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Application of Outdoor Inquiry Learning Model on Cognitive Learning Outcomes of Class XI Senior High School Students

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Abstract. This research determines the effectiveness of the use of outdoor inquiry learning model. This research was quasi-experimental research, which uses outdoor inquiry learning model. The research population was students of XI grade in SMAN 1 Sleman 2nd semester, academic year 2016/2017. The sample on the cognitive aspects of learning outcomes is 25 students of MIA 1 class and 29 students of MIA 2. MIA 1 class was the experiment class that gets the application of outdoor inquiry, while MIA 2 class was the control class which uses the conventional learning method. The data were collected by giving a pre-test, then followed by the learning process and observation. After completing the learning process, students were given the post-test. Hypothesis testing method it to analyze for gain value on the pre-test and post-test result. The results showed there was a significant difference between the inquiry learning model and conventional learning model on the achievement of cognitive learning outcomes.

Keywords: Outdoor inquiry learning model; Cognitive learning outcomes; Senior high school students.

1. Introduction

Education can be said as a conscious effort to prepare students through guiding, teaching, and training activities for their roles in the future. As we all aware of the formal education system in Indonesia is based on the 2013 curriculum. This curriculum emphasizes a scientific approach, where students are trained to observe problems, analyze and solve the problem. One way in achieving this goal is to encourage the student to be more active in the learning process. Nowadays, the real challenges in the education world are the increasing needs, especially, in producing human resources who have competencies on how to think, communicate, and high competitiveness [1].

Learning is an activity which could be done anywhere such as in the family, school and community environment. The main goals of this learning activity are to gain knowledge, skills, and attitudes as a form of change during learning [2]. Cognitive learning models say that a person's behavior is determined by his perception and understanding of the situation related to his learning goals. This cognitive theory states that learning is an internal process that includes memorizing and processing information, emotions and other psychological aspects. Learning is an activity which involves a very complex thought process. The changes in the student's behavior, as a result of the learning process, can be used to assess the achievement of learning and teaching objectives whether or not the learning activities are carried out in accordance with the plan which has been prepared to ensure it has an impact to improve the learning program [3].

Inquiry learning model is a learning which is based on constructivism philosophy because through this learning model students can build their own knowledge. Scientific inquiry is important to be developed at every level of science education because the students need to learn as good as possible, therefore they could develop the ability to think and work scientifically [4]. Inquiry learning model is a student-centered model in which students are asked to conduct their own experiments as wide as possible in order to observe what is happening and look for the answers to their own questions. In this model, students must be more active in learning.

This active learning is in line with the basic objectives of inquiry learning as mentioned by W.Gulo i.e. a series of learning activities that involve the finest ability of the learners to search and investigate an inquiry systematically, critically, logically, and analytically. Accordingly, the students have the ability to formulate their own findings [5]. There are various ways to support this learning model, one of them is learning in the place other than the classroom. The basic principle of this activities is to give the students an opportunity to explore, imagine, try new things and learn by themselves with their friends. This method is believed to be more effective as students find their own knowledge through experience [6].

It is an evidence that outdoor inquiry learning methods could encourage the students in finding their own knowledge especially in the problems solving and expressing their own opinions. By using this learning method, students are exposed to a problem from the beginning. Then it followed the curiosity and the need of seeking the answer. This is a student-centered process with the new environment learning place where mostly in the outdoor places could save the student from boredom which commonly occurs in the traditional classroom.

This research determines the effectiveness of the use of outdoor inquiry learning model. The research was conducted in Sleman 1 State Senior High School (SMAN) indicates that most of the physics learning models used in RPP (Learning Implementation Plans) inclined to be teacher-centered learning. The environment around the school has the potential to be used as a learning resource in class XI learning material since it consists of a wide farming field. Moreover it also an outdoor study room in front of the laboratory. Based on these facts, the researchers conducted a study entitled "Application of Outdoor Inquiry Learning Models to Cognitive Learning Outcomes of Students in Class XI of Sleman 1 State Senior High School. In order to see the effectiveness of the application of outdoor inquiry models in the achievement of student's learning outcomes, the author compares it with conventional models and measure the differences in the pre-test and post-test scores for class XI students in Lup.

The rest of this paper is organized as follow: Section 2 describes the proposed research method. Section 3 presents the obtained results and following by discussion. Finally Section 4 concludes this work.

2. Proposed Method

The author determines the sample of this research by purposive sampling technique based on certain criteria. Specifically, the author uses a sample from two classes i.e. Class XI MIA 1 as an experimental class while XI MIA 3 as a control class. The experimental class exposed to the outdoor inquiry learning models while the control class uses a conventional learning model. This type of research is quantitative research using experimental methods. The design of this research is a pre-test and post-test control group design because it can control all external variables which could influence the course of the experiment [2]. The design of this research is as follows (see Figure 1):
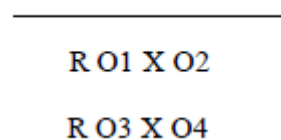
$$R\ O1\ X\ O2$$

$$R\ O3\ X\ O4$$

Figure 1. Research Design

Where:

O_1 = Pre-test experimental class

O_2 = Post-test experimental class

O_3 = Pre-test control class

O_4 = Post-test control class

Independent variables are variables which are affecting of changes or the emergence of dependent variables. The dependent variable is the variable that is affected or which is the result, because of the free variable. The dependent variable in this study is the outcomes of cognitive learning. The instrument of a multiple choice objective tests are used, the students are required to answer some questions through a smartphone designed by researchers with an assisted mobile application "that quiz". The problem consists of the cognitive domain C1 to C6. Testing the validity of each item is done by the supervisor based on material aspects, construction aspects and language aspect. After data has been collected then the author conducts the N-gain test and a statistical test, namely t-test.

3. Results and Discussion

This section presents the obtained results and following by discussion.
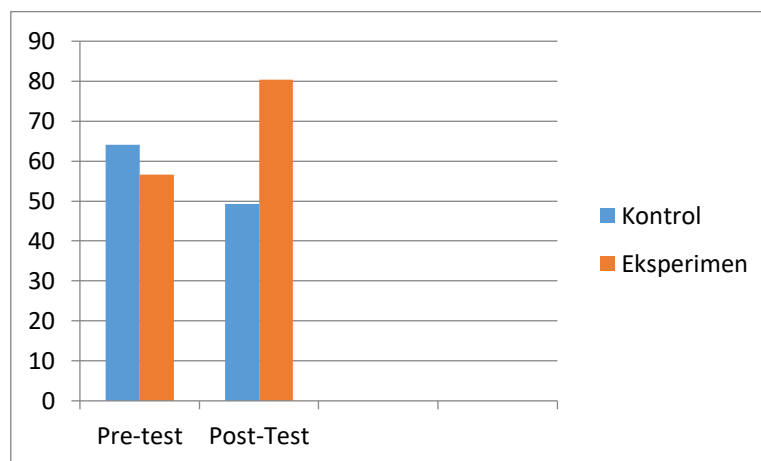

Figure 2. Pretest and Postest Result

From Figure 2, the post-test is conducted to the experimental class after they performed the outdoor inquiry models activities. The same test also conducted to the control class, however, the latter is not received any experience of the same model learning. Then the data for the cognitive domains are collected after the pre-test and post-test, subsequently, the author calculates the gain score formula according to Hake's theory. The result of this pre-test and post-test on both classes could be seen in Tables 1 and 2 as follows:

Table 1. Pretest Result

	N	Highest score	Lowest score	Average	Completeness
Experimental class	25	72	28	56,64	44%
Control class	29	84	28	64,14	65,5 %

According to the data as seen on Table 1, it is evident that the results of the pre-test in the experimental class has the highest score is 72 and the lowest score is 28 with a mean of 56.64. On the other hand, the control class has reached the highest score of 84 and with the identical lowest score i.e.

28 with a mean of 64.14. For the percentage of the completeness level, the Table 1 shows the experimental class is 44%. This percentage is considerably lower than the completeness level of the control class which is 65.5%. This value is obtained according to the KKM score of the school, which is 62.

Table 2. Posttest Result

	N	Highest score	Lowest score	Average	Completeness
Experimental class	25	100	60	80.41	69%
Control class	30	100	30	49,31	23.3 %

After the post-test, the number dramatically changed. The experimental class hit the highest marks, 100 with the lowest score is 60. By this result, the average score is 84.41 and level completeness reach 69%. Then the control class, which the student did not experience the new learning model, indeed it also hit the same highest mark, however, the lowest score could be said relatively low which only 30 points with the average only reach 49.1. From the perspective of completeness, the experimental class has nearly three times higher than the control class, which is 69% compare to 23.3%. The base in measuring this completeness also use the same score as used in the pre-test which is 62.

3.1. Validity Results of Cognitive Learning Outcomes Instrument Results

In the assessment of question instrument validation cognitive learning outcomes measurement, there are three assessed aspects i.e. material aspects, construction aspects, language aspect. The first aspect consists of the suitability of the questions with indicators, objectives, and competencies. The second aspects consist of clarity, suitability of the questions with the material, there are work instructions, scoring guidelines, and clarity of images and graphics presented. While the third aspect consists of language usage and accuracy, communicative nature, clarity in sentences and not using any words or expressions that give rise to multiple interpretations. Based on the validation results which are performed by the supervisor of this research, it has been concluded that the question instrument is valid after the revision is done.

3.2. Normal Gain Test
3.2.1. Normal Gain Test of Experimental Class

After obtaining the results of the pre-test and post-test, then the author calculates the N-gain test to determine the improvement of cognitive learning outcomes on the research object. The result shows the lowest N-gain value falls into 0.3 for the lowest score, while the highest N-gain value is 0.9. Calculation of the lowest average as for E19 students could be seen in the following formula:

$$g = \frac{posttest - pretest}{nmax - pretest}$$

$$g = \frac{50 - 28}{100 - 28}$$

$$g = \frac{22}{72}$$

$$g = 0.3$$

Whereas, the calculation of the highest average N-gain can be seen for E17 students with a pre-test score of 72 and posttest 100 on this following formula:

$$g = \frac{posttest - pretest}{nmax - pretest}$$

$$g = \frac{100 - 72}{100 - 72}$$

$$g = \frac{28}{28}$$

$$g = 1$$

N-Gain on the experimental class students have medium criteria, this can be proven by calculating the average N Gain value with an average pretest score of 56.64 and an average posttest score of 80. 41. The calculation on this N-gain can be seen on the following formula:

$$g = \frac{S\ posttest - S\ pretest}{nmax - S\ pretest}$$

$$g = \frac{80.41 - 56,64}{100 - 56,64}$$

$$g = \frac{23,77}{43,36}$$

$$g = 0.5$$

3.2.2. Normal Gain Test of Control Class

Meanwhile, the lowest N-gain is could be said at the low category which is 0.17. In contrast, the highest N-gain is in the high category which is 1. The lowest average calculation for students E08 could be done by this formula.

$$g = \frac{posttest - pretest}{nmax - pretest}$$

$$g = \frac{posttest - pretest}{nmax - pretest}$$

$$g = \frac{40 - 28}{100 - 28}$$

$$g = \frac{12}{72}$$

$$g = 0.17$$

The calculation of the highest average N-gain can be seen for E24 students with pretest 60 and posttest 100 values as follows:

$$g = \frac{posttest - pretest}{nmax - pretest}$$

$$g = \frac{100 - 60}{100 - 60}$$

$$g = \frac{40}{40}$$

$$g = 1$$

N-Gain for the experimental class students have relatively poor criteria, as demonstrated by the calculation of the average N Gain value with an average value of pre-test 64.16 and an average post-test score of 49.31:

$$g = \frac{S\ posttest - S\ pretest}{nmax - S\ pretest}$$

$$g = \frac{49,31 - 64,16}{100 - 64,16}$$

$$g = \frac{-14,85}{35,84}$$

$$g = -0.41$$

In sum, according to the above data, it can be seen that the gain value on the experimental class is higher than the gain value on the control class. This gain also can be categorized as a medium on the experimental class, however, the control class is at a poor level.

3.3. Effectiveness Testing

In testing the effectiveness of the SSQ-assisted Inquiry model the author uses a basis from the achievement of students' learning outcomes according to the minimum completeness criteria in the modeling class. This analysis uses one-sample t-test technique using the assistance data processing software, SPSS 21. The decision criteria used are Ho rejected if the sig value. those obtained through SPSS are less than the significance level (α). The significance level used in this analysis is $\alpha = 0.05$. The reference used in this test is 62, which is the lowest score that must be achieved by students after participating in learning by using Outdoor Inquiry model. This value is a reference point to determine whether or not of the Outdoor Inquiry model helps the student achieve the score as needed on minimum completeness criteria. The hypotheses for testing *t*-test in the modeling class in terms of student learning outcomes are:

Ho = SSP Outdoor Inquiry model is not effective in supporting the achievement of learning outcomes of students

Ha = SSP Outdoor Inquiry model is effective in supporting the achievement of learning outcomes of students.

Mathematically, the two hypotheses can be written as follows:

$$\text{Ho} : \mu \leq 62$$
$$\text{Ha} : \mu > 62$$

The following is the result of One-Sample t-Test analysis in the experimental class is shown in Figure 3 below:

	t	df	Sig. (2-tailed)	Test Value = 62 Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
mial	4.625	24	.000	14.80000	8.1955	21.4045

Figure 3. Results of Sample t-Test Analysis of the experimental class

According to the table above, sig values is 0.000. This value is smaller than the value of $\alpha = 0.05$.

Consequently, the Ho is rejected. Hence, it can be concluded that the SSP of the Outdoor Inquiry model based on that quiz-assisted practicum is effective in supporting the achievement of learning outcomes of students in the experimental class. The results demonstrated that there are significant differences in cognitive learning outcomes between students in the experimental class compare to a student in the control class. The former class are using the Outdoor Inquiry learning model, in contrast, the latter class is using the conventional model. The students in the experimental class have higher cognitive learning outcomes because the stage in the Inquiry learning model are more structured.

The application of the Outdoor inquiry model has a higher level of effectiveness when viewed from the improvement of students' cognitive learning outcomes. This model has many advantages and feasible to apply. Those advantages are (1) this method has a thorough observation on the object of learning with an easier technique to understand the lesson; (2) through the direct observation, the students could understand there many ways to understand the object of learning. In other word, there a million way to understand other than from lecturing session or reading a book; (3) outdoor learning also can improve student activity and stimulate their creativity. In the same time, it also reduce class boredom, (4) Learning using Outdoor Inquiry models evidently improve student learning outcomes (5) The use of that quiz in learning evaluation can foster student motivation how to deals with the problems or questions.

4. Conclusion

In conclusion, according to the above data, it is evident that the Outdoor Inquiry learning model has a higher level of effectiveness compared to conventional models. This is evidenced by (1) there is a significant difference between the inquiry learning model and conventional learning models on the achievement of students' cognitive learning outcomes. As demonstrated in the previous paragraph, the average gain using the Outdoor inquiry learning model is 0.55, in contrast, the average gain using the conventional method only -0.41. In addition, the level of the significance value of 0.000. which is considerably smaller than 5% (0.05) as the threshold level of Ho's acceptance area. This shows a significant difference in normalized gain score data between the control class and the experimental class.

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