

**THE DIFFERENCE OF STUDENTS' LEARNING OUTCOMES USING
INQUIRY TRAINING MODEL AND DIRECT
INSTRUCTION MODEL**

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Abstract

The objective of this research was to carry out the difference of students' learning outcomes using inquiry training model and direct instruction model in physics topic. The research method was quasi experiment. The population was all students at class VIII semester II consist of 9 classes at SMP N 1 Tebing Tinggi. The sample of this research is two classes that consist of 50 students, class VIII-1 as an experiment class and class VIII-2 as a control class and taken by cluster random sampling. Normality of the test result from the both samples was normal and homogeneous, the testing criterion was accepted H_0 if $-2.012 < t' < 2.012$ and refuse H_0 in other condition. Here, H_0 was refused because t' is 2.75 and H_a was accepted. So it can be concluded that there was significant difference of students' learning outcomes using inquiry training model and direct instruction model.

Keyword : Inquiry Training Model, Students' Learning Outcomes

Introduction

Natural science is concerned with how to find out about natural phenomenon systematically. It is not only a collection of knowledge about facts, concepts, or principles but also it is a process of discovery. Learn about natural science expected become facilitated for learners to learn about human and environment, as well as the prospect of further development in applying them in daily life. Process of learning emphasis on experience to develop learners' competence order to explore and to understand natural surrounding scientifically.

Physics is one of subjects that are less attractive for students based on the low percentage of students' when mastery of learning. It caused by difficulty for students to understand the content of learning who delivered by the teachers. Generally, physics teacher at school more often discussing the theory of the handbook, providing formulas and problems. It makes physics only as reading material and students can only imagine what teacher explained.

Learning strategy above causing physics to be one of the subjects which are not interesting for students and the students assumes that physics is difficult. Whereas physics is a subject that close in daily life and the application can be found directly in our environment. In this case the teacher has an important role to make paradigm of students to be positive. So, students have good motivation in learning.

Based on preliminary study through interview directly to the physics teacher at SMP N 1 Tebing Tinggi found that the teachers still using the conventional learning. When present the subject matter, the teacher only explain in front of class and give a summary of the material with notes on the board.

The students activity are listen and record the important things that given by teacher. Thus, the students are passive and can not directly follow learning process. From interviews said also that the students learning outcomes in physics subject is low. About 70% of students who did not achieve the value of KKM 75.

The reason that cause low student learning outcomes is students only has role as listeners and teacher as center of learning. Thus, the students only accept knowledge from teacher but can not construct knowledge themselves.

From this observation found that 38% of students that like learn physics using experiment in laboratory and 36% of students that interest learn physics by way of groups. But the teachers rarely do learning style that needed by students' in learning process. Teacher only guide the students to memorize formula without give the concept understanding and show the physics phenomenon in daily life. So, in this case, students less active in learning process.

Based on the above conditions should apply an appropriate model of learning and can improve students' learning outcomes in physics. Learning model that suitable for used is inquiry training model. Inquiry training model is designed to bring students directly into scientific process into small periods of time. The training has resulted in an increased understanding of science, more creative thinking, and skills for obtaining and analyzing information as students establish facts, build concepts, and then generate and test explanations or theories. The students are active learners involved in exploration, questioning, problem solving, inductive reasoning, invention, labeling, and discovery.

Researchers previously performed by Rostina Harahap (2009) when given pre test get the average value is 36.00. After pretest, students is given treatment using inquiry training model that make student learning outcomes increased with an average value is 77.40. From this situation the researcher take the title "The Effect of Inquiry Training Model Toward Student Learning Outcomes in Newton's law Topic at Class VIII SMP N 6 Academic Year 2009/2010 ". The weakness of this study is students' difficult work in group discussion.

The background above shows that the problem is very important to investigate and look for the solution, because if the problem is not resolved then it is difficult for teachers to achieve the goals of learning and difficult for students to achieve the competencies expected.

Inquiry Training Model

The inquiry model, developed by Richard Schuman (Joyce and Weil, 1972), is based on the premise that the intellectual strategies used by scientists to solve problems and inquire into the unknown can be taught to students. Using the natural curiosity of students, they can be trained and disciplined in the procedures of inquiry. The elements of their inquiry process were identified and these were built into an instructional model called inquiry training. Inquiry training is designed to bring students directly into the scientific process through exercises that compress the scientific process into small periods of time. The training has resulted in an increased understanding of science, more creative thinking, and skills for obtaining and analyzing information as students establish facts, build concepts, and then generate and test explanations or theories.

Syntax of inquiry training model:

Phase One: Confrontation with the Problem

- a. Present the problem situation
- b. Explain the inquiry procedures to the students.

Phase Two: Data Gathering—Verification

- a. Gather information about the event/problem to verify the nature of the objects and conditions.
- b. Confirm the occurrence of the problem situation. The data should be recorded on the board or on data sheets kept by each student.

Phase Three: Data Gathering – Experimentation

- a. Isolate relevant variables. Students introduce new elements into the situation to see if the even happens differently, changing things to see what will happen.
- b. Students hypothesize a solution to the problem.
- c. Hypothesis are confirmed or revised.

Phase Four: Organizing, Formulating an Explanation

- a. Ask the students to explain the hypothesis that has been accepted as a tentative solution to the problem and organize the data to support the hypothesis.
- b. Have the students state their explanation so that the ranges of the possibilities are noted.

Phase Five: Analysis of the Inquiry Process

- a. Ask the students to review the process they have just used to arrive at acceptance of the hypothesis (their pattern of inquiry).
- b. Discuss ways that they could have improved their inquiry.

Direct Instruction

The instructional design principles they propose focus on

conceptualizing learner performance into goals and tasks, breaking these tasks into smaller component tasks, develop training activities that ensure mastery of each subcomponent, and, finally, arranging the entire learning situation into sequences that ensure adequate transfer from one component to another and achievement of prerequisite learning before more advanced learning.

Syntax of direct instruction model:

Phase one is the orientation phase in which a framework for the lesson is established. Three steps are particularly important in carrying out the intent of this phase: (1) the teacher provides the objective of the lesson and the level of performance; (2) the teacher describes the content of the lesson and its relationship to prior knowledge and experience; and (3) the teacher discusses the procedures of the lesson—that is, the different parts of the lesson and students' responsibilities during those activities.

Phase two is the presentation phase, in which the teacher explains the new concept or skill and provides demonstrations and examples.

Phase three is the teacher leads students through practice examples, working in lockstep fashion through each step .of the problem as it appears on the VRT.

Phase four, guided practice, gives students the opportunity to practice on their own while the teacher is still in the environment.

Research method

This research was done in SMP N 1 Tebing Tinggi at class VIII on May in the academic year 2012/2013. Population of this research is all of students in grade VIII in SMP N 1 Tebing Tinggi in the academic year

2012/2013 that have total class is 9 class with 25 students per class. Sample in this research are taken with *cluster random sampling*. The sample is two classes, namely: one class as control class and one class as experimental class.

Research design that used in the study involved two classes treated differently. To determine the students' understanding of the concept is done by giving a test on both classes before and after treatment. The study design was as follows:

Table 3.1 Two Group Pretest-Posttest Design

| Class | Pret est | Treat ment | Postt est |
|------------|-----------|------------|-----------|
| Experiment | X_{1_E} | T | X_{2_E} |
| Control | X_{1_c} | O | X_{2_c} |

Where:

X_{1_E} = Pretest in experimental class

X_{2_E} = Posttest in experimental class

X_{1_c} = Pretest in control class

X_{2_c} = Posttest in control class

T = Treatment with inquiry training model

O = Direct instructional model

Selection of data analysis techniques specified interval data dissemination. The spread of data is how the data is spread between the highest value with the lowest value, and the variability in it because the normality test sample should be done. Normality test aims to determine whether a sample comes from a normally distributed population or not. Lilliefors test was used to test of data. And then done homogeneity test to know the data homogeneous or not, used homogeneity to test variance similarity. In this case, we tested the

similarity of the two population variances by the formula:

$$F = \frac{S_1^2}{S_2^2}$$

Where S_1^2 = greatest variance value of the pretest and S_2^2 = smallest variance value of the pretest.

The hypothesis tested that used is t test with the formula:

$$t_{\text{count}} = \frac{\bar{X}_1 - \bar{X}_2}{S \sqrt{\left(\frac{1}{n_1}\right) + \left(\frac{1}{n_2}\right)}}$$

Where S is combination variance that calculated by formula:

$$S^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}$$

Where:

t = t distribution

\bar{x}_1 = Mean value of experimental class

\bar{x}_2 = Mean value of control class

n_1 = Size of experimental class

n_2 = Size of control class

S_1^2 = Variance of experimental class and aff

S_2^2 = Variance of control class

Testing criterion is: H_a accepted, if where $t_{\text{count}} > t_{\text{table}}$ got from t distribution list with probability $1 - \alpha$ and $dk = n_1 + n_2 - 2$ and $\alpha = 0,05$. For another value of t H_0 rejected.

Result of Research

Applying of *inquiry training model* based on the development consist of three assessment aspect, that is cognitive aspect, psychomotor aspect, and affective aspect. So, the *inquiry training model* have meaningfull in learning process.

1. Students' Learning Outcomes in Cognitive Domain

In the beginning of this research, experiment and control class were given pretest which aim to see initial learning ability of students in both of classes. Based on the data of research result on appendix and obtained the mean value of the pre-test in experimental class before given treatment by using Inquiry Training Model is 44.24 and the standard deviation is 12.45. While the mean value of pre-test obtained in control class is 43.44 and the standard deviation is 13.89. After both of classes are given a different treatment, then both classes are given post-test. Based on the data of research result and the mean value after applied Inquiry Training Model in experiment class is 78.6 and the standard deviation is 14.0. While in control class obtained the mean value of student's post-test is 67.7 and standard deviation is 14.3. This result show that the average value of students' learning outcomes of using inquiry training model is higher than student who get direct instructional model.

Before conducted the hypothesis test, firstly conducted prerequisite test of data that is normality test using Liliefors test.

Based on the calculation obtained pre test in experiment class is $L_{\text{count}} = 0.113$ and $L_{\text{table}} = 0.173$. Thus get $L_{\text{count}} < L_{\text{table}}$ ($0.113 < 0.173$) and post test in experiment class is $L_{\text{count}} = 0.124$, and $L_{\text{table}} = 0.173$. Thus get $L_{\text{count}} < L_{\text{table}}$ ($0.124 < 0.173$). By this result was concluded that the data were in normal distribution. For pre test in control class is $L_{\text{count}} = 0.127$ and $L_{\text{table}} = 0.173$. Thus get $L_{\text{count}} < L_{\text{table}}$ ($0.127 < 0.173$) and post test in control class is $L_{\text{count}} = 0.126$ and $L_{\text{table}} = 0.173$. Thus get $L_{\text{count}} < L_{\text{table}}$ ($0.126 < 0.173$). By this result was concluded that the data were in normal distribution also.

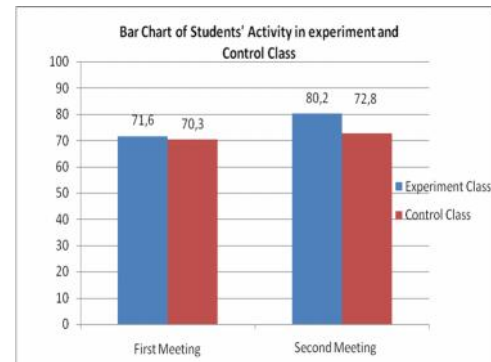
From the calculation with compare both value for pre test, we get $F_{\text{count}} < F_{\text{table}}$ ($1.24 < 1.98$). This situation means that variant of pre-test both samples is from the homogenous population. Then compare both value for pos test, we get $F_{\text{count}} < F_{\text{table}}$ ($1.05 < 1.98$). This situation means that variant of pre-test both samples is from the homogenous population.

Testing hypothesis using t test that is distinguish the average of postest result of students in experiment and control class to know whether or not significant difference of students' learning outcomes using inquiry training model and direct instructional model in light topic at class VIII SMP N 1 Tebing Tinggi. The testing criteria is accept H_0 if t_{count} between -2.012 and 2.012 , and rejected H_0 if t has the other score. From the calculation result of concept mastery obtained $t_{\text{count}} = 2.75$, so H_0 is rejected and H_a is accepted or in other word said that there are significant difference of students' learning outcomes using inquiry training model and direct instructional model.

2. Students' Learning Outcomes in psychomotor Domain

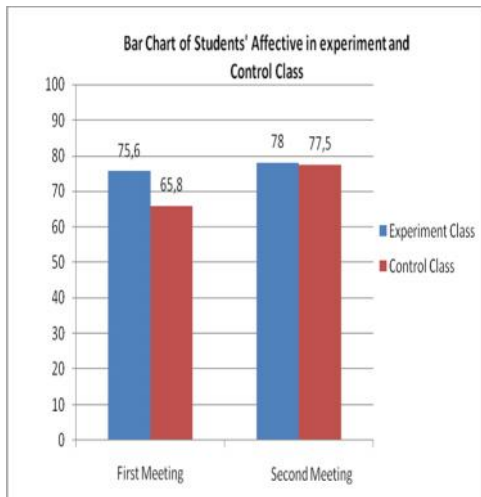
Skill of student during two meeting in experiment class using inquiry training model increased. In first meeting the average value is 71.6 and second meeting is 80.2. In experiment class using inquiry training model, student is more active and students are directly involved in the learning activity (students center learning). The psychomotor of student in control class also increased but have lower value. In first meeting the average value is 70.3 and second meeting is 72.8. This is because they don't do the experiment, and just doing the exercise given by researcher in white board. So the

psychomotor of student in control class is lower than experiment class. Comparison between result of psychomotor domain in experiment and control class, showed in chart below:



3. Students' Learning Outcomes in Affective Domain

Affective of student during two meeting in experiment class has increased. In first meeting the average value is 75.6 and second meeting is 78. The affective of student in control class also increased but have lower value. In first meeting the average value is 65.8 and second meeting is 77.5. This is because Inquiry Training Model is model that student center learning. Thus students more active in learning process. Inquiry Training Model can exercise student to be cooperative with their friend in group, and also grow the rigor and discipline when do the experiment, and also exercise student be ethic to delivering opinion when student present their answer in front of the class. As general Inquiry Training Model make student become responsible with their behavior. And for control class student have low affective because direct instruction make teacher as center of learning. Comparison between result of affective domain in experiment and control class, showed in chart below:



Discussion

The results in Cognitive, Affective, and Psychomotor shows that there was significant difference of students' learning outcomes using inquiry training model and direct instructional model in light topic at class VIII SMP N 1 Tebing Tinggi.

Result of Cognitive domain showed acquisition value of the average pretest students in the experimental class was 44.24 with a standard deviation of 12.45 and an average posttest score of 78.63 with a standard deviation of 14.00. While the values obtained in the control class average pretest students of 43.44 with a standard deviation of 13.89 and an average posttest score of 67.7 with a standard deviation of 14.35. From the data, average posttest value of experiment class is bigger than control class. The increasing of posttest value is caused by after pretest done we give treatment to the students. In experiment class we give the treatment using Inquiry Training Model and control class given the treatment using Direct Instruction model.

Observation result in psychomotor domain shows activeness of students during the learning greatly affects the value of learning outcomes. The activity of student can seen more

specific from doing worksheet that shared to students in experiment class while in control class, the activity of students can seen when researcher do explanation of learning matter and giving problems. When students active at the time of learning activities then the learning outcomes higher. There is different activity of students' in experiment class and control class. Average value of students' activity in experiment class higher than control class. It also that causes the average value of post test in experiment class higher than control class.

Observation result in affective domain shows that the attitude of the students during the learning activities affects the value of learning outcomes. From this research, when students have good attitude when learning activities the learning outcomes becomes higher. Attitude students in experiment and control class in good category, but average value of affective domain in experiment class higher than control class, students learning in group in experiment class make students have higher attitude.

If we compare based on the before researcher like Pandey, get that Inquiry Training Model over conventional teaching method in teaching physical science at the secondary level of science students. A total of 100 students participated in the study. The author selected the randomized groups, pre-test post-test design in true experimental design. Results revealed a statistically significant effect of Inquiry Training Model (ITM) over conventional teaching method on Academic achievement of students. Based upon the achievement test in physical science (ATPS), teaching of physical science through Inquiry Training Model is more effective than the teaching through the

Conventional Method at the secondary level. The ITM model may be advocated as a better tool than the conventional method for teaching Physical Science. And like Brunner and Suchman believes that students that can become increasingly conscious of their process of inquiry and that they can be taught scientific procedures directly. Schleker also reported that inquiry training resulted in increased understanding of science productivity in creative thinking and skills for obtaining and analyzing information. He reported that it was more effective than conventional recitation method of teaching in the acquisition of information, but that it was efficient as recitation or lectures accompanied by laboratory experiences. And according to Joyce and Weil, the essence of the model is the involvement of the students in a genuine problem of inquiry by confronting them with an area of investigation, helping them identify a conceptual or methodological problem within that area of investigation, and inviting them to design ways of overcoming that problem. Thus, they see knowledge in the making and are initiated into the community of scholars. At the same time, they gain a healthy respect for knowledge and will probably learn both the limitations of current knowledge and its dependability.

This research shows that the implementation of the research showed that Inquiry Training Model has beneficial because the model is designed to bring students directly into scientific process into small periods of time and the training has resulted in an increased understanding of science, more creative thinking, and skills for obtaining and analyzing information as students establish facts, build concepts, and then generate and test explanations or theories. Thus, the students are active

learners involved in exploration, questioning, problem solving, inductive reasoning, invention, labeling, and discovery.

Although the using of inquiry training model can improve students' learning outcomes, students' activities and students' affective, but still there are students who less interested in concept learning. Because they have been accustomed to working on the problems when study with physics calculations and students still tend to work alone rather than working in groups.

Conclusion

Based on the research result, data analysis, and discussion so can be concluded that:

(1)The average value of students' learning outcomes of using inquiry training model is higher than student who get direct instructional model (2)Students' activity as long as using inquiry training model increased, from the first meeting up to the second meeting. The category of students' activity is good. And students' affective as long as using inquiry training model also increased, from the first meeting up to the second meeting. The category of students' affective is good (3) Based on the results of the analysis of data processing hypothesis testing using the t test get that $t_{count} > t_{table}$, so it can be stated that there is a significant difference of students' learning outcomes using inquiry training model and direct instructional model in light topic at class VIII SMP N 1 Tebing Tinggi.

Suggestion

Based on research result and discussion before, researcher give suggestions as follows:

(1)For the next researcher so that use the time effectively thus the syntax in inquiry training model can achieved and occurs well (2)For the next researcher, so that prepare one observer for each of group to get accurate data and to observe the students' affective will be better if researcher take daily notes of students from class teacher (3)For the next researcher so that give more attention and guidance of students who are less active in learning process.

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Sudjana. 2005. *Metoda Statistika*. Bandung: Tarsito.

Wenning, J., C., et all. 2011. Experimental Inquiry in Introductory Physics Courses. *Journal of Physics Teacher Education Online,6(2)*.

References

Alberta. 2004. *Focus on inquiry: a teacher's guide to implementing inquiry-based learning*. Learning and Teaching Resources Branch.

Agbarachi, Jacinta, et all. 2011. Instructional Method and the School Science Curriculum. *Current Research Journal of Social Sciences , 3(3)*, 188-198.

Dahar, R., W., 2006. *Teori-Teori Belajar dan Pembelajaran*. Jakarta: Penerbit Erlangga.

Joyce, Bruce. 2004. *Models of Teaching (fifth edition)*. New Jersey: Prentice-Hall International, Inc.

Klein, Stephen, B., 1991. *Learning (Second Edition)*. Singapore :McGraw-Hill, Inc.

Sanjaya, W., 2006. *Kurikulum Pembelajaran Teori dan Praktik Pengembangan KTSP*, Jakarta; Kencana.

Pandey, A., et all. 2011. Effectiveness of Inquiry Training Model over Conventional Teaching Method on Academic Achievement of Science Students in India.