

The Effect of Inquiry Training Learning Model on Science Process Skills and Student Learning Outcomes

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Abstract: *This study aims: To find out whether there are differences in science process skills and student learning outcomes was taught by inquiry training model of learning with students taught with conventional learning model. Are there improvements in the science process skills and student learning outcomes taught by inquiry training learning model. The sample in this study conducted by random sampling of two classes, where first class as experiment class applied inquiry training model and second class as control class applied conventional learning. Instrument used in this research that is test instrument of science process skill in the form of essay as many as 10 items and instrument test of learning outcomes in the form of multiple choice as many as 18 items which have been declared valid and reliable. From the result of the research, it can be concluded that there is influence of inquiry training learning model and conventional learning to science process skill and student learning outcomes. Science process skill and student learning outcomes was taught by inquiry training learning model better than conventional learning with Gain in high category.*

Keywords: *Inquiry Training, Science Process Skills, Students Learning Outcomes*

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I. Introduction

Education is a very important factor for human life. Through education, attitude, character, personality and human skills will be formed to face a better future. Education is a future asset that determines the advancement of a nation. Improving the quality of education should be a top priority in development.

Essentially, the study of physics is more emphasis on the process of finding. Discovery activities such as observing, comparing, classifying, calculating, measuring, summarizing and predicting are science process skills (SPS). This is in line with the opinion of as in [1] which states that the skills of the process of science is the ability of students to apply scientific methods in understanding, discovering and developing science. In addition, the skills of the science process also need to be trained and developed because the skills of the science process have the following roles: 1) To help students develop their minds, 2) to give students opportunities for discovery, 3) to improve memory, 4) to provide intrinsic satisfaction when students have succeeded in doing something, 5) Helping students learn the concepts of science.

The reality in schools, especially in physics learning has not been much learning activities that are oriented toward habituation and improvement of SPS. Students are expected to absorb information passively and then remember it during the test as in [2]. This kind of learning resulted in students not having experience to observe, measure and experiment. Students' ability is limited to the memorization of many formulas.

One of the causes of the above problems is the weakness of the learning process. The learning process that is applied so far less empower the students to train the process skills in obtaining and understanding the material being studied. Learning should also be designed to train students' skills in the psychomotor domain. Learning students with SPS can improve students' psychomotor competence.

The above is supported by the observations made at the Private High School Dharma Bakti Lubuk Pakam, the learning used by physics teachers has tended to use conventional teaching-centered learning with lecture, question and answer methods. This causes the learning process applied to be less meaningful. Based on documentary study in the school, the average score of the students' test both odd and even semester for physics subject is still low. Based on the Value Collection List (DKN) T.P. 2016/2017 the average grade of students of class X for the first semester of 71,45 and for the second semester is 72,24 with the Minimum Exhaustiveness Criteria (KKM) in the school is 70.

Student learning outcomes (LO) are still low. The low learning results of physics, among others, because students rarely experimenting in learning. Students are not trained to perform a finding process that aims to train their SPS. The passive process of learning makes students unable to construct their thinking structures that impact memorizing knowledge. Students are never invited to find problems, formulate

hypotheses, collect data, analyze and conclude learning, so it is very reasonable if the learning results obtained not satisfactory.

Passive learning also leads to low student process science skills. Students are not actively involved so as to give less opportunity to develop their thinking process. In addition, physics learning has not been meaningful, coherent and does not emphasize discovery activities. It is also what causes the contents of physics learning is considered as memorize, so the science process students' skills are very low.

According to reference [3], the inquiry training model is designed to bring students directly into the scientific process through exercises that can condense the scientific process into a short period. The goal is to help students develop the discipline and develop the intellectual skills necessary to ask questions and find answers based on their curiosity.

The inquiry training model involves the students actively in asking the question why something happened and then searching and collecting and processing the data logically to further develop an intellectual strategy that can be used to find answers to the question. The inquiry training model begins by presenting puzzle-filled events to students. Students who face the situation will be motivated to find the answer to the problem that is still a puzzle. Teachers may use this opportunity to teach assessment procedures in accordance with the steps of the inquiry training model.

The inquiry training model gives students the opportunity to participate in solving physics problems through direct fact-finding and then forming an understanding by combining experience and interpersonal skills (group) to obtain an agreement that is the solution of the problem. Through the model of learning inquiry training students are expected to improve the SPS and LO.

Reference [4] stated that there is a significant influence on the application of learning model inquiry training on student LO in physics lessons. Inquiry training model can be advantageous because it gives equal opportunity to all students, whether students have low ability, moderate or high to succeed. Students are actively involved during the learning process through group work and have curiosity. Not only cognitive ability can be developed, but also psychomotor ability.

Researchers are interested in applying an inquiry training model to improve SPS and student LO. The use of this innovative learning model can be used to develop and improve the SPS as well as student LO.

II. Method

This research was conducted at SMA Swasta Dharma Bakti Lubuk Pakam, in odd semester of Lesson 2017/2018 which consist of 10 classes. The sample in this study was taken by cluster random sampling which took two classes that will be taught with inquiry training model and conventional model.

Variables in this study in terms of role, consist of independent variables and dependent variables. The independent variables in this research are inquiry training model and conventional model and the dependent variable in this research are SPS and student LO.

The study involved two different sample classes treated. The experimental class applied inquiry training model while the control class applied the conventional model. The research design is two group pretest-posttest design as shown in table 1.

Table 1. Research Design

Sample	Pretest	Treatment	Posttest
Experiment Class	Y ₁	X ₁	Y ₂
Control Class	Y ₁	X ₂	Y ₂

Source: Reference [5]

Information:

Y1: Pre test

Y2: Post test

X1: Treatment for inquiry training learning model.

X2: Treatment for conventional model.

To test the research hypothesis used technique of data analysis with test of difference of mean value (Test-t) with significant level $\alpha = 0,05$ or 5%.

III. Result And Discussion

1. Result

The data descriptions presented in this study consisted of the value of SPS and the LO of the control class and the experimental class. The experimental class scores average postes of SPS of 79.03 and control class of 72,19. Analysis of normalized N-gain values of conventional class PPP results showed that pretest averages of 30,34 and average postes of 72,19 with the formulation obtained N-gain of 0,6 in the medium category. Analysis of N-

gain values normalized the results of PPP inquiry training class showed that the average pretest of 31,69 and average postes 79,03 with the formulation obtained N-gain of 0,7 in the high category.

N-Gain analysis postes the SPS of each conventional class indicator and inquiry training can be seen in Figure 1.

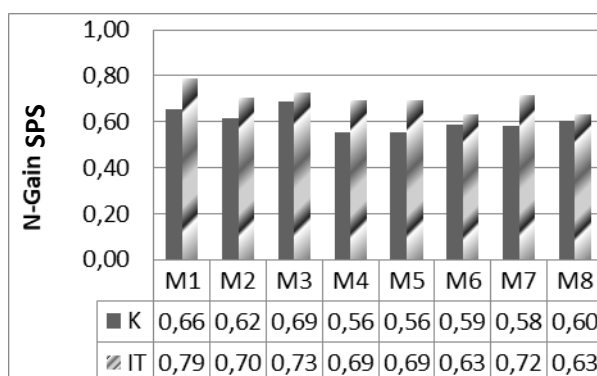


Figure 1. Graph of PPP Analysis

The average posttest value of experimental class learning result is 83,94 and control class is 75,66. Analysis of normalized N-gain value of conventional class learning result showed that pretest mean of 48,97 and average posttest 75,66 with its formula obtained N-gain of 0,5 in medium category. Analysis of normalized N-gain values of inquiry training class results showed that the average pretest of 48.94 and average posttest 83.94 with the formulation obtained N-gain of 0.7 in the high category.

N-Gain posttest analysis of LO of each conventional class indicator and inquiry training can be seen in Figure 2.

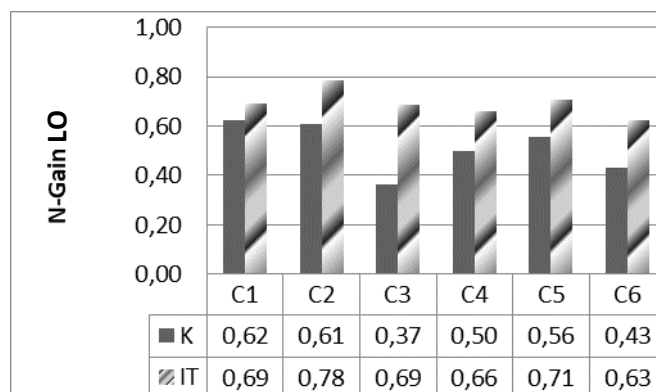


Figure 2. Graph Analysis of Learning Outcomes

Furthermore, the statistical test was done to see the difference of SPS and the experimental class and experiment class, for the normality test, homogeneity test and t test.

Table 2. Normality Test

Var.	Class	L _{count}	Sig.	L _{table}	Info
SPS	Konv.	0,132	0,167	0,157	Normal
	IT	0,092	0,200	0,157	Normal
LO	Konv.	0,147	0,078	0,157	Normal
	IT	0,149	0,070	0,157	Normal

The results of the test contained in Table 2 shows the results of normality test for LO with greater significance than significant 0.05 so it can be concluded the data posttest SPS and LO between classes have the same variance. The resultant homogeneity test is shown in Table 3

Table 3. Homogeneity Test

Var.	F _{count}	F _{table}	Sig.	Info
SPS	0,076	2,340	0,784	Homogenous
LO	1,158	2,340	0,286	Homogenous

The results of the test contained in Table 3 shows the results have a significant count greater than significant 0.05 so it can be concluded PPP pretest data and LO between classes have the same variance. The t test output from the research can be seen in Table 4.

Table 4. Test t

Var.	T _{count}	t _{table}	Sig.	Info
SPS	4,426	1,70	0,001	Different Sig.
LO	3,133	1,70	0,003	Different Sig.

Based on Table 4. T test calculations on significant SPS obtained significant results 0,001 and this significant smaller than significant $\alpha = 0.05$. Then there is a significant difference between the SPS of students taught through inquiry training and conventional models. On the significant learning results obtained 0,003 results and significant is smaller than significant $\alpha = 0.05$. Then there are differences in LO between students taught through inquiry training and conventional models.

IV. Discussion

1. Differences in Student SPS Taught With Inquiry Training and Conventional Inquiry Model

Inquiry training is a learning model designed to bring students directly into the scientific process through an exercise that can condense the scientific process in a short period. Inquiry training emphasizes the learning process of critical and analytical thinking skills to search for and find out for themselves the answers to a questionable problem and to educate students in the process of investigation and to seek clarification of rare phenomena.

Inquiry training model gives students the opportunity to perform scientific processes such as identifying problems, formulating hypotheses, collecting data from experiments and concluding. Students gain hands-on experience on how to measure and calculate, find relationships and formulate concepts in their own way. Students are taught to acquire the skills of the science process.

Scientific process skills are the ability of students to apply scientific methods in understanding, developing and discovering science. Scientific process skills are very important for every student as a provision to use scientific methods in developing science and is expected to gain new knowledge or develop the knowledge it has. Through learning inquiry training, students' SPS are built in such a way that they reach the optimum level.

In the process of learning in the classroom with the model of inquiry training begins with cognitive conflict that bridges the initial knowledge and experience of students with new material to be taught. This is very helpful for students to actively engage in question and answer. Involvement of students actively inquiring can detail the problems presented so that the formulation of the problem is expected to be found by students, so it can formulated a hypothesis for the answer to the problem.

Students are given the opportunity to design their own experiments from the tools provided. Student observation inspires students' curiosity. Visible students are actively observing melted wax processes on different metals and can classify which metals have high conduction coefficients. Comparing processes also occur well, students can compare the convection process by observing the experiment.

Students are able to self-clarify the temporary answers / hypotheses proposed at the beginning of the learning through discussion of experimental results. The resulting conclusions are more targeted towards the learning objectives. Teachers only facilitate learning and direct discussions that are too far from learning activities. The facts in this study indicate that the students have been doing science process activities so that the SPS also increased.

Unlike the case with conventional learning model that emphasizes the process of training to students. Knowledge is taught by way of training students, students are trained in a guided by the teacher where the material is delivered directly without any process of relating to the knowledge and experience of the student's beginning. The tendency of students is required to memorize the knowledge given by the teacher. A series of activities are conducted in an instructional manner such as the experimental steps that have been listed on the student worksheet without giving the students the opportunity to seek their own knowledge. This series of instructional activities is conditioned on a quiet class situation, with no significant activity, minimal question-and-answer activities, students only pay attention to teacher explanations and do what is on the student worksheet. Students have difficulty in acquiring SPS in their learning process.

The SPS is a series of active activities where students directly do so. Passive student activity has an impact on the weak absorption of knowledge by students. The knowledge gained did not last long in the students' memory, so the students' SPS became low.

The SPS that is taught by the model of inquiry training shows good result. Students are able to answer the test of LO on all PPP indicators well compared to students taught by conventional learning models. The average results of the SPS of students taught with inquiry training showed higher results than conventional. So it

can be concluded that there are differences in the SPS between students taught by model inquiry training and conventional models, where the skills of the science process students are taught with the model of inquiry training is better than the SPS students are taught with conventional models.

Based on the results of previous research to prove that the SPS can be trained by applying teaching and learning strategies or learning models that emphasize more on student activity.

The results of reference [6] concluded that inquiry-based learning can significantly improve scientific process and scientific attitude skills. This research is conducted on science lessons where students are skilled in asking questions and able to conduct experimental activities well. Students are able to be objective and honest in describing the results of the experiment, for the variable of scientific attitude.

Reference [7] concluded that the application of physics learning model inquiry training can improve students' SPS. This study is a classroom action study that evaluates the improvement of process skills alone in each cycle regardless of the significance of the inquiry model's influence on students' SPS.

Reference [8] concluded that the model of inquiry training effectively improves students' learning achievement. Reference [9] concluded that the inquiry training model is more effective in improving students' academic achievement than conventional method. Both studies mentioned the effectiveness of inquiry learning but did not specifically address the students' SPS.

2. Differences in Students LO with Inquiry Training and Conventional Learning Models

Learning model of inquiry training students are invited to actively seek their own knowledge. Students are trained to discover the physical phenomena of the process designed by the teacher. The role of the teacher as a motivator is obvious when the teacher invites students to identify and formulate the problem. As a teacher facilitator gives space to students to conduct experiments and data collection, the teacher gives space to students to do question and answer and gives students the opportunity to explain the results of the discussion. In each experiment the students gain proficiency in conducting heat transfer experiments. A series of psychomotor activities that students do with passion and are able to build cognitive structures in long-term memory.

Inquiry training model can be more accustomed students to prove a subject matter, proving by conducting self-investigation by students who are guided by the teacher. The investigation can be done by students either in the room like the laboratory or open field then the result of the investigation is analyzed by the students using reference books that support about the material being investigated. Through the application of this inquiry training model the development of students' cognitive sphere more focused and in everyday life can be applied in motor. Skills acquired through a series of science processes enable students to actively build their knowledge.

Conventional learning puts teachers at the center of learning, students only receive information (knowledge) from what is delivered by the teacher, so that students are less empowered. Students gain knowledge because they are "notified" by their teachers and not "self-discovery" by students directly. The learning activities are oriented towards the target mastery of the material, so that it only succeeds in short-term memory competence, but fails to equip students with long-term knowledge and knowledge. Students find difficulties in improving the results of physics learning, because they do not have sufficient experience of knowledge, knowledge.

Conventional learning is delivered through lecture, demonstration, question and answer methods and assignments. Teacher activities in learning as if only transfer the knowledge they have to students. Students are not involved in physical, mental, or environmental learning. Conventional learning is less able to improve student LO.

Comparison of LO of students taught by inquiry training model and conventional model is evident. Students who are taught with an inquiry training model get direct experience of their learning so that their LO are better than the students taught with the models that receive knowledge from the teacher and memorize them. The average of student LO taught by inquiry training model is better than conventional. So it can be concluded that student LO taught with inquiry training model is better than student LO taught with conventional models.

Previous research also explains the same results, where inquiry training learning can improve student LO. Inquiry-based learning can improve student LO, students gain hands-on experience in experimental work. Students do not just do the task in writing only.

Reference [9] concluded that the Inquiry Training model is more effective in improving students' academic achievement than conventional methods. Academic achievement in this research is the result of student physics learning. Students get good LO because they have direct learning, while in conventional class students are taught only by the method of training.

V. Conclusion And Suggestion

1. Conclusion

There is influence of instructional model of inquiry training and conventional learning model to students' SPS. Students taught with inquiry training earn average PPP better than conventional. There is an increase in the average SPS of students taught by inquiry training in the high category, whereas students who are taught conventionally have improved in the medium category. There is influence of learning model inquiry training and conventional learning model to student LO. Students who are taught with inquiry training earn better LO than conventional. There is an increase in the average of student LO taught by inquiry training in the high category, whereas students taught with conventional experience improvement in the medium category.

2. Suggestion

Application of appropriate inquiry training model used to improve students' SPS. Implementation of appropriate inquiry training model used to improve student LO. Implementation in the learning process of inquiry training desperately requires appropriate cognitive conflict with the context of learning materials, and the level of students' understanding to support the student process in berinkuiri.

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