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THE EFFECT OF DISCOVERY LEARNING MODEL ON STUDENTS LEARNING OUTCOMES ON WORK AND ENERGY MATERIAL AT SMA NEGERI 1 SAIPAR DOLOK HOLE

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Abstract

This study aims to determine the effect of the Discovery Learning model on students' learning outcomes in the subject of Work and Energy in class X SMA Negeri 1 Saipar Dolok Hole. This type of research is a quasi-experimental. The population of this research were all of students X MIPA and the samples were X MIPA 1 as the experimental class and class X MIPA 2 as the control class, each class consisting of 30 people. The instrument was in the form of 10 essay test which have been validated. Learning outcomes were measured through the pre-test and post-test. Based on the results of the study, pre-test mean value of the experimental class was 30,17 and for the control class was 26,33. The results of testing the hypothesis obtained $t_{count} < t_{table} = 1{,}750 < 2{,}002$ using $\alpha = 0{,}05$, it means experiment class and control class have same ability. And for post-test, mean value of the experimental class was 81,60 and for the control class was 74,30. From the calculation of t-test one side, obtained $t_{count} < t_{table} = 2{,}895 < 1{,}671$ using $\alpha = 0{,}05$ So, there was the effect of Discovery Learning model on students' learning outcoes of Work and Energy material in class X SMA Negeri 1 Saipar Dolok Hole.

Keywords: Discovery Learning, Learning Outcomes, Work and Energy

Advances in science and technology during the 21st century have led to a rapid and significant increase in population participation rates. From lifestyle choices and ways of interacting with the general public to competitive skills. To function, the world needs humans who can see and respond to emerging needs. Education has a strong advantage over others when it comes to communication. For this reason, efforts to improve the quality of education must continue. In this modern era, students are required to have high-order thinking skills.

According to Sani (2019), individuals in the 21st century understand the importance of educating young people who are imaginative, adaptable, able to make the right decisions, and talented in problem solving. By raising educational standards, we can better equip the next generation to compete in this growing period of globalization. The 2013 curriculum, which is being changed and is currently being implemented in schools in Indonesia, was developed with the aim of improving the quality of education in the country (Kemendikbud, 2018). The 2013 curriculum mandates student-centered learning.

To build a flexible and student-centered learning environment that will motivate students to participate more actively and help them achieve higher standards, Dimyati and Mudijono (2015)

argue that every school should adopt a single learning system that prioritizes student curiosity. Progress in many fields is influenced by high quality education. However, one of the big problems facing Indonesia today is the low quality of education. The learning process related to model selection is one of several variables that contribute to the low quality of education.

Creative and imaginative teachers are highly demanded to improve the quality of education in the learning process, especially in learning Natural Sciences (IPA) in the field of physics. This is because learning physics is considered as important learning for the growth of other disciplines, which emphasize understanding rather than memorizing (Sanjaya, 2011).

According to Trianto (2015), effective teacher teaching methods are very important and a must for students to learn effectively. If a student is able to learn so that he can meet the given learning outcome indicators, this is a sign that he has succeeded in learning. Students should grow into mature human beings who are aware of their obligations to themselves, and have noble personality and morals after participating in the education and teaching process. Taking into account their responsibilities as educators, teachers who teach in front of the class need to have teaching standards and practice these ideas as efficiently as possible so that they do more than just teach.

The main problem in learning in schools today is learning that is still teacher-centered and does not provide access for students to develop independently through discovery in their thinking processes. According to Ompusunggu, et al. (2016), the monotonous physics learning process with lectures still emphasizes explanation of material, solving questions and assignments without inviting students to interact with each other, with such learning resulting in a lack of opportunity for students to participate, less experience learning, less able to communicate with groupmates, and students are still less able to propose hypothesis and draw good and correct conclusions.

Based on an interview conducted with a physics teacher at SMA Negeri 1 Saipar Dolok Hole, information was obtained that students' interest in physics to be a difficult subject. Students are less active when learning takes place. When the teacher asks questions, not many students give answers, only a few are willing to respond to the questions given. In addition, there is less interaction between students who have high thinking skills and students who have low thinking skills. The way teachers teach in the classroom also tends to be teacher-centered. In the learning process, teachers often use lecture methods, question and answer, and work on questions, resulting in students getting bored and lazy to listen to the teacher who is teaching in class. Students are rarely

invited to think about finding physics lessons boring and difficult to understand. This has an impact on student learning outcomes to be low.

The information obtained from the teacher is that daily tests are held for each chapter that has been studied during the learning process. For the results of daily tests on Work and Energy material, the average values is 68,90. For mid-term test results, the average value is 75,65. And for the end of semester test results, the average value is 73,50. Whereas the KKM for physics subjects at the school is 70. If we look at the average daily test scores, it can be concluded that the average score is still below the KKM. For mid-term test scores and final semester tests, they have achieved scores above the KKM, although they are not that high. This shows that there are deficiencies in the learning process of physics subjects at the school.

One way that is used to overcome problems that exist in the classroom is to use a student-centered learning model. Active student participation in learning will be more meaningful because students are directly invited to construct their knowledge. The model used in this study is the Discovery Learning model. Hosnan (2016) argues that discovery learning is a model for developing a way of learning for students to actively find by themselves, investigate by themselves, then the results obtained will last a long time in the memory, will not be easily forgotten by students.

The Discovery Learning model is a learning process that takes place when students are required to compose learning material themselves before it is presented to them in final form. To reveal an idea or generalization that can be used in the field, Oemar Hamalik (Ilahi 2016) states that discovery is a learning process that relies on students' intellectual attitudes in overcoming various difficulties.

According to Martaida, et al. (2017), by conducting their own research and learning, students can become more active learners and ensure that the information they obtain will stick in their memories for a long time and be difficult to forget. Discovery learning teaches students to think critically and try to solve their own problems.

Students can explore and learn new things that have not been discovered in a discovery learning atmosphere. Arrangements like these seek to enhance children's learning and encourage creativity. Students are asked to investigate problems and solutions, search for related information, design solution methods, use the tactics they have chosen, and solve challenges collaboratively as part of discovery learning.

The steps used by the discovery learning model according to Hosnan (2016) are as follows:

a. Stimulation

This stage exposes students to something that arouses their curiosity, then continues by not giving generalizations, so that curiosity arises and investigates itself.

b. Problems Statement

This stage provides an opportunity for students to identify the formulation of the problem that is relevant to the learning material that will be formulated in the form of a hypothesis.

c. Data Collection

This stage gives students the opportunity to collect as much relevant information as possible to prove the truth of the hypothesis.

d. Data Processing

This stage requires students to process the information obtained, either through interviews, observations, and so on. Then the data is processed in a certain way.

e. Verification

This stage directs students to carry out careful examinations to prove the truth of the hypotheses that have been made, with the results of data processing.

f. Generalization

This stage asks students to draw conclusions by paying attention to the verification results.

In previous research conducted by Lidiana, et al. (2018), the results showed that the learning outcomes of the experimental class with the discovery learning model were higher than the physics learning outcomes of the control class which was given the direct learning model treatment. Research conducted by Sasmita and Kurnia (2022), the results of their research show that there is an increase in student learning outcomes before and after using the discovery learning model. Based on research conducted by Hajar, et al. (2020), the results showed that the learning motivation scores of classes taught using the discovery learning model were higher than classes taught by problem solving models, so that class learning outcomes of the discovery learning model increased.

Based on the background of the problem, this researcher intends to conduct research under the title "The Effect of Discovery Learning Model on Students Learning Outcomes on Work and Energy Material at SMA Negeri 1 Saipar Dolok Hole".

METHOD

This type of research is a quasi-experimental. The population in this study were all students of

class X MIPA SMA Negeri 1 Saipar Dolok Hole. The research sample was taken by 2 classes which were determined by random sampling technique, namely class X MIPA 1 as the experimental class and class X MIPA 2 as the control class, each class consisting of 30 people. At the beginning of the study, the researcher gave a pre-test to the experimental class and the control class to determine the students' initial abilities in both classes. The instrument used was in the form of 10 essay tests which had been validated by 3 validators, namely 2 UNIMED physics lecturers and 1 physics teacher at the school where the research was conducted. After the pre-test data was obtained, the data were analyzed using the normality test, homogeneity test, and two-party t hypothesis test (Sudjana, 2005). In the two-party t test, if the conditions for H_0 are met: $t_{count} < t_{table}$, then H_0 is accepted, and it is concluded that both classes have the same initial abilities. Then the two classes were given different treatment. The experimental class is taught using a discovery learning model and the control class uses a conventional model. Then both classes were given a post-test. Post-test data were analyzed using the normality test, homogeneity test, and one-sided t hypothesis test. In the one-sided t test, if $t_{count} < t_{table}$, then there is a significant effect using the discovery learning model.

RESULTS AND DISCUSSION

Research Result

Based on the results of the study, when the two classes had not been given different treatment, they were given a pre-test. The pre-test results obtained, the average value of the experimental class was 30,17 and the average value of the control class was 26,33. The results of the pre-test obtained are then tested for similarity by using a two-party hyphothesis test with the condition that the data must be normally distributed and homogeneous. The results of the two-party t test from the experimental class and the control class can be seen in the following table:

Table 1. Pre-test t Test Result

Class	Average	t_{count}	t_{table}	Conclusion
Experiment	30,17	1,750	2,002	Same initial ability
Control	26,33			

In Table 1 above, the calculation of the average value of the pre-test of the experimental class and the control class, obtained the value of $t_{count} < t_{table}$. So, it can be concluded that the initial

ability of students in the experimental class is the same as the control class before being given treatment.

After the pre-test data is known, the two classes are given different teaching. The experimental class was given a discovery learning model, while the control class was give a conventional model. At the end of learning students are given a post-test to test the final results of the learning process. The results of the post-test obtained, the average value of the experimental class was 81,60 and the average value of the control class was 74,30. The results of the post-test tested the hypothesis using the one-party t test can be seen in the following table:

Table 2. Post-test t Test Result

Class	Average	t_{count}	t_{table}	Conclusion
Experiment	81,60	2,895	1,671	The ability of the experimental class is better than the control class
Control	74,30			

In Table 2 above, the calculation of the average value of the experimental class post-test and the control class, obtained the value of $t_{count} > t_{table}$. So, it can be concluded that there are differences in student learning outcomes in the experimental class compared to the control class due to the effect of the discovery learning model higher than conventional learning on the Work and Energy material in class X at SMA Negeri 1 Saipar Dolok Hole.

Results and Discussion

The study began by giving 10 essay tests at pre-test on both sample classes to determine students' initial abilities. The average of the pre-test obtained by the experimental class was 30,17 and the control class was 26,33. Then the pre-test value is analyzed by normality test, homogeneity test, and two-party hypothesis test. Hypothesis testing was done and obtained $t_{count} = 1{,}750$ and $t_{table} = 2{,}002$. So, $t_{count} < t_{table}$, it means the initial abilities on both classes are the same.

After the pre-test data is known, the two sample classes are given different teaching. The experimental class was given a discovery learning model, while the control class was give a conventional model. At the end of learning students are given a post-test to test the final results of the learning process. The post-test questions given to students are the same as the pre-test. The results of the post-test obtained, the average value of the experimental class was 81,60 and the average value of the control class was 74,30. Then, the post-test value is analyzed by normality test, homogeneity test, and one-sides hypothesis test. Hypothesis test obtained $t_{count} = 2{,}895$ and $t_{table} = 1{,}671$. So, $t_{count} < t_{table}$, it can be concluded that the final ability of the experimental class and the control class is different. The learning outcomes of experimental class students that

use the discovery learning model are greater than the learning outcomes of control class students that use conventional model.

Implementation of discovery learning in the experimental class makes students more active. The activity begins with the researcher providing a stimulus that results in students; curiosity about something that involves all of their abilities to dig up information, so that students can formulate their own findings with confidence. Then students are given the opportunity to identify and provide answers to the problems given in the form of hypotheses. After that, the researcher asked the students to do a practicum in groups and collect data to prove the hypothesis they had made. The next step, the data that has been collected by students is analyzed and tested the hypotheses that have been prepared. The next activity is that students are asked to present the results of group discussions from experiments and the truth of their hypotheses in front of the class and other groups responding to the results of group discussions that present them. The final step is for students to conclude the results of the discussion. At the stage, the researcher's role is to help straighten out and confirm the conclusions given by students, then make conclusions together with all students.

Through the steps of the discovery learning model students are brought directly into the process of discovering knowledge through experiments, so that students participate actively in the investigations carried out the students can build their own knowledge.

The results of this study are in line with Bell's theory (in Hosnan, 2016) which says that the discovery learning model aims at discovery, students ave te opportunity to be actively involved in learning. The fact shows that student participation in learning increases when the discovery model is used. Dicovery learning helps sudents form effective ways of working together, sharing information, and hearing the ideas of others.

Based on the description that has been presented, it can be concluded that the application of the discovery learning model can improve student learning outcomes. This was reinforced by previous research conducted by Sasmita and Kurnia (2022), which stated that after being given learning differences in the two classes, there was an increase in the average score of the experimental class, which previously obtained a pre-test of 67.27 to 85.85 for post-test scores. It can be concluded that there is an influence from the discovery learning model on physics learning outcomes. The results of research of Hajar, et al. (2020) showed that the average result of the experimental class which was taught using the discovery model was higher with a score of 44.17, compared to the control class which was taught using the problem solving model which obtained an average score of 26.84. Linggile, et al. (2022), stated that the results of the research conducted

showed that after the discovery learning model was implemented in the classroom, the post-test results were higher than the pre-test results. This shows that the application of the discovery learning model has a good effect on student learning outcomes. Research conducted by Haryadi and Pujiastuti (2019) states that learning based on natural phenomena through the discovery learning model can be applied to improve students' science process skills. Judging from the results obtained for each indicator of science process skills achieved with an average N-gain for each aspect, it is in the sufficient category. Saputra, et al. (2022), stated that the results of the pre-test in the experimental class using the discovery model 56.15 experienced an increase in the post-test score, which was 66.75. While in the control class, the score was not so high, the pre-test was 48.53 and the post-test was 57.72. This shows that the application of the discovery learning model has an effect on student learning outcomes.

CONCLUSION

Based on the results of the research and analysis of the data obtained, it can be concluded as follows:

1. Student learning outcomes using the discovery learning model in the experimental class increase. This can be seen from before learning begins, students are given a pre-test and obtain an average of 30.17. After being given treatment and carrying out a post-test, an average of 81.60 was obtained.
2. Student learning outcomes using conventional models in the control class have increased, but not as big as the experimental class. The pre-test value obtained was 26.33. Then after being given the conventional model treatment, the post-test score increased to 74.30.
3. The final ability of the experimental class students who use the discovery learning model is higher than the abilities of the control class students who use the conventional model. This shows the influence of the discovery learning learning model on student learning outcomes in the material Work and Energy.

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