypothesis test, normality test was implemented by using Kolmogorov-Smirnov Anakova's formula, and the homogeneity test was carried out by Levene's Test formula to know whether the distribution is normal and homogenous. Thus, based on the data analysis result and discussion, it can be concluded that result of Anacova test showed that the critical thinking ability has p value = 0.729 bigger than $\alpha = 0.05$, which showed that learning strategy did not exert any influences towards critical thinking capability.

Keywords: *problem based learning, jigsaw, critical thinking*

I. Introduction

Education is a necessity that has to be fulfilled in the process of living. The development of a nation is influenced by the quality of education from the nation itself because a higher education can create good quality human resources. A good quality in education will bring the student to increase their learning achievements to be better. Several skills that have to be owned by human resources are critical thinking ability, cooperation, and problem solving (BSNP, 2010). It is related to the statement from Hassani and Rahmatkhah (2014) that one of the education purposes is to make the student think critically. The ability to think critically need to be developed optimally because by having this kind of skill students can be rational. The students who have critical thinking abilities will always question themselves while facing all of their problems to determine what is good for them. Corebima (2005) mentioned that several discussions have revealed that there is a relationship

(even effect) between formal reasoning ability and the students' achievements in biology, including laboratory skill and critical thinking ability. The way to face the competition in globalisation era is by implementing constructive learning. Constructive learning is a learning method which centred at students so that the students are able to construct their own knowledge. Teacher has a huge responsibility in forming students' learning experience. Majid (2013) stated that teacher can encourage the development of the children by acting as a scaffolder i.e. understanding the existence of boundaries in children development temporarily and help, in order to give those helps accurately and let the children grow beyond their own development-boundaries later on.

Lack of learning activities which involved students in improving students thinking ability in Senior High School in Jember district can also be seen in Muhammadiyah Senior High School 3 Jember. According to the recent observations which held by the researcher on January 28th, 2015 when the teacher was teaching X IPA 4 class is evident that the students' critical thinking ability is still less enhanced in the teaching and learning process. On 29th January 2015, the researcher held an interview with tenth grade Biology teacher and tenth grade students of Muhammadiyah 3 Senior High School. Lack of critical thinking ability empowerment had an impact towards students' learning results. The information that is achieved from biology teacher in Muhammadiyah 3 Senior High School Jember reveals that virtually 50% of tenth grade students has not reached the minimum passing grade in every single test or daily post-test in biology yet. This shows that the cognitive learning results of the students are still in low category. Besides, it is also showed by less enthusiasm of the students in class, there are egoistic students and do not want to join with their classmates, and then those students have a tendency to choose a group that they wanted. Students with high ability are dominated the lower one. In the process of learning, only the high ability students who are actively answered the questions from the teacher, whereas others just be silent and only listen. Students usually come to school without any preparation about the material, students do not prepare at home before going to school. After material is given, the teacher gives a chance for the students to ask the teacher but unfortunately, only few students who took that chance. When the

teacher asks questions, there are only few students who answered it. Teacher has already told the students to read at home, but ignored, due to low reading interest and also low learning eagerness.

Based on those facts, the researcher assumes that effort is necessary to be done in order to empower students' critical thinking ability. One of the efforts that can be proposed is by implementing Problem Based Learning strategy combined with Jigsaw. PBL strategy is a learning strategy which confronts students to problems as the base in learning i.e. in other words students learn from a problem or based on problem. According to Warsono (2012), Problem Based Learning is a type of classroom management that is necessary to support constructivism approach in teaching and learning. Cooperative Jigsaw learning which involves students actively learn in group atmosphere to solve problems and learn to have a responsibility to their own learning and others. Students do not only learn material given, but also they have to be ready and be responsible to give that material to the group members. Majid (2013) mentioned that Jigsaw is a cooperative learning model which centred in students' group work in the form of small group. The research results of Karmana (2010) stated that one of learning strategies that is able to empower critical thinking ability of students is small group learning or cooperative.

Related research between Problem Based Learning and Jigsaw, and its relationship with critical thinking ability and cognitive learning results has been reported by Aisyah and Ridlo (2015) that Jigsaw learning strategy and Problem Based learning can improve meta-cognitive skill score in biology. The other research results have been reported by Limarta (2012) that Problem Based Learning combined with Jigsaw can improve meta-cognitive skill and learning achievements of tenth grade state senior high school in Pandaan. It is in line with the research result of Setiawan (2015) that the implementation of learning journal with Jigsaw strategy combined with Problem Based Learning which based on Lesson Study can improve meta-cognitive skill of students in biology, particularly in general biology course. Palennari (2012) also reported that Problem Based Learning strategy with cooperative learning Jigsaw can improve the understanding concept of the students.

This research aims to know the effect of learning strategy towards critical thinking ability of tenth grade students' senior high school in Jember district.

II. Method

Design of the research which is used in this research is quasi experiment. Treatment is given to the free variable to know the effect on controlled variable but the outside variables which influenced cannot be controlled (Cook and Campbell, 1979). The purpose of quasi experimental research is to retrieve estimated information for information that can be achieved by true experiment in impossible condition to control or manipulate all relevant variables (Suryabrata, 2013). This research uses Pre-Test – Post-Test Non-Equivalent Control Group (Cohen et. al., 2011). The population in this research is all tenth grade senior high school students in Jember disctrict in the 2014/2015 academic year. The sample in this research consists of four classes' i.e. tenth grade of IPA 3 as a controlled class (multi strategy), X IPA 1, X IPA 2, and X IPA 4 as experiment class, X IPA 4 (Problem Based Learning), X IPA 2 (Jigsaw), and X IPA 1 (Problem Based learning combined with Jigsaw). Simple Random Sampling technique is used to collect the sample by considering the equality in academic skill of those four classes. Simple Random Sampling technique can be done if the population is homogenous, so that it is necessary to have the equality test before deciding the sample (Prasetyo and Jannah, 2012). The equality can be seen by having the equality test which is given to tenth grade students of Muhammadiyah Senior High School 3 Jember by using SPSS version 22 for windows i.e. Anova test. The free variable that is used in this research is Problem Based Learning strategy, Jigsaw strategy, and Problem Based Learning combined with Jigsaw, meanwhile the controlled variable is critical thinking ability of students. The result of the research data is critical thinking analysis. The collected data is analyzed by using Kovarian (Anakova) analysis. Before doing the hypothetical test, assumption test is used to know the normality and homogeneity of the collected data. Normality test was done to know whether the distribution of the data is normal or not, whereas homogeneity test was done to know the homogeneity of the data. Statistical analysis was done by using SPSS

software version 22 for Windows, Analisis statistik dibantu dengan software *SPSS 22 for Windows*, with 0.05 ($p < 0.05$) significant levels.

III. Result and Discussion

Controlled variable that is used in this research is critical thinking ability. Data for the variables was obtained from scoring result in pre-test and post-test which had been given in the form of essay for about 18 questions. The scoring result then converted into range score between 0 and 100. Scoring data of critical thinking ability of the students were attained from pre-test which had been done before implementing learning strategy, and post-test which had been done after implementing learning strategy. The mean score of pre-test in critical thinking ability in Problem Based Learning was 58.41 while the mean post-test score was 68.85. The mean pre-test score in critical thinking ability in Jigsaw strategy was 58.57 whereas post-test was 69.39. The mean pre-test score in critical thinking ability in Problem Based Learning combined with Jigsaw strategy was 60.37 whilst post-test score was 70.29. The mean score of pre-test in critical thinking ability in multi-strategies was 56.49 while the mean post-test was 70.31. The mean score in critical thinking ability in Problem Based Learning experienced a growth at 10.44 or 17.88%. The mean score in critical thinking ability in Jigsaw strategy witnessed an increase at 10.83 or 18.48%. The mean score in critical thinking ability combined with jigsaw saw a growth at 9.92 or 16.43%. The mean score in critical thinking ability in multi-strategies witnessed an increase at 13.82 or 24.46%. The mean score between pre-test and post-test of critical thinking ability can be seen on Table 1.

Table 1 The Mean Score of Pre-Test and Post-test in Critical Thinking Ability

No	Strategy	Mean Score		Improvement (%)
		Pre Test	*Post Test*	
1	PBL	58,41	68,85	17,88
2	Jigsaw	58,57	69,39	18,48
3	PBL + Jigsaw	60,37	70,29	16,43
4	Multi-strategies	56,49	70,31	24,46

After collecting the data, data analysis is conducted. The technique of data analysis which is used to test hyphothesis in order to know the effect of free-variable

towards controlled-variable is kovarian (Anakova) analysis. Before conducting Anakova analysis, it is necessary to do perquisite test i.e. normality test to know whether the data is normally distributed or not, whereas homogeneity test is to know whether the collected data come from homogeny sample. The normality test is tested by using One-Sample Kolmogorov-Smirnow Test, while homogeneity test is tested by using Levene's Test of Equality of Error Variances. The result of One-Sample Kolmogorov-Smirnov Test towards the data of critical thinking ability showed a significance value at 0.087 for pre-test and 0.324 for post-test. Both significance scores were bigger than 0.05 which indicated that the data came from a normal distribution. The result of normality test in critical thinking analysis can be seen in Table 2.

Table 2 The Result of Normality Test in Critical Thinking Analysis

		The initial score of critical thinking ability	The final score of critical thinking ability
N		120	120
Normal Parameters(a, b)	Mean	58,3798	69,7041
	Std. Deviation	9,04935	7,17724
Most Extreme Differences	Absolute	0,114	0,087
	Positive	0,083	0,060
	Negative	-0,114	-0,087
Kolmogorov-Smirnov Z		1,253	0,953
Asymp. Sig. (2-tailed)		0,087	0,324

Homogeneity test is also tested towards post-test data of critical thinking ability. Based on the calculation, the significance score was 0.140. This significance was bigger than 0.05, which indicated that inter-variance groups are indifferent or homogeny. The result of homogeneity test in critical thinking ability data is shown on Table 3.

Table 3 The Result of Homogeneity Test in Critical Thinking Ability Data

F	df1	df2	Sig.
1,864	3	116	0,140

The normality test in critical thinking ability data showed that it had been normally distributed, while the result of homogeneity test illustrated that the

variance among data were homogeny. Based on those two perquisites test, so Anakova test can be tested in critical thinking ability data. The Anakova summary from data calculation in critical thinking ability is mentioned at Table 4. According to the table, it can be seen that learning strategy F score = 0.435 had acquired and sig = 0.729 bigger than alpha 0.05 (>0.05), so that H_0 which stated that there is no effects on learning strategy toward critical thinking ability of the students is accepted, hypothesis which stated that there is an effect on learning strategy towards critical thinking ability is rejected, so that it can be concluded that there is no significant influence or effect towards critical thinking ability.

Table 4 The Summary of Anakova Calculation Result in Critical Thinking Ability which Taken from Pre-test and Post-test Result

Source	Amount	df	Mean	F	Sig.
Corrected Model	614,702(a)	4	153,675	3,204	,016
Intercept	8364,539	1	8364,539	174,409	,000
XBKRITIS	568,865	1	568,865	11,861	,001
Class	62,553	3	20,851	0,435	0,729
Error	5515,317	115	47,959		
Total	589169,127	120			
Corrected Total	6130,019	119			

Corrected mean score in critical thinking analysis can be seen on Table 5. The mean score in critical thinking analysis at Problem Based Learning class was 68.85. The mean score in critical thinking ability in Jigsaw class was at 69.35. The mean score in critical thinking ability in Problem Based Learning combined with Jigsaw was 69.80. Mean score in critical thinking ability at multi-strategies was at 70.77.

Table 5 Mean Score in Corrected Critical Thinking Ability

Strategy	Mean	Gap	Correction

	Pre Test	*Post Test*		
PBL	58,41	68,85	10,44	68,85
Jigsaw	58,57	69,39	10,83	69,35
PBL + Jigsaw	60,37	70,29	9,92	69,80
Multi-strategies	56,49	70,31	13,82	70,77

One of the learning strategies that are able to empower high-critical thinking ability students i.e. cooperative learning (Corebima, 2010). Jigsaw is a type of cooperative learning which consists of several members in a group that is responsible for mastering learning material and able to deliver that material into other members in his or her group. The students are wished to be able to help each other, discuss, and argue for honing the knowledge that they mastered at that time and close the gap in each understanding. The cooperative learning of Jigsaw encourages students to be active and help each other in mastering the learning material to achieve maximum achievement.

The research result is evident that the lowest improvement of critical thinking ability has happened in the class that implemented Problem Based Learning strategy and the highest improvement was in multi-strategies class. This is because the researcher was not really good in implementing Problem Based learning. Besides, the students also feel unfamiliar with the Problem Based Learning strategy that is used by the researcher. The students are usually given multi-strategies model which implemented daily by the teachers such as lecturing, asking-giving question, and presentation. As mentioned by Sanjaya (2007), the challenge to apply Problem Based Learning strategy is if the students do not have any interest or confidence that problems that are learnt are difficult to be solved, so that they feel reluctant to try it. Amir (2009) also mentioned that one of the weaknesses in Problem Based Learning is the alteration of students' role which needed to be active in the learning process. This is also become specialized challenge by the researcher to make the students more active.

IV. Conclusion

Based on the result analysis and discussion, it can be concluded learning strategy does not significantly affect the critical thinking ability of tenth grade students at SMA Muhammadiyah 3 Jember, there is no difference in critical thinking ability between students in control group and experiment group. Suggestion that can be delivered is that biology teacher should be able to create a fun learning process and full of motivation so that the critical thinking ability can be improved optimally. The teacher should understand more about the character of each student so that the learning process can be received by the students, and they become more active in learning process. This research is very limited to the ability of the researcher, so that a further study related to the implementation of Problem Based Learning combined with Jigsaw towards critical thinking ability of students.

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