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Effect of Model Inquiry Learning for Higher-Order Thinking Skills Students

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ABSTRACT

The independent variable in this study is the application of inquiry learning model and the dependent variable is the higher level thinking skills of students in learning physics. To measure the dependent variable are used as instruments in the form of an essay about 9 to about freetest questions and 10 questions for the posttest questions. Before the question is used in the experimental and control classes, the first test of test validity and reliability. Test the validity of using the product moment correlation and tests of significance, while Alpha reliability test using the formula. Experimental class given treatment application inquiry learning model in the learning process of physics, while the control class implement conventional learning models in the process of learning physics.

Testing for normality using Chi Square test to show that the data are normally distributed. Homogeneity test using the F-test indicates that the sample is homogeneous. In hypothesis testing used parametric test (t-test) with level $\alpha = 0.05$ sifnifikan. From the test results obtained tcount TTable = 3.39 and = 1.667, thitung> ttable thus be concluded that the application of inquiry learning model significantly influence the results of higher level thinking skills of high school students in learning physics. The results of this study demonstrate higher-level thinking skills of students in class higher than the class of experimental control. This is because the experimental class are learning physics lesson where students can find themselves and develop concrete knowledge acquired from experience.

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1. INTRODUCTION

Learning is a fundamental thing that cannot be separated from people's lives. Along with the development of society and increasing needs, the important thing to do is to improve the world of education. Thus, education can produce creative human resources, able to solve actual problems in life and be able to produce new technology so that it is useful for people's lives. The development of technology is the creation of scientists and experts based on their expertise in interpreting the needs of humanity on earth. Technological progress has stimulated education to adapt according to the demands of the times and foster learning opportunities for students and students to continuously develop their knowledge. Learning activities are a learning process experienced by students. Students will get a learning experience when the teacher facilitates learning activities oriented to the acquisition of

student learning skills. The process and learning outcomes are two important things in learning. In the learning process, students must build their own knowledge based on the cognitive structure they have and social interactions to achieve a balance of cognitive structures. The teacher acts as a facilitator. Based on that science learning process is more focused on individual student activities or socially in class.

Physics learning is in accordance with its objectives based on the educational unit level curriculum (KTSP), which is learning that equips students with knowledge, understanding, and a number of abilities to develop science and technology. To achieve these objectives, physics learning in schools must emphasize the understanding of physics concepts based on the nature of natural science education (IPA). The nature of science education includes products, processes, and scientific attitudes. That is, students can understand scientific products (concepts, laws , principles, theories) based on scientific processes (observing, experimenting, measuring, etc.) so as to produce scientific attitudes (objective, open, and have curiosity). Therefore the key is learning physics must actively involve students so that the learning process runs well. The science-physics learning process is not only understanding physical concepts, but also students can think constructively about physics as a science process skill, so that students' understanding of the nature of physics is intact, both as a process and as a product. In learning physics that must be considered is how students get knowledge (learning to know), concepts and theories through practical experience by carrying out observations or experiments (learning to do), directly (skill objektives) so that he serves as a scientist. So from that, in studying physics students are required to continue to develop their thinking skills so that the goals of learning can be achieved. One of the thinking skills is higher order thinking skills (higher order thinking). The ability to think at a higher level is a thinking ability that does not only require abilities

3 just keep in mind, but it requires other higher abilities, such as the ability to analyze, synthesize and evaluate. The next problem is how to teach explicit thinking skills and integrate them with learning materials, especially in physics lessons that can help students develop their thinking skills.

Most of the teachers think learning is said to be successful when students are able to solve test questions or examinations by getting good grades. In addition, the teacher has finished carrying out his duties if all the learning material contained in the curriculum has been conveyed to students. Thus, the teacher will feel happy if the learning material has been completed and student learning outcomes are good. One of the problems faced by our education world is the problem of the weak learning process. In the learning process, children are less encouraged to develop thinking skills. The learning process in the classroom is directed at the child's ability to memorize information and understand theory only. As a result? When students graduate from school, they are theoretically smart, but they are poor in application. From the facts above it can be concluded that the lack of interest and motivation of students in learning physics due to the lack of student involvement activities in teaching and learning activities (KBM). Teachers who tend to only "rely" on test scores, and repetition as an indicator of student achievement and achievement without regard to the thinking skills that are expected to emerge in the learning process of students. Thus, an educator needs to apply a learning model that directs students to play an active role and explore the potential that exists in him, so students are able to develop certain skills such as skills in problem solving, decision-making skills, analytical skills, evaluation skills and also think logically and systematically. One of the learning modes that can develop students' thinking skills in the learning process is by self learning model. This inquiry learning model is an application of constructivism learning based on scientific observations and studies so that the self-learning model is suitable for science learning, especially physics where students are directly involved with the object being studied. Inquiry learning models can involve student activity, students are encouraged to actively learn with concepts physics so that it can develop its knowledge of physics. In inquiry learning there are mental processes

that are higher in level. Such as formulating problems, making hypotheses, designing experiments, conducting experiments, collecting data and analyzing data and drawing conclusions. Based on the above background, the researcher felt the need to conduct research under the title "The influence of inquiry learning models on high-level thinking skills".

2. METHOD

This study uses a quasi-experimental method. The study was conducted in two classes, namely the experimental class and the control class. In the experimental class, physics learning is done by inquiry learning mode. In the control class, learning is not done by inquiry learning mode. Assessment is done by giving the same test to the experimental class and the control class.

Kelompok	Pretest	Perlakuan (Variabel Bebas)	Post test
$R_{(E)}$	Y_1	$X_{(E)}$	Y_2
$R_{(K)}$	Y_1	$X_{(K)}$	Y_2

Sumber: Sugiyono, 2009, hal.113-114

Information :
R = random subject selection process
E = experimental class
K = control class
A = free test results
X (E) = treatment for the experimental class
X (K) = treatment for the control class
Y1 = pretest
Y2 = postest

Sample
The research was conducted in SMA 30 Jakarta class X in October-November 2012. As for the sample of this study is class X-5 and X-6, each consisting of 35 students.

Instrument
The instrument used in research is a physics learning achievement test based on basic competencies and indicators. The learning achievement test is an objective test consisting of 9 items of essay choice form.

3. RESULTS AND DISCUSSION

In the posttest normality test calculation for the experimental class, it was found that the Chi Square value was calculated = 5.113. Furthermore, compared to the Chi Square table price with the terms dk = k-1, dk = 6-1 = 5, and the error is set at 5%, the Chi Square price table is 11,070. Because the Chi Square value (5.113) is smaller than the Chi Square table price

(11.070), the distribution of the post-test value of the experimental class can be stated as normal distribution.
In the calculation of the posttest normality test for the control class, the Chi Square value = 9.505 was found. Furthermore, compared to the Chi Square table price with the terms dk = k-1, dk = 6-1 = 5, and the error is set at 5%, then the Chi Square price table is 11,070. Because the price of Chi Square calculated (9,505) is smaller than the price of Chi Square table (11,070), the distribution of post-test value of control class can be stated as normal distribution.
In the calculation of the postest homogeneity test obtained the price F arithmetic = 1.13. Furthermore, compared to the F table price with the terms dk numerator = n –1 = 35-1 = 34, the denominator d = n –1 = 35-1 = 34, and the error is set at 5%, then the F table price is 1.76 . Because the calculated F value (1.13) is smaller than the F table price (1.76), the post-student value data is declared homogeneous.

Research Hypothesis
To find out if there are differences in the average level of thinking skills of high school students in physics learning with inquiry learning models, then the statistical hypothesis can be formulated
H0 =
H1 =
Information :
= average level of high-level thinking skills of students with inquiry learning models (experimental class)
= average level of thinking skills high level without inquiry learning model (control class)
H0 = null hypothesis, namely the average result of high-level thinking skills taught by the inquiry learning model, less or equal to the average value of high-level thinking skills taught without the inquiry learning model (without treatment), which means no significant effect.
H1 = research hypothesis, i.e. the average results of high-level thinking skills taught by the inquiry learning model, greater than the average value of high-level thinking skills taught without the use of inquiry learning models (without treatment), which means they have a significant effect. Hypothesis testing calculations obtained price t arithmetic = 2.39. Furthermore, compared with the price of t table with the terms dk = n1 + n2-2 = 35 + 35-2 = 68, and the error is set at 5%, the price of t table is 1.995 Because the price of t arithmetic (2.39) is greater than the price t table (1,995), then Ho is rejected and Ha is accepted. The conclusion is that there is a significant influence of the instructional learning model on students' higher order thinking skills.

Discussion
In this study the data taken is physics learning outcomes data in the form of cognitive abilities of students from two classes, namely class X-5 as an experimental class and class X-6 as a control class consisting of 35 students in groups of students who use inquiry learning (experimental) and 35 students in groups of students without using the inquiry learning model (control). Data is taken before and after the learning treatment, where the experimental class is given a learning treatment in the form of an inquiry learning model while the control class is given a learning treatment without an inquiry learning model. From the results of tests of higher order thinking skills before being given treatment (pre-test) taken to determine the initial ability of the sample (experimental class and control class), while the results of tests of higher order thinking skills after being given treatment (post-test) were taken to determine the final ability sample (experimental class and control class). With these data it can be seen how much influence the learning of inquiry learning models on students' higher-order thinking skills. The pre-test data can be seen in the following table:

Data	Eksperimen	Kontrol
N (banyak siswa)	35	35
Nilai Terendah	49	51
Nilai Tertinggi	91	92
Interval kelas	6	6
Rata-rata (Mean)	67,6	68,9

From the pre test results above, it can be seen that students' high-level thinking skills are known, the pretest results of the experimental class students with the highest score is 91 and the lowest score is 49 and the average value is 68.2. Whereas in the control class the highest value is 92 and the lowest value is 51 and the average value is 70.4.

After the initial assessment of students' high-level thinking skills was carried out with a pre-test, then the experimental class was treated with the inquiry learning model while the control class was given treatment without the inquiry learning model, then conducted a posttest and obtained the following values:

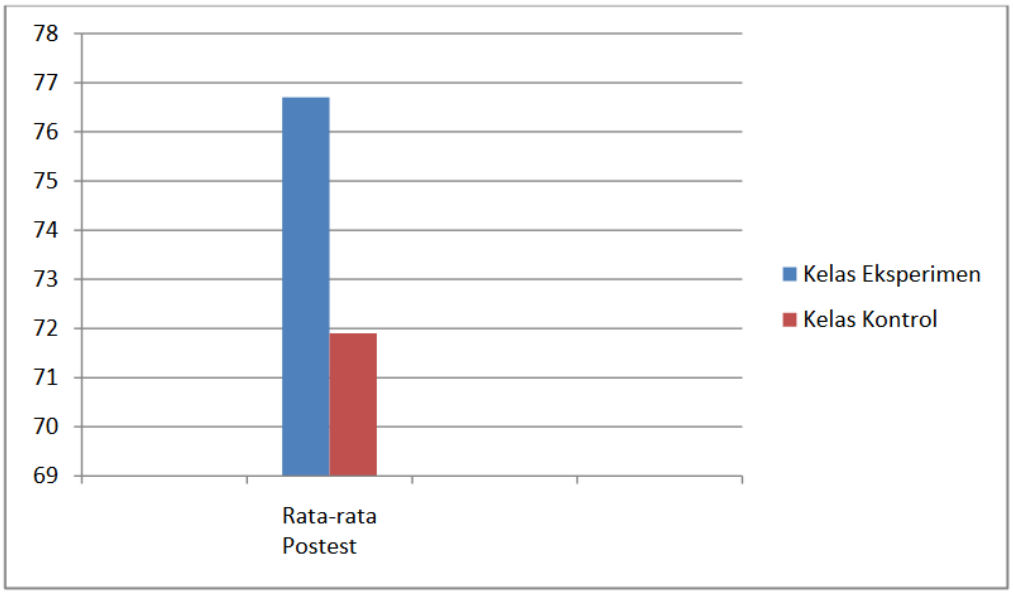
Data	Eksperimen	Kontrol
N (banyak siswa)	35	35
Nilai Terendah	61	50
Nilai Tertinggi	96	91
Interval kelas	6	6
Rata-rata (Mean)	77,2	71,8

In the table, it is known that after being treated using inquiry learning models, the experimental class has increased with an average grade of 77.2. This value is higher than the value in the control class where the average value of the class is 71.8.
To find out whether there is an increase between the pretest and posttest values of the experimental class and the control class. The difference between the pretest results and the students' posttest results can be seen in the table below:

From the above table, it is known that in the experimental class that was given treatment

with the inquiry learning model the average score was 76.7 so that an increase of 9.1 occurred while the control class that was not treated with the inquiry learning model had a mean score of 71.9 so that it was known an increase of 3.0. So the increase in the experimental class is greater than the control class.
To see the comparison of students' higher order thinking skills, see the table below:

Kelompok	rata-rata pretest	rata-rata post test
kelas Eksperimen	67,6	76,7
kelas Kontrol	68,9	71,9



From the graph above, it is known that the pretest results of high-level thinking skills of students, the average value of the control class is slightly greater than the average value of the experimental class. Then given treatment, in the experimental class given learning with inquiry learning models while in the control class given learning without inquiry learning models. After that, the students' high level thinking skills were assessed after being treated with posttest, then the graph above shows the average value of the posttest experimental class is higher than the average posttest value of the control class.

The results of research conducted at SMAN 30 Jakarta in the 2012-2013 academic year odd semester in October-November 2012 found that the increase in the average value (gain) of the experimental class was higher than the increase in the average value (gain) of the control class. Where the increase in the average value the experimental class gain of 9.1 and the increase in the control class average of 3.0. Previously it was known that the average value of the experimental class pretest was 67.6 and the average value of the pretest of the control class was 68.9 while the average value of the posttest of the experimental class was 76.7 and the average value of the control class was 71.9. From this it can be discussed that the experimental class that was given learning by the inquiry learning model there was a significant increase in value of 9.1 while the increase in the value of the control class given learning without the inquiry learning model also increased but only by 3.0. The test

instruments used were to measure students' high-level thinking skills. So, from the discussion above it can be seen that the increase in high-level thinking skills in the experimental class is higher than the increase in high-level thinking skills in the control class. According to researchers, factors that influence students' higher-order thinking skills are the way of learning of students themselves and how to teach teachers. From this research, it is known that higher level thinking skills consisting of analytical skills, synthesis abilities and evaluation skills can be improved by inquiry learning models. This inquiry learning model can increase student motivation, because in the inquiry model problems are introduced, in this case the problems introduced are events that confuse students. So, when confronted with a confusing event, together they try to find an explanation of students 'curiosity. This is supported by research by researchers in which students' learning changes when given inquiry learning, where students are excited in conducting investigations. According to this researcher because students are motivated to explain events that confuse them and also to prove their hypotheses. Students become more attentive, more active and ask questions more often when experiencing difficulties. when conducting an investigation. Students are also required to analyze the general properties of the object of interest. This is what causes students' higher-order thinking skills which consist of analyzing, synthesizing and evaluating to increase.

This is also supported by the results of hypothesis testing that have been done, it is found that there are significant and significant differences between the experimental class being taught with the inquiry model and the control class being taught without the inquiry model. This can be seen from the posttest value of the experimental class whose average value is 76.7 higher than the posttest value of the control class which has an average value of 71.9. In the calculation of the hypothesis test even the price of t arithmetic (2.39) is greater than the price of t table (1.995) then the conclusion is that there is a significant influence of the learning model of inquiry into the high-level thinking skills of students. From the discussion above shows that learning using inquiry learning models is wrong an effective learning model that can be used to train and improve students' higher-order thinking skills. Therefore, learning with inquiry learning models can be used as an alternative to solving the problem of students' high-level thinking skills.

4. CONCLUSION

Based on the results of research and data processing, it can be concluded that the application of inquiry learning models has a positive effect on high-level thinking skills in physics learning. This is indicated by the increase in the average value in the experimental class is higher than the increase in the average value in the control class. This is because in the experimental class applied learning with inquiry learning models while in the control class applied learning without inquiry learning models.

REFERENCES

Arikunto, Suharsimi. 2011. Dasar-dasar Evaluasi Pendidikan. Jakarta: Bumi Aksara

Arikunto, Suharsimi. 2006. Prosedur Penelitian Suatu Pendekatan Praktik. Jakarta: Bumi Aksara

Bruce Joyce dan Marsha Weil. 2003. Models of Teaching. New Delhi: Prentice –Hall of India

Dimyati dan Mudjiono. 2010. Belajar dan Pembelajaran. Jakarta: Rineka Cipta

Hamalik, Oemar. 2009. Proses Belajar Mengajar. Jakarta: Bumi Aksara

Hamruni. 2011. Strategi Pembelajaran. Yogyakarta: Insani Madani

Hamzah B. Uno dan Satria Koni. 2012. Assessment Pembelajaran. Jakarta: Bumi Aksara

Ibrahim, Muslimin. 2007. Pembelajaran Inkuiri. Surabaya: UNESA
Khoiru Ahmadi,dkk. 2011. Strategi Pembelajaran Berorientasi KTSP. Jakarta: Prestasi Pustaka Karaya
Lewy, dkk. 2009. Pengembangan Soal untuk Mengukur Kemampuan Berpikir Tingkat Tinggi Pokok Bahasan Barisan dan Deret Bilangan di Kelas XI Akselerasi SMP Xaverius Maria Palembang. Palembang: Unsri
Lisnawati, Lilis. 2007. Hubungan antara Keterampilan Proses Sains dengan SikapIlmiah Siswa melalui Pembelajaran Inkuiri Terstruktur.Jakarta: UINN.
K, Roestiyah. 2008. Strategi Belajar Mengajar. Jakarta: Rineka CiptaNana S. Sukadinata. 2011. Metode Penelitian Pendidikan. Bandung: Remaja Rosdikarya
SriIndah.2012.Penerapan Pendekatan Problem Solving melalui model pembelajaran Search, Solve, Create and Share disertai Hands on Activities untuk Meningkatkan Keterampilan Berpikir Kreatif Siswa. Surakarta: Unisma,2012
Sugiyono. 2009. Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D.Bandung: Alfabeta
Sunardi dan Etsa Indra Irawan. 2010. Fisika Bilingual untuk SMA/MA kelas X. Bandung: Yrama Widya