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The Effect of Experiment Methods on Student Learning Results in Learning IPA in Class VIII Mts. Negeri 2 Labuan

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ABSTRACT

This study aims to analyze how much influence the experimental method has on the learning outcomes of students in class VIII MTs. Negeri 2 Labuan. The research method used is the experimental method, with the form of quasi exsperimental design with the type of time series design. The sample of this study was 25 students. Based on the results of statistical calculations show that the average student post-test learning outcomes of 73.22. The results of hypothesis testing obtained 4.8138 (tcount> ttable) so that it is declared accepted. From the calculation of effect size obtained 1.5379 (high). This means that the experimental learning method has a high influence on student learning outcomes in class VIII MTs. Negeri 2 Labuan. Keywords: Experimental Learning Method, Learning Outcomes.

Keywords: Experiment Methods, Student Learning, Learning Result

INTRODUCTION

The use of appropriate learning methods in each lesson can encourage curiosity about the subjects taught, increase motivation in doing assignments, make learning active and fun which in turn will have a positive impact on student learning outcomes themselves. An active learning if the teacher involves students in the learning process, so that there is all-way communication between students and teachers, teachers with students, and students with students. In order for this all-way communication to be realized, the teacher as a facilitator must be able to develop his teaching methods. Especially in learning Natural Sciences. Natural Science is a science of nature that studies events that occur in nature.

Natural Science can be defined as a collection of knowledge arranged in a guided manner. This is in line with the KTSP curriculum that Natural Science deals with how to find out about nature systematically, so that it is not only mastery of a collection of knowledge in the form of facts, concepts, or principles but also a process of discovery.

Based on observations made at MTs. Negeri 2 Labuan on August 23, 2023 during Natural Science lessons, the teacher only applies the lecture method and uses picture media as a tool. From the results of the interview, it is known that the teacher has not fully implemented the experimental method and has not even implemented it for a long time on the grounds that there is no availability of tools and materials to carry out an experimental activity and does not have free time to make his own materials for experimental activities. In addition, data was also obtained that the average score of students in class VIII A in Natural Science lessons was 67. This value is below the minimum completeness criteria of 70. This shows the need for improvement and variation in the use of learning methods that can attract students' attention.

If the learning process of Natural Sciences is carried out using the experimental method, students will experience the discovery process themselves and have their own unforgettable experiences and do the process of something happening themselves. Thus, they will more easily remember what they learn because they experience it firsthand. Because according to Roestiyah (2012: 80) "The experimental method is one way of teaching, where students conduct an experiment on something; observe the process and write down the results of the experiment, then the results of the observations are submitted to the class and evaluated by the teacher".

The experimental learning method should be applied in learning Natural Sciences because the experimental learning method is a method developed with the aim of guiding students to be able to find their own answers to the phenomena encountered through a series of teaching and learning activities and guidance and direction from the teacher. So, the experimental learning method is a method that provides opportunities for

students both individually and in groups to conduct an experiment by experiencing and discovering for themselves a new knowledge for students.

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Learning outcomes are often used as a measure to determine the extent to which a person understands or masters the lessons that have been taught. To actualize learning outcomes, measurement is required using good and qualified evaluation tools. Meanwhile, according to Winkel (in Purwanto, 2013: 45) states that "Learning outcomes are changes that result in humans changing in their attitudes and behavior". In addition, Winkel (in Purwanto, 2013: 45) said "The aspect of change refers to the taxonomy of teaching objectives developed by Bloom, Simpson and Harrow including cognitive, affective and psychomotor aspects".

Nana Sudjana (2009: 22) states that, "Learning outcomes are the abilities that students have after they receive their learning experience". Meanwhile, according to Abdurrahman (in Asep Jihad and Abdul Haris, 2012: 14) "Learning outcomes are the abilities that children acquire after going through learning activities". As well as Juliah (in Asep Jihad and Abdul Haris, 2012: 15) states that, "Learning outcomes are everything that students have as a result of their learning activities." According to Benjamin S. Bloom (in Asep Jihad and Abdul Haris, 2012: 14-15) "Learning outcomes can be grouped into three domains, namely cognitive, affective, and psychomotor domains".

Based on some of the above opinions, it is concluded that learning outcomes are the abilities or knowledge that students have after carrying out learning activities. Based on the description above, the researcher raised a study with the title "The Effect of the Experiment Method on Student Learning Outcomes in Natural Science Learning in Class VIII MTs. Negeri 2 Labuan".

METHODOLOGY

The research method used in this research is experimental research method. The experimental research method is a research method used to find the cause and effect and certain effects of one or several variables on other variables under controlled conditions. The reason for choosing the experimental method in this study is because researchers will look for the effect of student learning outcomes before using experimental methods and after using experimental methods in learning Natural Sciences in class VIII MTs. Negeri 2 Labuan. The population in this study were VIII grade students of MTs. Negeri 2 Labuan which consists of 2 classes, namely VIII A and VIII B classes totaling 50 students, each class totaling 25 students. The sampling technique used in this study was Cluster Random Sampling.

According to Hadari Nawawi (2012: 166) "The unit of analysis in this technique at the time of processing or analyzing the data used is the group as a whole unit (intect), among others, by using the average value. Cluster random sampling is used if the population does not consist of individuals, but consists of groups of individuals or clusters. The sample in this study was the experimental class VIII A which amounted to 25 students consisting of 14 female students and 11 male students. To anticipate problems arising in conducting research in the field, it is necessary to arrange research procedures that will be carried out including the preparation stage, the implementation stage, and the analysis stage. To anticipate problems in conducting research in the field, it is necessary to arrange research procedures that will be carried out including:

1. Preparation Stage, namely (a) Discussing with the teacher about the objectives desired by the researcher in this study. (b) Prepare instruments in the form of pre-test and post-test questions and lesson plans. (c) Conduct validity of research instruments. (d) Conducting test trials on class VIII students MTs. Negeri 5 East Pandeglang. (e) Analyzing the data from the trial results to determine the level of reliability of the research instrument. (f) Analyzing the level of difficulty of the differential power of each item that has been tested. (g) Based on the results of the analysis, then the question is used as a data collection tool.

2. Implementation Stage, namely (a) Adjusting the research schedule with the Natural Science learning schedule at the research site school. (b) Giving pre-test to students. (c) Carry out learning activities using experimental methods with the material of the nature of light. (d) Researchers asked the teacher for help to observe students in learning activities, namely by using experimental methods. (e) Giving post-test to students.
3. Analysis Stage, namely (a) Scoring test results. (b) Calculating the average student test results. (c) Calculating the standard deviation followed by a data normality test. (d) Conduct hypothesis testing using the t formula. (e) Calculate effect size. (f) Making conclusions.

The data collected in this study are data on student learning outcomes in the form of pre-test, post-test and observation data on student skills in experimenting. Sources of data in this research are This is a person, namely students and paper, namely student test answers both pre-test and post-test results.

The data collection techniques in this study are direct observation techniques and measurement techniques with the data collection tool used is a test. The data collection tools used in this study were observation sheets and pre-test and post-test questions.

The research instruments in this study are lesson plans that have been compiled by researchers, tests with objective forms, validity carried out by one lecturer who is competent in Natural Sciences with the results of the instruments used are valid, the reliability of multiple-choice instruments previously researchers conducted a trial of questions carried out at MTs. Negeri 5 Pandeglang with the acquisition of reliability of 0.55 which is classified as moderate reliability value criteria, difficulty level, and differentiating power.

To answer the problems in this study and determine the right conclusion, it is necessary to carry out data processing techniques as follows:

1. To answer sub-problem number one, namely how much is the average value of student learning outcomes in learning Natural Sciences in class VIII MTs. Negeri 2 Labuan before using the experimental method, the average formula for calculating the learning outcomes test according to Nana Sudjana (2009: 67) is used as follows:

$$\bar{X} = \frac{\sum fi.xi}{\sum fi}$$

2. To answer sub-problem number two, namely how much is the average value of student learning outcomes in learning Natural Sciences in class VIII MTs. Negeri 2 Labuan after using the experimental method, the average formula for calculating the learning outcomes test according to Nana Sudjana (2009: 67) is used as follows:

$$\bar{X} = \frac{\sum fi.xi}{\sum fi}$$

3. To answer sub-problem number 3, namely how much influence the application of experimental methods has on student learning outcomes in learning Natural Sciences in class VIII MTs. Negeri 2 Labuan, the t-test formula will be used with the following steps:
   a. Calculating the score of student learning outcomes in Social Science learning class VIII MTs. Negeri 2 Labuan, from each pre-test and post-test answer.
   b. Calculating the average pre-test and post-test results using the formula for calculating the average learning outcomes test according to Nana Sudjana (2009: 67) as follows:

$$\bar{X} = \frac{\sum fi.xi}{\sum fi}$$

   c. Calculating the Standard Deviation (SD) of pre-test and post-test results, the following formula is used:

$$SD = \frac{\sqrt{\sum fxi - \bar{x}}}{n-1}$$

   (Burhan Nurgiyantoro, Gunawan, Marzuki, 2004: 111)

   d. Conduct data normality test using chi squared with the following procedure. Formula:

$$X^2 = \frac{(O_1 - E_1)^2}{E_1} + \frac{(O_2 - E_2)^2}{E_2} + \cdots \frac{(O_n - E_n)^2}{E_n}$$

   (Burhan Nurgiyantoro, Gunawan, Marzuki, 2004: 111)

e. If it turns out that the class is not normally distributed, then further use non-parametric statistical tests. In this case, using the Mann-Whitney U test. According to Sugiyono (2013: 153) states that, "The formula for calculating the Mann-Whitney U test is as follows: The value for sample 1 is expressed as follows:

$$U_1 = \frac{n_1.n_2}{2} + R_1$$

The value for sample 2 is expressed as follows:

$$U_2 = \frac{n_1.n_2}{2} + R_2$$

f. To find how much influence the use of experimental methods has on student learning outcomes in learning Natural Sciences in class VIII MTs. Negeri 2 Labuan, the effect size formula from Cohen adopted by Glass (Leo Sutrisno, et al, 2007: 4-9) will be used as follows:

The criterion for the magnitude of the effect size used is:

$$ES = \frac{\overline{Ye} - Y_e}{S_c}$$

4. To answer sub-problem number four, namely how students' skills in conducting experiments in learning Natural Sciences in class VIII MTs. Negeri 2 Labuan is by adding up all the average results of the assessment rubric on student skills in experimenting from all meetings that have been conducted by all groups and then the results are divided by eight meetings.

RESULTS AND DISCUSSION

Results

This study aims to determine the effect of the application of experimental methods on student learning outcomes in class VIII MTs. Negeri 2 Labuan in the 2022/2023 school year. Data on student learning outcomes in science learning in class VIII MTs. Negeri 2 Labuan is presented in table 1 below:

Table 1. Table of Data Processing Results Based on Science Learning Outcomes

Description	Pre test	Post Test
Average	45,68	73,22
Standar Deviation	15,92	17,90
Normalitas Test	4,056	5,448
Hypotesis test	4,81	

Based on Table 1 above, the average student learning outcomes in science learning after applying the experimental method (post-test) is higher than the average student learning outcomes before applying the experimental method (pre-test).

The calculation of standard deviation is used to compare the spread or deviation of two or more data groups. The results of the Standard Deviation are as follows: The pre-test standard deviation value is 15.92 while the post-test standard deviation value is 17.90. This means that the scores on the post-test are more evenly distributed than the pre-test. To find out the initial ability of students in learning Natural Learning Science, the data from the average and standard deviation of the pre-test needs to be analyzed and must be normally distributed.

Based on the results of the calculation of the pre-test data normality test obtained x 2 count of 3.419 then compared with the Chi squared list or table with a significant level (α) = 5%, it is obtained = 7.815. This shows that < or 3.419 < 7.815, means significant. So, it can be concluded that the pre-test data is normally distributed. While based on the normality test of the post-test data obtained = 5.3749 then compared with the Chi squared list or table with a significant level (α) = 5%, it is obtained = 7.815. This shows that < or 5.3749 < 7.815, means significant. So, it can be concluded that the post-test data Then continued with the Chi-square test.

So, it can be concluded that the post-test data Then proceed with the hypothesis test (t-test) and obtained normally distributed. 4.81, while with db = 25 - 1 = 24 and a significant level (α) = 0.05 is 1.711. Because ≥ or 4.81 ≥ 1.711 means significant, so it can be concluded that the null hypothesis (Ho) is accepted. From the explanation of the t test calculation, it means that there is an effect of the experimental method on student learning outcomes in class VIII MTs. Negeri 2 Labuan.

To determine the magnitude of the effect of experimental methods on student learning outcomes, it is calculated using the effect size formula. From the results of these calculations obtained ES of 1.5379 and included in the high category. Based on the calculation of the effect size, it can be concluded that the experimental method has an effect on student learning outcomes in science learning in class VIII MTs. Negeri 2 Labuan. For more details regarding the comparison between the pre-test and post-test scores, it can be seen in Figure 1 of the following diagram of the average student learning outcomes which clearly illustrates the average difference in student learning outcomes from the pre-test and post-test results that have been carried out in class VIII MTs. Negeri 2 Labuan.

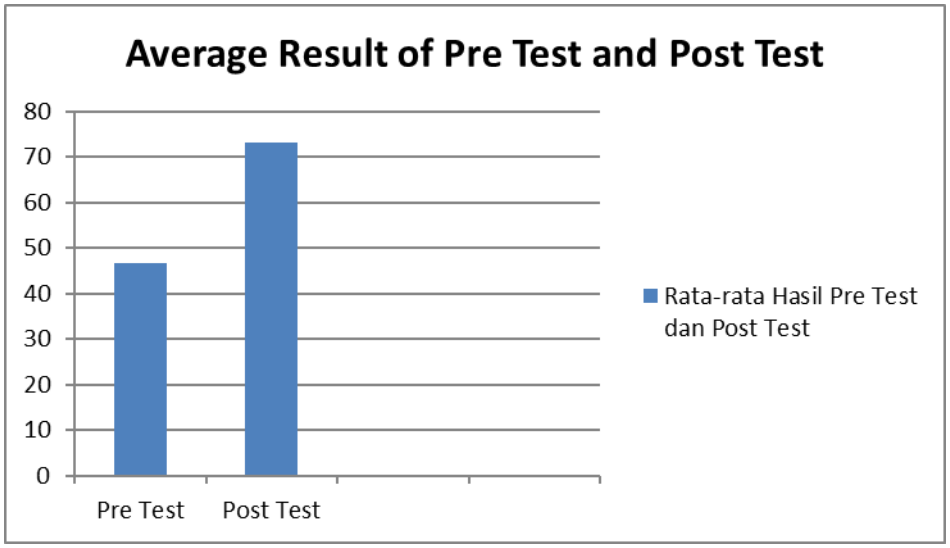

Figure 1. Bar Chart of Pre-Test and Post Test Results

Discussion

In this study, the sample was class VIIIA MTs. Negeri 2 Labuan in the 2022/2023 school year consisting of 25 students. The technique used to obtain the sample is the cluster random sampling technique. The learning process was carried out for 8 meetings where each meeting lasted 70 minutes of learning by using the experimental method as the main method and accompanied by lecture methods, assignments and others as a complement.

In this study, the learning process was observed by Mr. Abdul Hakim, M.Pd as the Head of Madrasah and the homeroom teacher of class VIIIA and the collaborator of the teacher council as an observer or observer whose task was to observe students' skills in conducting experiments.

During the learning activities, there were not many obstacles faced by researchers. Students followed the learning enthusiastically. Although sometimes there are some students who make a little noise. During the learning process, students were asked to carry out experimental activities in accordance with the instructions contained in the student worksheets that had been distributed previously. After completing the experimental activities, students from the representatives of each group were asked to come forward to the front of the class to read out the results of the activities they had done in groups.

After the learning process was completed, the researcher gave several practice questions to students in accordance with the material that had been taught. This is done to measure the extent to which students understand and remember what they have done during the learning process. From the results that have been obtained, there are some students who are able to answer questions correctly and there are some students who still cannot answer questions correctly.

There are several factors that can affect these learning outcomes, among others: (a) The overall health condition of students during the teaching and learning process is good and healthy. (b) There are several students who have high enthusiasm in the learning process so that they spur other students to study well and seriously. (c) The facilities and infrastructure used during teaching, especially when conducting experiments, have been prepared by the teacher as much as possible. Each group is given their own tools and experimental materials so that they can immediately carry out activities without having to borrow the necessary items from each other. (d) With the presence of the VIIIA class teacher, Mr. Abdul Hakim, M.Pd and student friends who helped in observing the students' process in experimenting, the class conditions became easier to control. (e) In general, the use of experimental methods in learning is very enjoyable for students because they can try and prove something for themselves. Especially when the experiment results in a product. They were very enthusiastic when using the products, they made themselves such as simple lup, kaleidoscope and simple periscope.

In addition to learning outcomes, students were also observed regarding their skills in conducting experimental activities. To find out how students' skills in conducting experiments, a rubric for assessing students' skills in experimenting has been prepared. When observing the students' process in experimenting, the researcher asked for help from the homeroom teacher concerned and a colleague to help observe the students' process in experimenting. Observations were made in the form of groups, to make it easier to assess.

In accordance with the results of calculating the average of the assessment rubric that has been filled in after observing each group, at the first meeting the average student skills in experimenting were 2.7 and included the sufficient category. For the second meeting, it was found that the average student skills in experimenting were 2.208, including the moderate category. In the third meeting, students' skills in experimenting increased to 2.708 but were still in the moderate category. Furthermore, the fourth meeting, students' skills in experimenting decreased to 2.6 and included the moderate category. In the fifth meeting, there was a slight increase to 2.875 and included in the moderate category. In the sixth meeting, there was a large increase in students' skills in experimenting of 3.25 and included the good category. For the seventh meeting, students' skills in experimenting decreased to 2.75 including the moderate category. When the last meeting, namely the eighth meeting, there was another increase in students' skills in experimenting, which amounted to 3.208 and included the good category. If calculated, the average student's ability to experiment in eight meetings using the experimental method is 2.787, which is included in the sufficient category.

CONCLUSION

Conclusion

Based on the results of data analysis obtained from student test results, it can be concluded that the average student learning outcomes before using the experimental method in learning Science in class VIII A MTs. Negeri 2 Labuan is 45.68. The average student learning outcomes after using the experimental method in learning Science in class VIII A MTs. Negeri 2 Labuan is 73.22. There is an increase between the average student learning outcomes before using the experimental method and the average learning outcomes after using the experimental method which is 27.54 points.

Based on calculations using the effect size formula where the price ES = 1.5379 is in the high category. So, it can be concluded that there is an effect of using experimental methods on student learning outcomes in learning Natural Sciences in Class VIII A MTs. Negeri 2 Labuan is large and includes a high category. In accordance with the assessment of students' skills in experimenting that has been carried out, a value of 2.787 is obtained and is included in the sufficient category. So, it can be concluded that students' skills in experimenting in learning Natural Sciences are sufficient.

Recommendation

There are several suggestions that researchers can convey based on the results of the study, namely as follows: (1) The experimental method is very good to use in learning because by applying this method, students get direct experience of the material being taught, students become part of the occurrence of an event and students can also make simple optical devices that can later be used in everyday life. (2) For the application of the experimental method, it would be better if at the beginning of the learning activities students are given an understanding of what will be done and given an explanation of what is meant by experimental activities. So that later when doing activities, students are not confused about what to do. (3) In the research that has been done, it takes a long time for students to carry out experimental activities. So that teachers in carrying out teaching and learning activities, must be able to streamline the time used.

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