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Application of Model Group Investigation based on Experiments Against Student Academic Skills

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Abstract: This study aims to see the effect of the Experiment-based Group Investigation learning model on the academic skills of students at one of the Madrasah Aliyah Negeri in Tebo. This research is quantitative by using the experimental method. using a posttest-only control group design. This study used two classes, namely the experimental class and the control class, sampling using the cluster random sampling technique. The instruments used for data collection are test questions and observations. Before the data were analyzed, normality and homogeneity tests were first performed. Then, the data were analyzed using a t-test and effect size. Based on the results of the study, it is known that there is an effect of using the Experimental-based Group Investigation learning model on the Academic Skills of students in learning physics. This can be seen from the calculation of the average post-test academic skill score for experimental class students 78.7 out of 26 students and the average post-test academic skill score for control class students 73.7 out of 25 students.

INTRODUCTION

Physics is an exciting part of science to study. Various science and technology products are inseparable from physics. However, based on the results of the national exam for physics subjects released by the Education Assessment Center of the Ministry of Education and Culture (Puspendik) until 2019, the scores obtained by high school/MA level students were below 50 with low criteria. This shows that there are still problems in learning physics. The problems that occur are caused by two factors, namely internal factors and external factors. External factors include the learning model used by the teacher, namely the conventional learning model. The conventional learning model is learning that makes the teacher the central actor in the classroom or teacher-centred learning (Amry et al., 2017). Conventional learning methods use the lecture method. Teaching and learning activities begin with apperception and motivation by the teacher to students, the teacher explains the material according to the learning objectives, students pay attention to the teacher's explanation, and the teacher gives assignments in the form of questions that students must complete. Teacher-centred learning will make students passive in learning; students only accept what the teacher says. Thus, of course, it will impact students' academic skills. To overcome the above problems, a student-centred

learning model is needed. Thus, it is expected that students can actively participate in learning so that students can construct knowledge in their heads and can improve students' academic skills.

Academic skills or academic abilities are abilities possessed by students in cognitive, affective, and psychomotor aspects. The cognitive aspect is related to the ability to represent or re-detail the conceptions/principles obtained in the learning process (Ariyana et al., 2018). Students obtain academic skills through meaningful learning experiences that involve students actively in learning. Research by Ade Suryanda, Eka Putri Azrai, and Nares Wari explains that students can be actively involved in physics, such as experimental planning, implementation, report generation, presentation, and evaluation (Ade Suryanda, Eka Putri Azrai, 2016). Furthermore, in research conducted by Widiawati, the GI model significantly improves students' physics learning outcomes (Siska Widiawati, Hikmawati, 2018).

Academic skills or academic abilities need to be honed and improved through a fun and student-centred learning model. Fun learning activities will undoubtedly motivate students to take physics lessons seriously compared to conventional learning. The use of the GI model is better in increasing students' motivation to learn physics than conventional learning. (Widiarsa et al., 2014) To support the GI model in improving academic skills, it is necessary to add experimental methods to learning. The experimental method will provide direct experience to students in constructing knowledge; students can understand the concepts of the material studied directly and make the acquired knowledge last long in their memories. Azka's research results show that the experimental method can increase students' motivation to learn physics (Azka et al., 2020)

Based on the literature review, using the GI model in learning to see its effect on students' academic skills is rarely done. On that basis, researchers use this model to improve the quality of the learning process, which impacts students' academic abilities.

METHOD

This research is quantitative by using an experimental method. The design was a posttest-only control group design using random cluster sampling for the sampling technique (Azka et al., 2020). The population in this study were students of class XI of one of the Madrasah Aliyah Negeri in Tebo. Before being given action, determine the experimental and control classes using a lottery. The class that was taken first was made the experimental class, and the class that was taken the second was made the control class. From the lottery results, class XI 2 was the experimental class, which consisted of 26 students, and XI 1 was the control class, which consisted of 25 students. The instrument used in this study was in the form of 20 multiple choice questions. Before the research instrument is used to collect data, the instrument is validated first by several experts in their scientific field.

The final stage of this research is data processing. The data obtained were processed using a t-test to see the experimental-assisted GI model's effect on students' academic skills. Next, perform a significance test using the Effect Size test. Before the

researchers processed data using the t-test and effect size, the prerequisite test was first carried out, namely the normality test with the Lilliefors test and homogeneity using the Bartlet test.

RESULT AND DISCUSSION

After a series of research, processes were carried out using the experimental-based GI learning model for class XI at one of the State Madrasah Aliyah in Tebo; academic skill data were obtained from the analysis of posttest scores of experimental class and control class students. From the analysis of the posttest scores for the experimental class, the average academic skill of the experimental class students is 78.7, with a standard deviation of 13.91, while the highest score is 96 and the lowest is 40. For more details, see the following frequency distribution diagram.

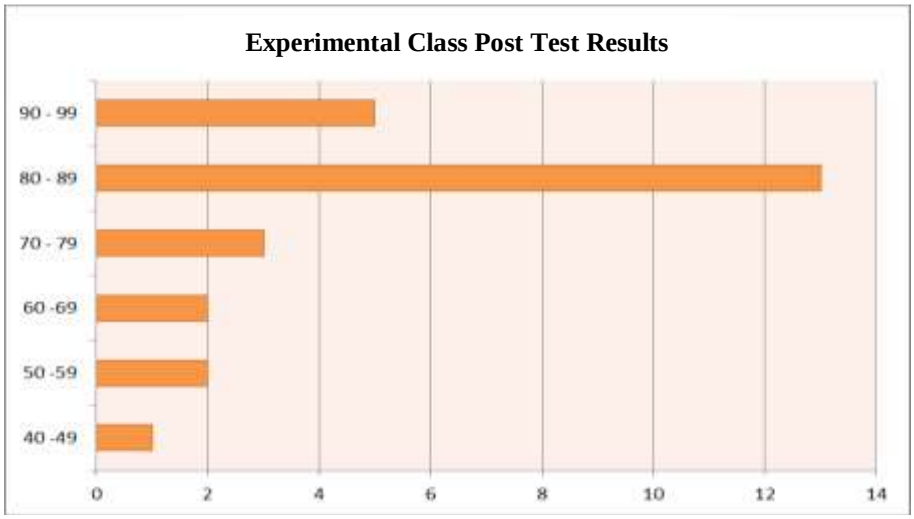

Diagram 1. Experimental Class Frequency Distribution

Based on the diagram above, the experimental class consisted of 26 students who were given 20 test questions. Students who get an interval value between 90-99 are five students or 19% of all students. Meanwhile, the highest number lies in the interval between 80-89, namely as many as 13 students (50%) next, which lies between the 70-79 value interval as many as three students (12%). Meanwhile, students who obtained the same interval between 60-69 and 50-54, namely two students (8%). Moreover, the last one is students who get an interval value between 40-49, as many as 1 or 4% of the total number of students. The diagram above illustrates that students' academic skills tend to be around the standard curve. This is because the data obtained are not classified as negative data or positive data, and the average value in the experimental class is 78.7.

In the control class, the average academic skill of students from the posttest analysis was 73.7, with a standard deviation of 14.52, while the highest score was 90 and the lowest was 36. For more details, see the following frequency distribution diagram.

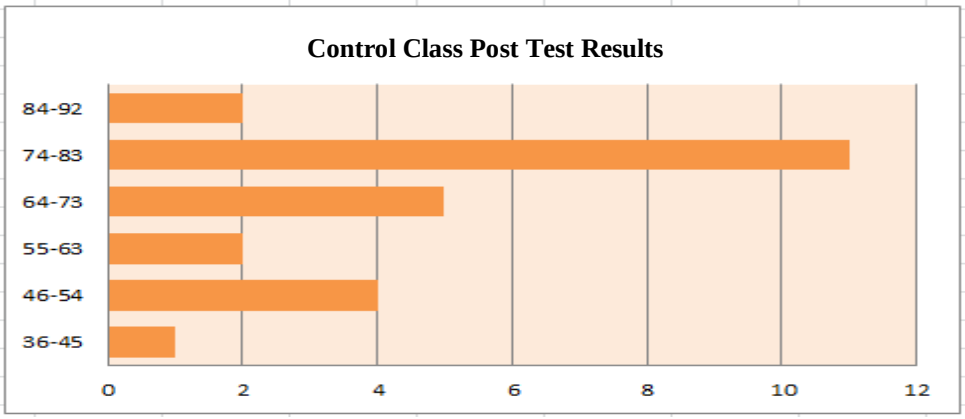

Diagram 2. Control Class Frequency Distribution

The control class consisted of 25 students who applied the conventional learning model. The control class was given 20 test questions to obtain academic skill data. Students who get an interval value between 84-92 are two students or 8% of all students. Meanwhile, the highest number lies in the interval between 74-83, which is as many as 11 students (44%). Next, there are five students (20%). While the students who obtained the interval value between 55-63 were two or 8%. Students who get a Value interval between 46-54 are four students (16%). Moreover, the last one is students who get interval values between 36-45, as many as one student or 4% of the total number of students.

The diagram above illustrates that students' academic skills tend to be around the normal curve. The average value of the experimental class is 73.7. Before the researchers tested the hypothesis, a prerequisite test was first carried out, namely the normality test using the Lilliefors test and the homogeneity test using the Barlet test.

The results of the normality test analysis of the experimental class obtained L_{Count}= 0,152 while L_{Table} = 0.173. At the 5%, significance level, the data is normally distributed if $L_{Count} \leq L_{Table}$. From the experimental class normality test results, it can be concluded that the data obtained are normally distributed. Furthermore, the normality test results for the control class obtained L_{Count}= 0,163 and L_{Table} = 0.180. At the 5%, significance level, he data can be said to be normally distributed if $L_{Count} \leq L_{Table}$. From the results of the normality test analysis for the control class, it can be concluded that the data is normally distributed. More details can be seen in table 1 below.

Table 1. Posttest normality test

Class	L_{Table}	L_{Count}	significance level	Description
Experiment	0.173	0,152	5%	Normal
Control	0.180	0,163	5%	Normal

After testing the normality of the data, it was obtained that the L_{Count} of both the experimental and control classes is smaller than the L_{Table}. hat is, the two classes are normally distributed. Next, test for homogeneity. The homogeneity test is carried out using the Barlet test to see whether or not a population is homogeneous. From the results

of the homogeneity test, it was obtained that F_{Count} = 1,14, while F_{Table} = 1,94 At a significant level of 5%, if F_{Count} < from L_{Table}, it can be concluded that the data has a homogeneous variance. From the results of the analysis, it is obtained that F_{Count} is smaller than F_{Table}, meaning that the data has a homogeneous variance. Because the prerequisite test shows that the data is normally distributed and homogeneous, it can be continued with the analysis of hypothesis testing, both t-test and effect size test.

Hypothesis testing, based on the results of the analysis of hypothesis testing using the t-test, the results are shown in Table 2 below.

Table 2. Hypothesis testing using a t-test

Class	T_{Count}	T_{Table}	Description
Experiment Control	1.79	1.68	Ho Rejected

Based on Table 2 above, the score t_{Count} = 1.79, while t_{Table} = 1.68. At the 5%, significance level, if $t_{Count} > t_{Table}$ maka Ho di tolak. Dari hasil perhitungan diperoleh t_{Count} Lebih kecil dari t_{Table}, then Ho is rejected. From the calculation results, it is obtained that Count is smaller than Table, so it can be concluded that there is an effect of using the experimental-based GI model on the physics academic skills of class XI students of one of the State Madrasah Aliyah in Tebo.

Next, analyze the Effect Size test. This test is used to see the significance of the effect of using the Wulandari et al.,(2020). earning model. In this case, GI is based on an experiment on the physics academic skills of a class XI student at one of the Madrasah Aliyah Negeri in Tebo. From the Effect Size analysis, a score of 0.53 was obtained. These results indicate that the Effect Size analysis score of 0.53 is in the medium category. This means that the use of an experimental-based GI model has an effect on students' physics academic skills. For more details can be seen in table 3 below.

Table 3. Category Effect Size

Effect Size	Category
d > 0,2 0,2 < d > 0,8 d > 0,8	Small Medium Hight

Table 3 above questions that the Effect Size analysis obtained a score of 0.53 including in the medium category.

Based on the analysis of normality and homogeneity tests using Lilliefors and Barlet using the results of students' daily test scores, the ability of the experimental class or control class was equivalent. Then the class was randomized to determine the experimental and control classes. The selected experimental class was given action in the form of an experimental-based GI model, while the control class used a conventional model. After receiving treatment, both classes were given Posttest questions. From the analysis results, the average value of the academic physics skills of the experimental

class students was 78.7, and the control class was 73.7. The average post-test result of the experimental class was higher than the control class. The results of hypothesis testing with t-test and Effect Size at a significance degree of 5% obtained a t-test score for t_{count} = 1.79, t_{table} = 1.68, and *Effect Size* = 0,53.

Based on the results of hypothesis testing, information is obtained that there is an effect of applying the experimental-based GI model to students' academic skills. In addition, the hypothesis test results show that the application of the experimental-based GI model can improve students' academic skills compared to the application of conventional learning models in learning.

CONCLUSION

Based on the results of research that has been carried out using an experimental-based GI model in class XI, Class XI 2 was selected as the experimental class, and class XI 1 was selected as the control class. There is an effect of using experimental-based GI on students' academic skills in learning Physics. This can be seen from the average score in the experimental class, which is 78.7 out of 26 students and 73.7 in the control class of 25 students. The effect size analysis obtained a score of 0.53, proving that the experimental-based GI model influences students' academic skills.

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