

EFFECTS OF SCIENTIFIC INQUIRY LEARNING MODEL AND LOGICAL THINKING ABILITY OF HIGH SCHOOL STUDENTS SCIENCE PROCESS SKILLS

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Abstrack

This study aimed to analyze whether the results of science process skills of students. Who are taught by the teaching model scientific inquiry better than conventional learning, to analyze whether the results of science process skills of students? Who can think logically high is better than the students who have the potential to think logically low, analyze whether there is an interaction between scientific inquiry learning model with logical thinking skills to students' science process skills. This research is a quasi-experimental design with the two-group pretest-posttest design. The study population is all students of class X SMA Negeri 4 Padangsidempuan semester II academic year 2016/2017. The The research instrument consists of two types: science process skills instrument consists of 10 questions in essay form which has been declared valid and reliable, and the instrument ability to think logically in the form of multiple choice is entirely groundless and complements (combination). The resulting data, analyzed by using two path Anava. The results showed that science process skills of students who are taught by the teaching model scientific inquiry better than conventional learning. Science process skills of students who can think logically high are better than the students who can think logically low, and there is an interaction between learning model scientific inquiry and conventional learning with the ability to think logically to improve students' science process skills.

Keywords: Scientific Inquiry Learning Model, Conventional, Logical Thinking Skills, Science Process Skills.

INTRODUCTION

Education is a significant human need for education has the task to

prepare human resources for the development of the nation.

Quality in educational contexts including inputs (input), process (process) and output (output).

Achievement of learning in school for all subjects seen from the result of student learning outcomes, including science. Physics as a science in the clump of science is related to how to find tau, learn and understand nature. Learning science is a process in which there are stages such as observing, measuring, analyzing and drawing conclusions to provide some experience to students.

According to Druxes et al. (1986: 3), Physics is the study of natural events that can allow for experimentation, research, measurement of what is to come, based on general rules.

Physics Learning at school not only conveys information about concepts and principles but as processes. Physics as the course in policy is "a way of Investigating." This means that in Physics students are invited to conduct activities that are investigating.

It can not be denied that conditioning an active learning environment is not an easy task. There needs to be cooperation between education providers, education implementers, and students.

Teacher as a pioneer as well as the front guard in education is required to be wise and prudent in addressing it.

A professional teacher is a teacher who does not easily give up with this unfavorable condition. Precisely with these adverse conditions used as the necessary capital to take even a relatively small policy to change the situation for the better. One of them is to use a learning model that encourages the emergence of logical thinking ability of students to obtain good learning outcomes.

Based on the results of initial observations in the school found that the implementation of Physics education is still not able to show the nature of physics as a process. Most teachers are still using conventional learning models that put forward lecture, question and answer methods and assignments. The results of interviews with some students said that students rarely do Physics learning with laboratory activities. Teachers usually directly teach concept Physics without performing experiments in advance. Besides the use of student worksheet (LKS) is rarely done, so the students are not

motivated to optimally develop their science abilities in the learning process of Physics.

The ability of students' science processes influenced by several factors such as the learning model used by teachers in the classroom. Teachers are expected to choose the right learning model to achieve the learning objectives. Keep in mind that learning not merely conveyed knowledge, but also efforts to create an environment that to learn student system for learning can be achieved optimally.

Learning model that can be used to create a climate that to learn system students are learning model scientific inquiry. Joyce and Weil (2003: 187) states, scientific inquiry learning model is a model that involves students in the investigation of the real problem. This model focuses on the process of research, where students are faced with a problem area, identifying conceptual or methodological issues within the field of investigation and inviting students to design ways to overcome the challenges they face. This learning model is very suitable to be used

because in the implementation of the teacher provides guidance or broad enough instructions to the students.

Application of scientific inquiry learning model is to expose students to the process of investigation (experimental). Students are trained to be skilled in observing, formulating problems, hypothesizing, predicting, finding patterns and relationships, communicating, designing experiments, conducting experiments, and measuring and counting.

Lawson (2003: 1391) said that scientific inquiry is always accompanied by deductive reasoning ability (hypothetic al-deductive reasoning). It means that scientific inquiry learning models, in addition to facilitated students to develop their science process skills, this model also facilitates students to develop the ability to think logically through deductive reasoning in making predictions/hypotheses. Lawson (2004: 322) says that the deductive and inductive logic, both essential to scientific inquiry.

METHOD

This research was conducted in SMA Negeri 4 Padangsidimpuan

which is located at Jl. ST. Soria Mulia No. 38 City of Padangsidempuan in second semester TP 2016/2017, starting from April 22 until May 31, 2017. Population in this research is all students of class X SMA Negeri 4 Padangsidempuan consisting of 8 levels that are from class X-1 until X-8 which amounted to 296 people. Random cluster level did sampling; wherein each class has an equal opportunity to be a sample. The first class as the experimental class is class X-1 applied scientific inquiry learning model and the second level as the control class is the class X-8 is used conventional education.

The variables in this study consisted of three variables: independent variable, moderator variable, and dependent variable. The independent variable in this study is a model of scientific inquiry learning and conventional education.

Moderator variable in this research is logical thinking ability, while the dependent variable is science process skill.

This research includes the study quasi the type of research that aims to see or determine whether there is a result/effect of something worn on the subject students are students. The study involved two different sample classes treated. In the experimental group has been processed with scientific inquiry learning model while the control group treated with conventional education. Two research design form group pretest-posttest design.

RESULTS AND DISCUSSION

From a result of pretest and posttest data processing for each class obtained mean and standard deviation in table 1.

Table 1. Pretest and postes data

Sample	N	Mean	Std. Deviation
Pretes control	31	51.13	6.15
Pretest experiment	31	48.47	7.37
Postes control	31	61.04	3.91
Postes experiment	31	77.5	5.80

After data obtained prerequisite test data analysis that is normality and homogeneity test and t test.

Table 2. Pretest and post test Normality test

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Results	Kolmogorov-Smirnova		
	Statistic	df	sig.
Pretest control	0.137	31	0.146
Pretest experiment	0.131	31	0.191
Posttest control	0.130	31	0.199
Posttest experiment	0.113	31	.200

Based on normality test result in table 2, significance value in sig column. data of pretest value and postes of science process skill obtained by significance value greater

than 0,05, hence can be said pretest and postes data of control class and experiment class is normal distribution. Furthermore, homogeneity test is done.

Table 3. Pretest and posttest homogeneity test

Results		Levene Statistic	sig.
Pretes	Based on Mean	1,239	0.270
Postes		3,157	0.081

Based on the results of the homogeneity of variance test output using Levene test in table sig > 0.05, it can be concluded that the control and experimental class students come from populations having the same variant, or both classes homogeneous. Based on test results obtained prerequisite that the science process

skills normally distributed and similar, then tested the hypothesis by testing general linear model Univariate ANOVA 2×2 .

Hypothesis testing

Here are the results of hypothesis testing for students' science process skills.

Table 4. Two Path Anova Test Results

Source	Mean Square	F	Sig.
Learning model	3032,432	325,881	0,000
Thinking	883,756	94.973	0,000
Model_Perbelajaran * Thinking_Logis	41,569	4.467	0.039

Science process skills of students who are taught by scientific inquiry learning model

The result of variance analysis test in table 4 obtained the significance value of learning model 0.000. Because of the sig value. $0.000 < 0.05$ so that the results of hypothesis testing reject or accept H_0 H_a in an alpha level of 5% means that the students' science process skills that are taught with scientific inquiry learning model are better than conventional learning. The skills of the science process in these two groups of students can be displayed in

the diagram comparison of science process skills of students in the pretest and posttest in Figure 1.

Figure 1 shows the average posttest science process skills of students in the experimental class taught by scientific inquiry learning model that is 77.50 higher than average posts science process skills that control class taught by conventional education namely (61.04). These results prove that the scientific inquiry learning model gives better results in improve students' science process skills.

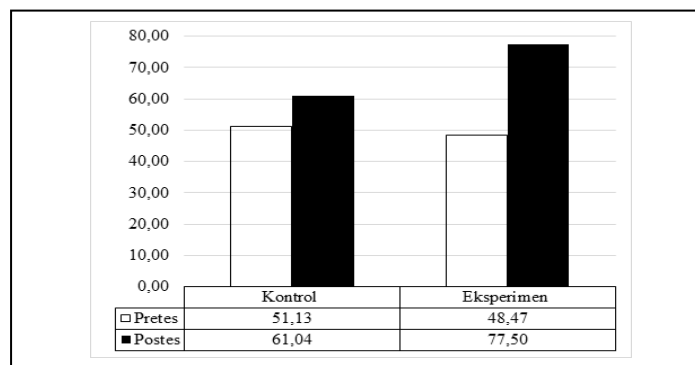


Figure 1. The relation between the value of the science process skills of the control and experimental classes

The results of this study are supported by research that has been done by some previous research. (Hussain, et al., 2011: 269) In his research said that the scientific inquiry learning model was significantly more efficient to improve learning outcomes compared to conventional education. Similarly, Fakhrunnisyak and Sinuraya (2016: 25) in her study also said that a significant difference between scientific inquiry learning model to the learning outcomes of students, compared with conventional education. In addition to improving student learning, scientific inquiry learning model effectively can improve students' science process skills (Ergul, et al., 2011: 62). Application of scientific inquiry learning model enables researchers to convey information to students, so the learning process to be innovative and not boring for students. This learning pattern is more varied than conventional learning model, because in this study students in the experimental class discussions and mutual sharing in solving the

problem. Learning activities such as observing, formulating problems, formulating hypotheses, collecting and processing data and summarized by students. So that in the learning process interwoven a transparency either between students themselves or between students and teachers.

Skills of science process students who have high logical thinking ability

The result of analysis of variance in Table 4 obtained significance value capabilities 0,000 logical thinking. Because of the sig value $0.000 < 0.05$ so that the test results reject the hypothesis H_0 or receive H_a in the standard alpha 5% means that the science process skills of students who have the ability to think logically with groups of students who have the potential to think logically above average better than students who have the ability to think logically low with a group of students who have the potential to think logical below average. Analyze the value of science process skills based on the level of

logical thinking ability can be seen in Figure 2.

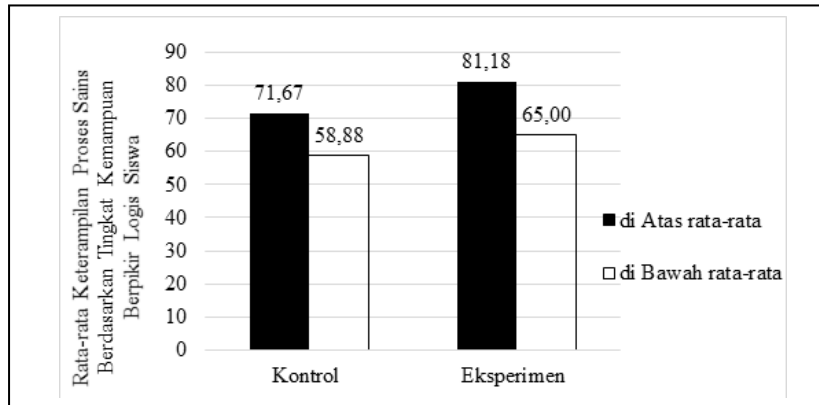


Figure 2. The relationship of science process skills to the learning model based on the level of logical thinking ability

This is in line with research conducted by Ismail and Jusoh (2001: 75) says that the ability to think logically can enhance science process skills and vice versa science process skills can improve the ability to think logically. This means that if the ability to think logically high then the science process skills are also high.

Research conducted by Manurutng (2014: 230) also said that there was a significant relationship between the ability to think logically with the ability of students in solve problems of kinematics.

Similarly, Oloyede (2012: 3) in his research concluded that students who have high logical thinking ability are more active and more easily

understand the concepts of learning compared with students who have low logical thinking ability.

Students who have high logical thinking ability with groups of students who have logical thinking abilities above average always use the concept in analyzing information in a logical, rational and intellectual way. Besides, students who have high logical thinking ability can also work alone without the help of others, always want to know the cause and effect of a problem and investigate the problem correctly. This means that students who have high logical thinking ability tend to be easier and successful in solving the problems of

physical phenomena from the concrete to the abstract correctly.

Interaction Between Scientific Inquiry Learning Model and Learning Conventional Logical Thinking Ability Students in Efforts to Improve Students Science Process Skills.

Variance analysis test results in table 4. obtained sig value. model_pembelajaran * Berpikir_Logis amounted to 0,039.

Because of the sig value. $0.039 < 0.05$ then the results hypothesis testing reject H_0 or receive H_a an alpha level of 5% means that there is an interaction between the scientific learning model inquiry and the ability to think logically to improve students' science process skills. The interaction results between the model of learning and level of logical thinking ability to improve students' science process skills shown in figure 3.

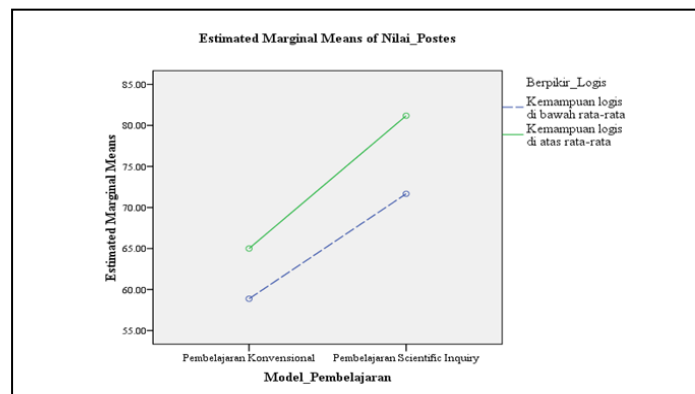


Figure 3. Interaction between scientific inquiry learning model and conventional learning with logical thinking ability on science process skill

Based on figure 3 it can be seen that if both lines are extended then at a point, there will be an intersection. Students who can think logically low with a group of students who can think logically below the average, if taught with scientific inquiry learning model and conventional education will obtain the value of science

process skills are low. Unlike the students who can think logically with groups of students who can think logically above average, if taught with scientific inquiry learning model will show the results of science process skills higher than classes taught by conventional teaching. This is because the current model of

scientific inquiry learning the students were invited to scrutinize the start of the problems, the answers while the (hypothetical), collecting and analyzing data and deduce the answer to the problem.

CONCLUSION

Based on the results of research and discussion it can be concluded:

1. Science process skills of students taught using scientific inquiry learning model is better than the science process skills of students taught using conventional learning. The skill in the science process of students who have high logical thinking ability is better than the students' science process skill which has low logical thinking ability.
2. There is no interaction between scientific inquiry learning model and conventional education with the ability to think logically in improving students' science process skills. Based on this research science process skills dominant scientific inquiry learning model in the group of students who can think logically

above average. Berdasarkan hasil analisis uji n-gain, peningkatan keterampilan proses sains (KPS) terpadu siswa materi pengukuran dapat meningkatkan KPS terpadu sebesar 0,34 dengan kategori sedang, dan respon siswa terhadap model pembelajaran *guided inquiry* dengan strategi student generated representations (SGRs).

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