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RESEARCH ARTICLE

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## THE EFFECT OF EXPERIMENT LEARNING METHOD TOWARD GRADE V STUDENTS' LEARNING OUTCOMES ON HEAT TRANSFER MATERIAL IN SDN LOYOBOHOR LEMBATA REGENCY

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### ABSTRACT

This research aimed to identify significant effect of using experiment method toward grade V students' learning outcomes on heat transfer material in SDN Loyobohor, Lembata Regency. Learning method used in this study was experiment method, by giving students, either individual or in groups to practice doing experiment. Using one group pretest posttest design, respondents were given pretest before treatment and posttest after treatment. Result of the study showed that the use of experiment learning method toward students' learning outcomes. This was proven by statistic data analysis result of paired t-test with  $t_{table} = 2.068$  dan  $t_{count} = 2.7007$ , therefore  $t_{count} > t_{table}$  which meant  $H_0$  was rejected and  $H_a$  was accepted. This result concluded that the learning method had significant effect toward students' learning outcomes.

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## INTRODUCTION

Science is an important subject to acquire. Samatowa in Isrok'atun (2020:21) argued that science discusses natural phenomena in systematic order based on experiment and observation result done by human being. Science is not merely a set of knowledge about things and living beings, but also way of work, thinking, and problem solving. By learning science, we automatically learn to know our environment, natural phenomena, living beings, objects and occurred events. Thus, materials on concepts must be delivered well and stimulates students learning motivation to understand every reality or natural phenomena and actualize the concept in real life. Based on interview result with Grade V homeroom teacher of SDN Loyobohor, students' outcomes was low and did not reach the defined KKM (Minimum Accomplishment Criteria) which was 65 on Grade V, theme 6, sub-theme 2, in learning basic competence 3.6 applying heat transfer concept in daily life and 4.6 reporting observation result of heat transfer. The previous learning methods were lecturing and tasks.

Lecturing method was monotonous and teacher centered which made students to be passive during learning process. They only listened, wrote, and memorized materials delivered by the teacher. This type of learning method caused students to get bored to learn and slow to understand materials which impacted in their low learning outcomes. In order to improve their learning outcomes, a serious learning method but attractive at the same time was needed therefore experiment method fit the criteria of the expected learning method. It is a method in which opportunities were given to students individually or in group to practice doing an experiment or observation in accordance with learning materials. This suggestion was supported by Djamarah in Trianingsih (2018:59) that experiment method is a method gives opportunities to students either individually or in group to train themselves doing experiments. It was expected that through this method, students would be able to search and obtain answers to problems they were dealing with themselves and also train their scientific thinking. It is through experiments that they can find solid proof of theories they are learning.

During its learning process, students are given chances to observe, analyze, prove, and draw conclusions of an object. Besides, they practice processing skill to get maximum learning outcomes.

## METHODS

**Research Method:** This study applied one group model of pre-experimental design of quantitative method which emphasized on comparison of the studied group conditions before and after treatment. The design is pictured below:

$O_1 \times O_2$

Details:

$O_1$  = pretest score (before treatment)

$O_2$  = posttest score (after treatment)

X = treatment given to a group through the implementation of experiment method

**Context of the Study:** This research was undertaken in SDN Loyobohor, Lembata Regency.

**Population and Samples:** The population of this study was a total of 25 grade V students of SDN Loyobohor, Lembata in 2020/2021 academic year which consisted of 10 male and 15 female students. Samples chosen to be studied were taken through saturated sampling technique in which all population members were included as samples. Therefore, the researcher took all the population as samples which covered all 25 V grade students of SDN Loyobohor.

**Variables:** There were two variables applied in this research, which were experiment learning method as independent variable and students' learning outcomes as dependent variable.

**Research Instruments:** Test was used as instrument to identify students' learning outcomes and then studied to see the impact of using the method to treat students.

**Validity and Reliability Test:** Validity test was undertaken to find out whether the measurement tool used to collect data was valid or not. To measure the level of validity, product moment correlation formula was run in Microsoft Office Excel 2007.

The formula was as follows :

$$r_{xy} = \frac{n\sum XY - (\sum X)(\sum Y)}{\sqrt{\{n\sum X^2 - (\sum X)^2\}\{n\sum Y^2 - (\sum Y)^2\}}}$$

(Tersiana, 2018:103)

Details:

$r_{xy}$  = correlation coefficient between variable X and variable Y, two correlated variables

$\sum X$  = total score per item

$\sum Y$  = total score (all items)

N = total data (amount of studied samples)

The next test was reliability test. The instrument could be categorized as reliable if the result revealed constant measurements and indicated measurement result accuracy to prove that the measurement tool was accountable. To measure reliability in this research, KR.20 (Kuder Richardson) formula was run in Microsoft Office Excel 2007 with the following formula:

$$r_{11} = \left( \frac{n}{n-1} \right) \left( \frac{s^2 - \sum pq}{s^2} \right)$$

Details:

$r_{11}$  = Reliability test

P = Proportion of items answered correctly

Q = Proportion of items answered incorrectly

$\sum pq$  = multiplication result of p and q

N = total item

s = test standard deviation

(Source: Arikunto, 2013: 115)

**Techniques of Data Collection:** The data collection techniques used in this study were (1) test which was used to measure learning outcomes based on the treatment given to students. The test in this study was in the form of a pre-test carried out before treatment and a post-test carried out after giving treatment during learning process; (2) documentation to obtain data directly from research site including relevant data, this technique was also used to determine students' learning outcomes and obtain visual proof of events during the study.

**Data Analysis Technique:** Normality test was carried out to see if the data obtained from students' learning outcomes was normally distributed or not. The normality test was run in Microsoft Office Excel 2007 application using Chi-square formula as shown below:

$$X^2 = \sum \frac{(F_o - F_h)^2}{F_h}$$

Details:

$X^2$  : Chi-square or sample normality

$f_o$  : Observed frequency

$f_h$  : Expected frequency

(Source ; Sugiyono, 2010:107)

The criterion was if  $X^2_{count} < X^2_{table}$  then the sample emerged from normally distributed population but the population was not normally distributed if  $X^2_{count} > X^2_{table}$ . Homogeneity test was carried out on learning outcomes of heat transfer in experimental class. The aim was to find out data from two variances of each sample group, namely homogeneity test between pretest and posttest values. If pretest and posttest score had similar variable, then class was homogeneous. The statistical approach used was F test with the help of Microsoft Office Excel 2007, with the following formula:

$$F = \frac{\text{Largest variant}}{\text{Smallest variant}}$$

(Source: Muncarno, 2015:57)

The hypothesis was tested using independent t-test with level of significance 0.05 in which the criterion of acceptance or rejection of  $H_a$  or  $H_o$  was defined on 5% level of significance.

- If  $t_{count} \geq t_{table}$  then  $H_o$  was rejected ( $H_a$  accepted)
- If  $t_{count} \leq t_{table}$  then  $H_o$  was accepted ( $H_a$  rejected)

It indicated that if significant value  $t < 0,05$  then  $H_o$  was not accepted, which meant that there was significant effect of independent variable toward dependent variable. On the other hand, if the significant value  $t > 0,05$  then  $H_o$  was accepted, which meant that there was no significant effect of independent variable to dependent variable.

## RESULTS AND DISCUSSION

### RESULT

The implementation of this research includes 3 stages: pretest, treatment, and posttest. Before being treated with the method in conducting research, students were given an initial test by working on pretest questions. After doing pretest, the students were given different treatment. The learning process was done using experiment method. After teaching using the method, posttest was then carried out.

**Result of validity and reliability test:** With the assistance of Microsoft Office Excel 2007, validity test was carried out using product moment correlation to identify the validity of each test item. The items would be declared valid if  $r_{\text{count}} > r_{\text{table}}$ . The test was undertaken with 25 students as participants ( $N=25$ ) and 5% level of significance,  $r_{\text{table}} = 0,39$ .  $R_{\text{count}}$  of each test item was bigger than 0,39, so it could be concluded that each test item was valid. The reliability test was run using *Kuder Ricardon* (KR.20) formula in Microsoft Office Excel 2007 too. Test items were reliable if  $r_{\text{count}} > r_{\text{table}}$ . The result of reliability test on 20 test items using KR 20 formula revealed that  $r_{11} = 0,81$ . The correlation coefficient score was on 0,80-1,0 interval which meant that it was reliable with high category.

**Normality Test Result:** The result of normality test on pretest  $\chi^2_{\text{count}} = 2.07694$  and  $\chi^2_{\text{table}} = 9.488$  whereas on posttest,  $\chi^2_{\text{count}} = 6.496$  and  $\chi^2_{\text{table}} = 9.488$ . It was found that the data of students pretest, posttest and learning outcomes had smaller  $\chi^2_{\text{count}}$  than  $\chi^2_{\text{table}}$ . This confirmed that all data were normally distributed.

**Homogeneity Test Result:** Based on the result of homogeneity test, the value of  $F_{\text{count}} = 1,87048$  and  $F$  distribution with degrees of freedom for numerator =  $25-1=24$ , meanwhile degrees of freedom for denominator is  $25-1=24$  as well as  $\alpha = 0,05$  or 5% and  $F_{\text{table}} = 1,98376$ . Based on the result of homogeneity test in which  $F_{\text{count}} < F_{\text{table}}$ , it was concluded that both data were homogenous.

**Hypothesis Test:** As confirmed in paired sample  $t$  test,  $t_{\text{count}}$  was bigger than  $t_{\text{table}}$  in which the value was  $2,70072 > 2,068$ , therefore  $H_0$  was rejected and  $H_a$  accepted. Hence, it could be summarized that there was significant effect of using experiment method toward students' learning outcomes on heat transfer topic in Grade V students of SDN Loyobohor, Lembata Regency.

## DISCUSSION

The discussion in this study focused on independent variable studied which was experimental method and dependent variable, student learning outcomes in grade V on heat transfer material. Validity and reliability test was done earlier to determine validity of the instrument used in research before the instrument was applied to students. Reliability test was done to determine whether the items were reliable as measuring tool. This study applied one group pretest posttest research design which was carried out through three stages, which were the initial test by answering pretest questions to determine the students' initial abilities. After conducting pretest, students were given different treatment by using experimental method during learning process. Heat transfer material itself covered heat transfer by conduction, convection, and radiation, so learning implementation in grade V SDN Loyobohor occurred three times. During the three meetings, all aspects of experimental method were explored and implemented. The steps of the experimental method began with an initial experiment conducted by teacher regarding experiments on heat transfer by conduction, convection, and radiation. Then students observed the initial experiment and draw hypothesis by answering questions given by the teacher verbally and verified the initial guess by making experiments on heat transfer by conduction, convection, and radiation and reporting the results of those experiments. After that, the teacher asked students to draw conclusions and give examples of heat transfer orally to reinforce their understanding of the material. After being treated using experimental method, the posttest was then administered. Relying on results of the study, it was found that student learning outcomes before and after being given treatment had differences, indicated by improvement posttest score compared to pretest score. The average score of their learning outcomes before treatment using experiment method was 46.2 meanwhile the average score of their learning outcomes after being treated using experiment method was 72. This meant that after being given treatment, students' learning outcomes had increased. Before testing the hypothesis, a normality test was first carried out to determine whether the analyzed data were normally distributed. The pretest data showed that  $\chi^2_{\text{count}} = 2.07694$  and  $\chi^2_{\text{table}} = 9.488$  whereas in posttest,  $\chi^2_{\text{count}} = 6.496$  and

$\chi^2_{\text{table}} = 9.488$ . This result indicated data of pretest, posttest concerning students learning outcomes in grade V were normally distributed. Furthermore, homogeneity test was carried out to find out that pretest and posttest data were homogeneous. The calculation results of homogeneity test gained the value of  $F_{\text{count}} = 1.87048$  and  $F_{\text{table}} = 1.98376$ , so it could be concluded that both data were homogeneous. The calculation results of hypothesis test using paired sample  $t$ -test with the assistance of Microsoft Excel obtained the value of  $t_{\text{count}} = 2.70072$  while  $t_{\text{table}} = 2.068$ , as the test criteria declared that if  $t_{\text{count}} > t_{\text{table}}$  then  $H_0$  was rejected and  $H_a$  was accepted. This indicated that  $2.70072 > 2.068$ , so the proposed alternative is acceptable. From this analysis results, it could be inferred that there was a significant effect of the experiment learning method on student learning outcomes in heat transfer material for Grade V SDN Loyobohor, Lembata Regency.

## CONCLUSION

Based on results of the study, a conclusion could be drawn that there was significant effect of experiment method on learning outcomes of grade V students on heat transfer material at SDN Loyobohor, Lembata Regency. This was proven by clear difference in their learning outcomes before being given treatment as marked by higher average score of posttest than average score of pretest. Their average score of posttest after the treatment was 72. On the other hand, the average score of their learning outcomes in pretest was 46.2. Based on the results of the paired sample  $t$  test, the results were  $t_{\text{table}} = 2.068$  and from  $t$  test calculation,  $t_{\text{count}} = 2.70072$ , so  $t_{\text{count}} > t_{\text{table}}$  then  $H_0$  was rejected and  $H_a$  was accepted. This meant that the proposed alternative was accepted and there was significant effect of the experiment method on learning outcomes of grade V students on heat transfer material at SDN Loyobohor, Lembata Regency.

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