The Effect of Pogil Model on Critical Thinking Skills of Islamic Senior High School Students

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DOI: 10.29322/IJSRP.9.09.2019.p9328
http://dx.doi.org/10.29322/IJSRP.9.09.2019.p9328

Abstract- This study aims to analyze the influence of the POGIL model on the critical thinking skills of Islamic students and due at MA Nurul Ulum, Malang City on Geography learning, the hydrosphere phenomenon and its impact on life material. This type of research is a Quasi-Experimental Design with non-equivalent Pretest-Posttest control group design. The results of the study showed that after being given treatment in learning, students were given posttest with the mean results in the control class was 67.08 and in the experimental class was 81.60. Hypothesis testing of posttest results data showed that there are significant differences in students' critical thinking skills in both classes. Based on the results of the analysis, it can be concluded that the POGIL learning model has a significant influence on the critical thinking skills of the MA students.

Keyword: *POGIL learning model, critical thinking skills, process oriented, guided inquiry*

I. INTRODUCTION

Competencies that are expected to be possessed in human resources are currently more focused on thinking skills (Greenstein, 2012). The results of research from Hanover Research (2011) on several institutions in the world show that there are twenty-seven types of 21st century skills needed by the world of work and there are four skills that rank first or most urgently to be owned by the community. The four skills that are very urgent to be mastered by the community are collaboration and team work, creativity and imagination, critical thinking, and problem solving. The 2013 curriculum not only requires students to play an active role in the learning process, but also with the level of thinking ability, one of which is the ability to think critically. Thinking is not a static process, but always changes constantly and dynamically in every day or every time (Deswani, 2009). Thinking skills that are used together with the skills to communicate, collaborate, solve problems, are expected to make students have the full ability to contribute to the rapid development of science and technology (Greenstein, 2012).

Students' critical thinking skills can be developed through learning with a scientific approach (Bensley, 2014). One learning model that is considered appropriate with these skills is the Process Oriented Guided Inquiry Learning (POGIL) which is the development of guided inquiry. POGIL is cooperative learning rooted in constructivist theory (Dutt, 2010). There are two aspects that are emphasized in POGIL namely the material aspects and aspects of the learning process (Hanson, 2006).

Hanson (2006) states that POGIL learning consists of five learning steps namely orientation, exploration, concept formation, application, and closure. At thestage orientation, motivation is given to create students' interest in the material to be learned by presenting phenomena related to the material, arousing curiosity, and making connections with prior knowledge. To hold exploration, students are given the opportunity to design experiments, make observations, collect, examine, analyze data, or information, investigate relationships between variables, and test hypotheses. At thestage concept formation, students are guided through questions that require students to think analytically so that students can find their own concepts. After the concept is found, the concept is strengthened and expanded at thestage application. At thestage application, students are given the opportunity to apply the understanding they have gained in different contexts and use their abilities to solve problems given by the teacher. At thestage closure, reflection on what is learned and done on the performance of students.

The critical thinking skills that have developed in the field have not yet been fully achieved. The questions given in the new class reach the level of concept understanding, so we need a learning model that can improve students' critical thinking skills. As is the case at MA Nurul Ulum Malang, most teachers use conventional learning models more often than other learning models that are more modern and in accordance with 21st century skills.

Various studies have been carried out to determine the effect and effectiveness of the POGIL learning model on critical thinking skills. Research conducted by Nurfitriyah (2017) shows the application of the POGIL method in learning the concept of acid-base titration shows that there is an increase in students' critical thinking skills. In addition, research conducted by Balasubramaniam

(2015), Radhi (2013), McDonell (2013), and Fishback (2011) shows that the POGIL learning model can improve students' critical thinking skills and problem solving.

Based on these descriptions, the authors conducted research on "The Effect of POGIL (Model Process Oriented Guided Inquiry Learning Learning) on the Critical Thinking Ability of Madrasah Aliyah Students". Critical thinking skills are critical reasoning activities that involve the formation of concepts and are produced through observation and experience. Critical thinking skills are measured using a written test description with several indicators including the ability to formulate problems, make deductions, make arguments, conduct evaluations, and draw conclusions. This research was conducted within the scope of the subject matter of the hydrosphere phenomenon and its impact on life in class X Geography subjects in the second semester of 2018-2019 academic year.

Learning theory which is the basis of the POGIL learning model is constructivism. Constructivism is a learning process that explains how knowledge is organized in humans. The elements of constructivism have long been practiced in the process of learning and learning. The theory of learning in the view of constructivism, states that the child does not receive just that kind of knowledge from others, but the child actively builds on his knowledge that the child already has an initial ability to. Critical thinking is an ability and habit that really needs to be trained as early and as often as possible

II. RESEARCH METHODS

The research design used in this study is quasy experimental design. The sampling technique in this study was purposive sampling. The sample in this study were students of class X-IIS-2 as an experimental class and class X-IIS-3 as a control class. The reason researchers chose sample classes is because both classes have balanced academic ability. The number of samples in this study were 56 students consisting of 30 experimental class students and 26 control class students. Data collection instruments in this study were in the form of critical thinking skills test questions and observation sheets.

Research patterns can be known through the following 1 images.

Group	*Pretest*	Treatment	*Posttest*
Experiment	O_1	X	O_2
Control	O_3	Y	O_4

Figure 1 Research Design *Non Equivalent Control Group Design*

Remarks:

O_1 : *Pretest* carried out in the experimental group to measure students' critical thinking skills

O_3 : Pretest conducted in the control group to measure students' critical thinking skills

X : Application of POGIL learning models

Y : Application of learning models discovery learning

O2 : Postest carried out on the experimental group to measure students' critical thinking skills

O4 : Postest conducted in the control group to measure students' critical thinking skills

The test in this study was used to measure critical thinking skills. The questions that were tested were 5-item essay question essays with C4-C6 cognitive levels (analyzing, evaluating, and creating). Questions are developed from discourses or articles that contain indicators of critical thinking skills that are formulating problems, making deductions, giving arguments, evaluating, and making decisions. After the test is done, then the test value is measured using a rubric.

III. RESULTS AND DISCUSSION

Data Analysis of Students' Critical Thinking Ability

Prerequisite Test for Inferential Analysis

Data Normality Test of Students' Critical Thinking Ability

Table 1
Normality Test Results *Pretest* Students' Critical Thinking Ability

Test Normality Data *Pretest Kolmogorov-Smirnov*	Group Class	
	Class Control	Class Experiment
Statistics	0.124	0.113
Sig. (2-tailed)	0,200	0,200

Conclusion	Normal	Normal

Source: *Processed Primary Data*

The normality test calculation results show that the *pre-test value of* the critical thinking ability of the control class is Sig. = 0.200> 0.05, this means that H_0 is received, so that it can be concluded that these data come from a normal distributed population. The results of the calculation of thenormality *Kolmogorov-Smirnovtest* through SPSS 24 obtained the *pre-test value of* the critical thinking ability of the experimental class is Sig = 0.200> 0.05, this means that $H_{0\ is}$ accepted, so it can be concluded that the data come from populations that are normally distributed . The complete results of the normality test calculation of thevalue of *pretest* critical thinking skills can be seen in the appendix.

Final Data Normality Test Research (*Posttest*)

The results of the normality test *posttest* critical thinking abilities of the experimental class and the control class can be seen in the following table.

Table 2
Normality Test Results *Posttest Students'* Critical Thinking Ability

Data Normality Test Posttest Kolmogorov-Smirnov	Group Class	
	Class Control	Class Experiment
Statistics	0.124	0.113
Sig. (2-tailed)	0,200	0,200
Conclusion	Normal	Normal

Source: *Processed Primary Data*

The results of the normality test calculation show that the value of *posttest* the critical thinking ability of the control class is Sig. = 0.200> 0.05, this means that H_0 is received, so that it can be concluded that these data come from a normal distributed population. The results of test calculations calculation oftest for normality *Kolmogorov-Smirnov* through SPSS 24 resultvalue *posttest* critical thinking skills experiment class is Sig = 0.200> 0.05, this means that H_0 is received, so that it can be concluded that these data come from a normal distributed population. The complete results of the calculation of the normality of thevalue of *posttest* critical thinking skills can be seen in the appendix.

Based on the results of the distribution normality test table in table, it can be seen that the significance value in the control class and experimental class both in thevalues *pretest* and *posttest* are normally distributed, seen from the significance level produced by more than 5% (0.05)

Homogeneity Test

Table 3
Homogeneity Test Results Critical Thinking Ability of Students in the Control Class and the Experiment Class

Levene Statistics	df1	df2	Sig.	Conclusion
.258	3	108	.856	Homogeneous

Source: *Primary Data Processed*

Based on the results of the variance homogeneity test output produced a value (*Lavene Statistics*) of 0.856 with a significance level greater than 5% (0.05), 0.856 which means that students in the control group and the experimental group are the same (homogeneous), or in other words diversity or the variance of students' critical thinking skills in the control class is the same as the experimental class.

Hypothesis Test Data on Students' Critical Thinking Ability Test Results

1. Test Independent Samplest-test Initial Value of Students' Critical Thinking Ability (Pretest)

The results of the hypothesis t-testtest using the program SPSS 24 for Windows are presented in the following table.

Table 4

Test Results Independent Samplest-test Initial Values of
Student's Critical Thinking Ability (Pretest)

t-test for Equality of Means				
Mean				
Class Experiment	Control Class	T	Df	Sig. (2-tailed)
58.87	57.65	-1.110	54	, 272

Source: Primary Data Processed

Based on the table it is known that the value$_t$ of -1.110 and t_{table} with a significance level (5%) 0.05, degree of freedom (df) = (n-2), then obtained $t_{(0.05)\ (54)\ table}$ = -2.019. Then the results of the value of t_{count}<t_{table}, which shows the results of -1,110 <-2,019. As for the significance level of 5% (0.05) has a significance value α> 0.05, i.e. sig (2-tailed) of 0.272> 0.05. So it can be concluded that there is no significant difference in critical thinking skills between the experimental class and the control class before being given treatment, meaning that between the experimental class and the control class students have the same critical thinking skills at the time of the pretest. This is reinforced by the experimental class obtaining an average value of 57.65 and the control class having an average value of 58.87.

2. Test Independent Samplest-test Final Value of Students' Critical Thinking Ability (Posttest)

The results of the hypothesis t-testtest using the SPSS 24 for Windows program are presented in the following table

Table 5
Test Results Independent Samplest-test Final Value of
Student's Critical Thinking Ability (Posttest)

t-test for Equality of Means				
Mean				
Class Experiment	Control Class	T	Df	Sig. (2-tailed)
81.60	67.08	-12.549	54	,000

Source: Primary Data Processed

Based on these tables it is known that the value of $t_{arithmetic}$ -12.549 and t_{table} with a significance level (5%) 0.05, *degree of freedom* (db) = (n-2), then obtained $t_{(0.05)\ (54)}$table = -2.019 . So the result values $t_{>}tt_{abel,}$ which shows the results -12.549> -2.019. As for the significance level of 5% (0.05) has a significance value α <0.05, i.e. sig (2-tailed) 0.000 <0.05.

So it can be concluded that there is a significant difference in the ability to think critically between the experimental class and the control class after being given treatment, meaning that the results of the critical thinking abilities of the experimental class after being treated with the learning model *POGIL* are better than the control class using the learning model *discovery learning*. This is reinforced by the experimental class having an average value of 81.60 and the control class having an average value of 67.08.

3. Paired *Samples t-test* value *pretest* and Value *posttest* befikir Critical Ability of Students Classroom Experiment

Test Results *Sample Paired t-test* value of *pretest* and values *posttest* critical thinking skills of students in the experimental class can be seen in the table below.

Table 6
Test Results Paired Samples t-test value pretest and posttest Class Experiment

Paired Differences				
Mean				
Pretest	Posttest	T	Df	Sig. (2-tailed)
58.87	81.60	-23.639	29	.000

Source: Primary Data Processed

Based on the table it is known that the significance value α <0.05, i.e. *sig (2-tailed)* 0.000 <0.05. So it can be concluded that there is a significant difference in the critical thinking ability of experimental class students between before being treated with themodel *POGIL* and after being given the treatment of the model. This is reinforced by the averagevalue *pretest* of 58.87 andvalue *posttest* of 81.60. So it can be concluded that the treatment of themodel *POGIL* influences students' critical thinking skills.

IV. CONCLUSION

Based on the results of the hypothesis test, students in the experimental class using thelearning model POGIL have the ability to think critically better than the control class students. The model POGIL has a significant influence on students' critical thinking skills, especially in their ability to draw conclusions from solutions to the problem of the hydrosphere phenomenon and its effects in daily life.

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