



## THE EFFECTIVENESS OF SCIENTIFIC BASED LEARNING TOWARDS SCIENCE PROCESS SKILL MASTERY OF PGSD STUDENTS

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### ABSTRACT

The purpose of this research is to find out the whether there is difference of science process skill (SPS) mastery and students' achievement between students who joined class that used scientific based learning method and ones that joined conventional method. The method of this research is Quasi-Experimental Design with static group design. The result showed that there was a significant improvement of SPS mastery by applying scientific based learning, while the improvement of conventional learning class was not quite significant. So, it can be concluded that there was a significant improvement of sig = 0,003 between students' SPS mastery that joined scientific based learning compared to that joined conventional learning.

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**Keywords:** Effectiveness; Scientific Learning; Science Process Skill

### INTRODUCTION

Education aims to develop the skills, character and civilization that is dignified in the context of the intellectual life of the nation, to become a man of faith and devoted to the one almighty God and a citizen who is noble, healthy, knowledgeable, skilled, creative, independent, democratic and responsible. So, the education should take part as foundation of all aspect of life. The component to build a nation is human, therefore it needs reliable human resource as a product of the success of education system in general.

The rapid development of science in recent decade affects the life of global community including in Indonesia. Based on this circumstance, the thought of reforming and movement of learning strategy, curriculum and its evaluation technique arises (Barlia, 2009).

The existence of the environment with maximum utilization will be very supportive to

implement concrete learning. Through a concrete learning process, the learning objectives will be easily achieved. This is in line with the Nurdiana (2013) statement, that said the learning process is a process that contains a series of actions of teachers and students on the basis of reciprocity which takes place in an educational situation to achieve a certain goal

One of the basic principles of science learning is to educate students to have the ability to develop curiosity, positive attitude, honesty and awareness of preserving nature. The process for conducting a good education is necessary for the purpose of education can be achieved as directed and in accordance with predetermined targets. The education system has many aspects that influence the success of the process of achieving goals, these aspects should always be developed by educators in learning systems in order to achieve the ideal learning objectives.

Science learning that emphasizes the concept that occurs in nature, should always be in sync with the situation that occurred in their nature. The substance of the material in science learning gives many experiences to the students to

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understand natural phenomena, so it is necessary to adjust the model of learning and appropriate learning media to be able to achieve that goal. In the context of science learning, it always refers to the nature of science lessons to be taught through three aspects of product, process, and attitude. Science is seen as a product, it means that the laws and theories in science is the product of a series of human activities, known as scientific research. While Science is seen as a process, it means to say in the learning process there is a hierarchy of In science there is systematic the procedures based on scientific research procedure that will produce a skill called science process skills (SPS). Finally, Science is seen as attitude means learners' attitudes of science that are applied in everyday life are obtained after applying science process skills.

Student' achievement process of science learning experience during learning activities, in order to be understood and remembered should consist of three things, they are acquiring cognitive thinking skills (minds on), psychomotor skills (hands on) and social skills (hearts on). The substance of science learning does not only provide supplies of memorizing concepts, but also should include a real learning experience with the environment. Characteristics of science besides to improve cognitive ability, students can gain a real learning experience and one of them can be achieved by doing experiments supported by appropriate learning model.

Efforts to reach the success of teaching and learning process is by implementing effective and efficient strategy learning approach, in order to achieve the learning objectives. Effective learning objectives can be achieved if students get knowledge and meaningful learning experiences during the learning process, this can be achieved if the learning involves students' active participation (Astutik, 2012).

The implication of understanding the nature of science learning is explained by Carin and Sund (1989), by giving instructions as follows: 1) The students need to be actively involved in science based activity that reflects scientific method and SPS that leads to discovery or inquiry activity; 2) The students should be encouraged to perform activities that involve finding solution of problems in the scientific society and technology; 3) The students need to be trained "learning by doing" and then reflect on it. They must actively construct the concepts, principles, and generalizations through the scientific process; 4) The teachers needs to use a variety of approaches / models in science learning. Students need to be directed to the understanding of the product and

content of teaching materials through the activity of reading, writing and visiting certain places; 5) The students need to be helped to understand the limitations of science, values, attitudes that can be developed through the study of science in society so that they can make decisions.

After observing the problem of science learning, it can be said that students are not accustomed to use their reasoning power, but rather familiar to memorize, and focus on the reference book so, it felt that there was a gap between the learning in the classroom and students' daily life environment. Therefore it is necessary to emphasize critical thinking culture that gives the feel of technology, environment and society and science teaching which refers to the future, and results competent learners (Wuryastuti, 2008).

To perform a meaningful learning, teaching activity should be adjusted to make students are aware of their prior knowledge, so they can work cooperatively in a positive and safe learning environment, and compare new ideas with their prior knowledge. The educators also need to connect students' new idea and prior knowledge, to build new knowledge and apply it in different situations (Medriati, 2011).

According to Sulaiman (2009), science process skills can improve students' achievement and increase the quality of learning process. Science process skills enable students to pay attention to learning materials that they should get.

Scientific approach includes several learning stages that include formulating problem, making hypothesis, collecting data, analyzing data and concluding. Through that learning approach it can invite students to participate actively in the process of problem solving and discovery solution of a problem that in the learning process (Russell, 2010). Characteristics of scientific approach emphasize students' ability to work actively to find a self-learning concept that is expected to support the learning process Science.

Science process skills enable students to pay attention to learning materials that should they get. Here are some of the skills needed in the process of constructing knowledge: (1) the ability to remember and express the experience; (2) the ability to compare and make decisions of similarity and difference; (3) the ability to like one experience better than the other one.

The substance of science is a process of discovery, while the output of the process are: (1) Process: expect the learners to gain the ability of observing, collecting data, processing data, interpreting data, concluding, communicating, etc; (2) Product: produce concepts, propositions, laws,

theories, and principles; (3) Attitude: generate an open attitude, objective, fact-oriented, responsible, cooperative, etc.

Learning science should emphasis on students' activity during the process and learning to build knowledge through a series of activities to create meaningful learning for students. Science teaching by using inquiry learning model has proven that skills related to the process of confidence or mastery of concepts has increased (Pujiastuti, 2013)

Previous knowledge or past experience will help students in learning, because the experience is a representation of all domains of learning of cognitive, affective, and psychomotor. Therefore, past experience and learning are not only able to determine what students have learned, but also what they want to learn. So to foster students' interest, teachers should pay attention to students' prior experience; and it should be noted that the affective component is often determined the students' success of learning rather than ability. Meaningful learning related to what students already know and it will build upon and change what is known. All knowledge is a product of individual constructivist activity. We do not get our truth without developing construction continually to explain reality. There is no knowledge without being mediated (Kuwara, 2004).

Based on writer's observation and experience, the majority of PGSD students are less concerned to the learning process of science-based subjects. The purpose of giving science-based course is to prepare them as prospective elementary school teachers to have a good mastery so when they become a primary school teacher, they can teach science concepts correctly. Therefore, the writer feels to examine the effectiveness of scientific-based learning courses based on science, especially in the course Basic Concepts of Science 2 in PGSD Study Program of IKIP PGRI Madiun in even semester 2014/2015.

## METHOD

The research was conducted in November-December 2014. Location of the research was in IKIP PGRI Madiun, East Java. Type of research is Quasi-Experimental Design with static group design. This quasi-experimental design was similar to the true experimental design that has a control group. In this design, there are two groups selected purposively. The first group was treated (X) and the other group did not. The treated group was experiment group and the untreated one was control group.

A pretest was given to experimental and control group to determine the condition of students before the treatment. Pretest results are used to test the homogeneity of the sample. After homogeneity test is reached then it was continued to the giving of treatment to the experimental group. The experimental group was then given a special treatment of scientific based learning, whereas the control group was treated by using conventional methods. SPS mastery indicators used include the ability of observing, classifying, measuring, inferring, and predicting. SPS mastery was observed by using observation sheet based on the students' performance test during the learning process. After the treatment then the students were given post test to measure the ability after the giving of treatment. At the end of the study, the results obtained by comparing the results of post-test done by the students was described to identify whether there is a difference between the experiment and the control group.

## RESULT AND DISCUSSION

This research was carried out in odd semester academic year 2014/2015 for 68 students of PGSD study program IKIP PGRI Madiun, it consisted of two classes, class B as experiment group and class C as control group.

Based on the analysis of hypothesis testing results obtained  $t$  value of 2.247 with  $\text{sig} = 0.003$ .  $\text{Sig}$  value was less than 0.05 that means  $H_0$  is rejected. This suggests that there are differences in student SPS mastery between the experimental group and control group. The conclusion shows that there is a significant difference in learning achievement and SPS mastery students of scientific based learning and conventional methods in the learning process Basic Concept of Science 2 course.

Based on the analysis result of hypothesis testing, the normality test results of learning achievement in the experimental group obtained  $\text{sig} = 0.023$  and the control group  $\text{sig} = 0.021$ . While the SPS mastery experimental group obtained  $\text{sig} = 0.298$  and control group obtained  $\text{sig} = 0.217$ , it shows that the price of  $\text{Sig}$ . (2-tailed) of science learning achievement pretest and SPS mastery in the experimental and control groups has greater significance value than the alpha value of 5% (0.05), then it can be concluded that the research variables distributed normally towards population. This indicates that there was no difference between the students' ability in experiment and control groups.

Based on the homogeneity test of learning

achievement, we can see the level of significance or probability values mean (average) is 3.246 which is above 0.05. Similarly, if the basis of measurement data is the median of the data, the significant figure is above 0.05. In addition, based on the homogeneity of SPS mastery we can see the level of significance or value of the probability of the mean (average) is 2.194 which is above 0.05. Similarly, if the basis of measurement data is the median of the data, the significant figure is above 0.05. Therefore it can be said that  $H_0$  was accepted. Thus, it can be concluded that the significance level of 5% of all groups used in this study had homogenous group variance or both groups had same variance

Learning process in this research was performed four times, the tests consisted of achievement pretest-posttest, and one initial observation to identify students' SPS mastery before treatment. Researchers conducted four times or twice meeting a week the learning process based on the material that should be given.

Samples R1 (experiment group) was treated by applying scientific-based learning. Samples

R2 (control group) was treated by applying conventional method. Application of scientific-based learning method in this study consisted of several phases: the delivery of goal and motivation, the division of experimental group, the materials delivery, the team learning activity using inquiry and discovery. Scientific based learning method was applied in R1 class or class B (experiment group) consisting of 34 students. While Conventional Method was applied in R2 class or class C (control group) consisting of 34 students. In general, the implementation of learning by using conventional method already worked quite well. Students were very active in the learning activities. Although lecturer used the lecture method, students still remained actively to ask and answer all questions, lecturer explained the material and students listened.

Based on data analysis, students' SPS mastery is presented in Figure 1 and 2.

SPS mastery observed in this research was focused to the ability of basic skills. Indicators observed in SPS mastery was the mastery of basic skills, such as observing, classifying, measu-

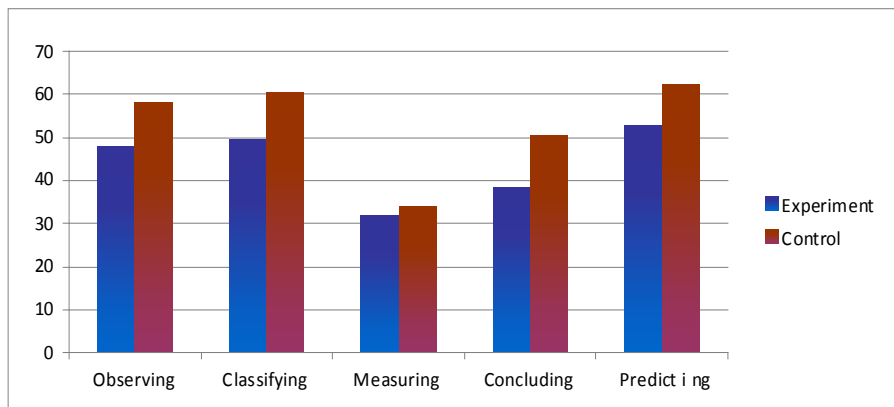


Figure 1. SPS Mastery Graphic (Pre-test)

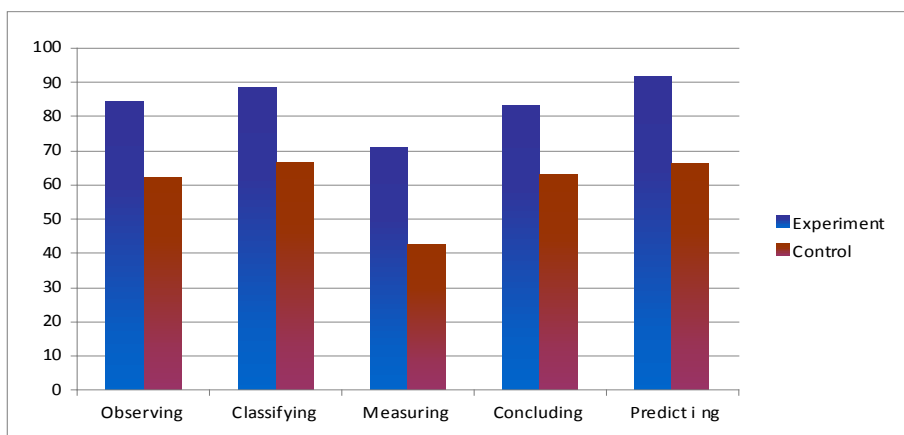


Figure 2. SPS Mastery Graphic after treatment (post-test)

ring, concluding and predicting. Learners should already have those five indicators of SPS mastery.

Before giving treatment of scientific-based learning, control group showed better ability of SPS mastery compared to experiment group. It happened due to several reasons, including the good initial SPS mastery of control group students, while experiment group mastery was lower.

Scientific learning applied to the experiment group was lab-based learning activities, it used inquiry and discovery approaches. After implementing scientific-based learning, SPS students' mastery in experiment group after was higher than control group that was taught by using conventional method.

Students' SPS mastery consisting of five indicators in experiment group was higher than control groups'. It happens because the scientific learning has been proven to be able to encourage the students to proceed in science learning activities, to improve the mastery of science process skills.

## CONCLUSION

The results showed there were differences in the ability of SPS mastery between students taught by using scientific based learning and they taught by using conventional methods. SPS mastery of experiment group improved significantly, while SPS mastery of control group improved insignificantly. Therefore it can be concluded that there were significant differences between SPS mastery ability in experiment and control group with  $\text{sig} = 0.003$ .

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