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Original Article

THE IMPACT OF THE E-LKPD ASSISTED DISCOVERY LEARNING MODEL ON STUDENT LEARNING OUTCOMES OF EFFORT AND ENERGY

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ABSTRACT

Background. In the current era of digital education, enhancing students' engagement and conceptual understanding in physics remains a challenge. Traditional teaching methods often lack the interactive components necessary for deep learning.
Research Purpose. This study aims to determine the impact of the E-LKPD-assisted discovery learning model on students' learning outcomes of effort and energy.
Research Method. At SMA Negeri 1 Medan, the study was carried out. This kind of study uses a pretest-posttest control group design and is quasi-experimental in nature. With 36 students in each of the experimental and control classes, cluster random sampling was the sampling method employed in this investigation. In the experimental class, the Discovery Learning model was used with the help of E-LKPD, whereas in the control class, traditional learning was used. The pupils in grades X-3 and X-4 served as the study's subjects. A learning exam consisting of fifteen multiple-choice questions served as the tool.
Findings. A pretest result in an average pretest score of 48.1 for the experimental class and 45.6 for the control class. Normality and homogeneity tests on the pretest data indicated that both classes' data were normally distributed and homogeneous. The two-tailed t-test resulted in a value of tcount < ttabel = = 0.97 < 1.994, indicating that the initial critical thinking ability of the experimental and control classes was the same. After the different treatments, a posttest was conducted for both classes, which resulted in an average posttest score of 76.5 for the experimental class and 63.5 for the control class. Normality and homogeneity tests on the posttest data showed that both classes' data were normally distributed and homogeneous. The one-tailed t-test resulted in tcount < ttabel = = 4.860 > 1.666, so the alternative hypothesis (Ha) was accepted.
Conclusion. Students' learning results on the subject of effort and energy are significantly impacted by the usage of Discovery Learning with E-LKPD assistance.

Keywords: Discovery Learning, E-LKPD, Effort, Energy.

BACKGROUND

The introduction of the free learning curriculum in early 2022 is the cornerstone of the revival of education in Indonesia after 2 years of the COVID-19 pandemic. This curriculum is designed to support learning recovery and provide learning freedom for teachers and students. The independent learning curriculum is one of the curricula created based on the philosophy of Ki Hadjar Dewantara and then developed into a flexible curriculum framework that focuses on essential material and responds to

student learning needs[1,2]. The independent learning curriculum focuses on students' internal learning, which optimizes content for understanding concepts, strengthening competencies, developing character, and providing flexibility[3,4]. Teachers are free to adapt the learning environment to the needs and interests of their students, and students are free to select the content that interests them.

The implementation of an independent learning curriculum requires education units at every school level to provide facilities that can support successful learning[5]. The characteristics of the Independent Learning Curriculum are: 1) Project and Character Based; 2) Focus on Essential Material; and 3) Flexibility for Teachers and Students[6]. However, the implementation of the independent learning curriculum is not going according to plan in all subjects. The implementation of the Merdeka curriculum in schools is still not optimal. Examples of obstacles that often occur when completing the implementation of the independent learning curriculum in physics subjects are: (1) teachers' difficulties in utilizing technology, (2) lack of student independence in self-study, (3) around teaching materials are still prepared by the teacher -centered, (4) students are usually passive during learning, (5) student learning motivation is generally low, (6) understanding of the concept of physics material is low, (7) low mathematical ability, (8) students' opinions that physics is a difficult subject, a lot of memorizing equations and calculations, (9) students' ignorance of the application of physics in everyday life[7].

Based on examples of obstacles that occur in the implementation of the Merdeka Belajar Curriculum in Physics, a similar thing also occurs at SMA Negeri 1 Medan. Researchers observed that at the beginning of learning, students did not have adequate knowledge related to the material to be studied. This is due to students' unwillingness to search for or repeat previous material, because the learning that is often received is only in the form of delivering physics material, summarizing printed books, and assigning practice questions. As a result, students only actively record the material presented by the teacher and focus on solving problems with mathematical formulas or calculations without understanding the meaning contained therein. Students do not have curiosity, so they do not feel curious about the material being taught. When the educator gives students opportunities to express opinions or answer questions related to the material that has been presented, many students are silent due to confusion. Not a few of them consider physics a subject that is difficult to understand[8].

This is explained based on a questionnaire that was conducted with students during observation. Referring to the explanation above, in connection with the acquisition through a preliminary study conducted at SMA Negeri 1 Medan. Physics learning at the school is also not so optimal, because learning is controlled by the teacher or continues to be centered on the teacher (teacher-centered), and the involvement of students is still minimal, resulting in passive students and just getting lessons as a whole from the teacher when learning activities occur. This is also based on the results of a questionnaire given to students where students need teaching materials to help me understand learning and self-study with a presentation of 60% and students

need Educational tools in the form of E-LKPDs that are interesting, motivate me to learn physics and make it easier for me to understand physics material and link the subject matter with applications in everyday life or can be seen and done this contains a fairly high percentage of 78%.

Furthermore, the results of interviews with teachers, that teachers experience that students' learning outcomes are decreasing and students' learning motivation is getting lower. A concrete example of this has an impact on the results of students' monthly exams, many of which have not reached the KKM score of 75. can be seen in attachment 27, so it really needs innovative teaching materials in order to help carry out learning and help deliver material contextually. When the learning situation is not innovative, it will make students less active in learning. What students do is only listen and follow directions from the teacher, not asking questions or asking for explanations from the teacher. One of the factors that students lack in understanding the concept of the material is due to students' ignorant thinking, so that the education process is less meaningful[9].

The effectiveness of learning activities is strongly influenced by the active role of teachers and students in the process, especially the role of the teacher as the main facilitator. Teachers are the main element in developing students' potential to become human beings in accordance with the goals of national education. Teachers must be interactive facilitators for students in developing the material they learn. Being a good facilitator requires the right learning model[10]. The learning model, which is a cover or frame of the application of an approach, method, strategy, and learning technique, is a type of learning that is demonstrated from beginning to end and is presented distinctly by the instructor. According to Arends, the strategy that will be employed, encompassing the learning environment, learning activities' phases, classroom management, and instructional objectives, is referred to as the learning model. The Discovery Learning model is one of the learning models that meets the aforementioned requirements[11].

According to certain perspectives on the Discovery Learning paradigm, children learn by solving problems in order to expand their knowledge and abilities. Accordingly, mastering one's own knowledge is referred to as "discovery learning". Based on the aforementioned viewpoints, it can be inferred that discovery learning entails the instructor guiding the organization of student-performed tasks, including searching, processing, exploring, and researching. In addition to broad abilities like creating rules, testing hypotheses, and obtaining data, learners acquire new information pertinent to particular items or subjects[12].

Every method certainly has an implementation procedure that must be followed if you want to use it, including the Discovery Learning method. The are six steps in Discovery learning that must be implemented systematically[13]. The six steps are: 1) Stimulation or stimulation; 2). Problem statement or problem identification; 3). Data collection or collecting data and information; 4). Data processing or data processing; 5). Verification or data analysis and interpretation or also called proof; 6). Generalization

or conclusion drawing. The Ministry of Education and Culture (2013) sets out 2 general phases of Discovery Learning's deployment [24]. First, get ready. In this stage, learning is planned, including activities; learning objectives are determined; student characteristics are identified; subject matter is chosen; topics that students must learn inductively are determined; teaching materials are developed; learning topics are arranged from simple to difficult, from concrete to abstract, or from enactive, iconic to symbolic stages; and an assessment of the process and student learning outcomes is prepared. Implementation comes in second. This phase is completed throughout the learning process. To support this Discovery learning model, teaching materials are used, namely E-LKPD.

Related to this, research was conducted on the effect of the model of Discovery Learning learning by E-LKPD, which will be used by students by utilizing the website, namely liveworksheet. Liveworksheet is a website that can be used to develop creative and interactive E-LKPD. The E-LKPD developed is equipped with a video of the initial problem, filling in the hypothesis of students, a video of practicum instructions, and analyzing the data obtained, until drawing conclusions. Providing E-LKPD, students can get a more realistic stimulus before carrying out practical procedures. Another benefit of using the website is that students can be more practical in accessing and filling out E-LKPD because a place has been provided to fill it in, and immediately provide feedback after the E-LKPD is completed. In addition, the provision of creative, innovative, and interactive E-LKPD is expected to help students understand each stage of learning, make the learning process more enjoyable, and help students understand learning physics[14].

Learning outcomes are the acquisition of students in terms of knowledge, mastery, and skills, which are the result of their own efforts, so that they show changes in behavior. Students actively explore information when carrying out learning while developing a discovery learning understanding of scientific knowledge or concepts[15]. The discovery learning model is not so different from the inquiry learning model in terms of how the process is carried out to improve students' knowledge and abilities. This discovery learning style involves or focuses on students during the process of problem solving, which aims to develop skills. One of the models seeks to increase students' interest during the educational process in order for students to be interested in learning to find their own information, namely discovery learning, and help them understand it better and avoid forgetting the learning easily[16].

Electronic Learner Worksheets (E-LKPD) are a series of activities used by students in conducting investigations and problem solving. E-LKPD is in the form of a student work guide to make it easier for students to understand learning material in electronic form, which is applied using a computer desktop, notebook, smartphone, or mobile phone. A set of fundamental activities that must be carried out by students to maximize understanding in an effort to achieve learning objectives[17]. This research aims to see whether or not there is an effect of the discovery learning model using E-LKPD media on student learning outcomes.

RESEARCH METHOD

This research includes a quasi-experiment (pseudo-experiment), namely, research intended to see the impact of everything that the subject students are forced to endure. At SMA Negeri 1 Medan, the study was carried out. This study used quasi-experimental research consisting of two classes given different treatments, namely, the experimental class was given treatment using the discovery learning model, and the control class was given treatment with conventional learning. The population consists of 2 classes, totaling 72 students, and the sample is class X-3 as an experimental class with 36 students and class X-4 as a control class with 36 students at SMA Negeri 1 Medan. This kind of study uses a pretest-posttest control group design and is quasi-experimental in nature. With 36 students in each of the experimental and control classes, cluster random sampling was the sampling method employed in this investigation. In the experimental class, the Discovery Learning model was used with the help of E-LKPD, whereas in the control class, traditional learning was used. The students in grades X-3 and X-4 served as the study's subjects. A learning exam consisting of fifteen multiple-choice questions served as the tool.

FINDINGS

1. Description of Pretest Data for Experimental and Control Classes

Students are given a pretest before starting learning the material on effort and energy; the pretest is used to measure the initial ability of students in both classes. The results obtained for each class are processed in more detail and specificity, and the sample is presented in Table 1. Standard deviation is a statistical value to determine the distribution of data in a sample, as well as how close individual data points are to the average sample value. The smaller the standard deviation value, the closer to the average, while if the standard deviation value is greater, the wider the range of data variation.

Table 1. Data on Pretest Values of Experimental Classes and Control Classes

Experimental Classes				Control Classes			
Value	Frequency	Mean	Standard deviation	Value	Frequency	Mean	Standard deviation
20-27	2	48.15	11.05	20-27	5	45.56	11.66
28-35	3			28-35	4		
36-43	6			36-43	5		
44-51	9			44-51	8		
52-59	8			52-59	8		
60-67	8			60-67	6		
$\sum = 36$				$\sum = 36$			

From the table 1, it can be seen that the pretest value for the experimental class obtained an average of 48.15 with a standard deviation of 11.05 and an average of 45.56 with a standard deviation of 11.66 for the control class data; the difference between the two data sets is not much different.

2. Pretest Data Normality Test

The prerequisite test for normally distributed data is the normality test using the Lilliefors test. This test is used to see whether the data used is normal or not. This test criterion has a condition that if L_hitung < L_tabel, then the data is normally distributed. The results of the pre-test data normality test in the experimental class and control class are presented in Table 2.

Table 2. Results of the pretest data normality test

Data	L_{Count}	L_{table}	**Conclusion**
Experiment Class Pretest	0.1081	0.1476	Normally Distributed
Control Class Pretest	0.1093		

Based on the data in Table 2, it is obtained that the pretest data of the experimental class Lcount = 0.1081, while the pretest of the control class Lcount = 0.1093. The use of a significant level of α = 0.05 and n = 36 so that L(table =) 0.1476, then obtained Lcount < Ltable so that it can be concluded that the pretest data of both classes are normally distributed.

3. Pretest Homogeneity Test

Homogeneity testing is conducted to determine whether the samples used in this study are homogeneous or not, meaning whether the samples used in this study can represent the entire population. Data homogeneity testing is carried out by testing the equality of variance (F test). The results of the homogeneity test show F_count < F_table, then the data is homogeneous. The results of the pretest data homogeneity test are presented in Table 3.

Table 1. Hasil uji Homogeneity Pretest Data

Data	**Varians**	F_{count}	F_{table}	**conclusion**
Experimental Class Pretest	11.0538	1.1120	1.56	Homogeneous
Control Class Pretest	11.6565			

Based on the data in table 3, the pretest data obtained is the F-count value = 1.1120 with F-table = 1.56 with a significance level of α = 0.05 and n = 36 so that the F-count value in the pretest data meets the testing criteria, namely F-count <F-table, then it can be concluded that the pretest value data of the two classes are declared homogeneous.

4. Description of Posttest Value Data for Experimental and Control Classes

After teaching with different learning models, the two sample classes, namely the experimental class and the control class, were given a posttest, which aimed to see the final learning abilities of students in the two classes. To see a detailed comparison of the posttest results of the two classes, see Table 4.

Table 4. Comparison of Posttest Values for Experimental and Control Classes

Experiment Class				Control Class			
Value	Frequency	Mean	Standard Deviation	Value	Frequency	Mean	Standard Deviation
47-54	0	75.7	8.10	47-54	9	63.89	9.87
56-63	1			56-63	10		
64-71	8			64-71	7		
72-79	9			72-79	6		
80-87	17			80-87	4		
88-95	1			88-95	0		
$\sum = 36$				$\sum = 36$			

From the table above, it can be seen that the posttest value for the experimental class obtained an average of 75.7 with a standard deviation of 8.10 and an average of 63.89 with a standard deviation of 9.87 for the control class data.

5. Posttest Data Normality Test

The prerequisite test for normally distributed data is the normality test using the Lilliefors test. This test is used to see whether the data used is normal or not. The criteria for this test have a requirement that if L_count < L_table, then the data is normally distributed. The results of the posttest data normality test in the experimental and control classes are presented in Table 5.

Table 5. Results of the Posttest Data Normality Test

Data	L_{count}	L_{table}	**Conclusion**
Experiment Class Postest	0.1257	0.1476	Normally Distributed
Control Class Posttest	0.1440		

Based on the data in Table 5, it is obtained that the Posttest data for the experimental class is L_count = 0.1257 while the Posttest for the control class is L_count = 0.1440. The use of a significant level of α = 0.05 and n = 36 so that L_(table =) 0.1476, then obtained L_count < L_table so that it can be concluded that the Posttest data for both classes are normally distributed.

6. Posttest Data Homogeneity Test

Homogeneity testing is carried out to determine whether the samples used in this study are homogeneous or not, meaning whether the samples used in this study can represent the entire population. Data homogeneity testing is carried out by testing the equality of variance (F test). The results of the homogeneity test show F_count < F_table, then the data is homogeneous. The results of the Posttest data homogeneity test are presented in Table 6.

Table 6. Results of the Posttest data homogeneity test for students

Data	Variety	F_{Count}	F_{table}	Conclusion
Experiment Class Postest	9.2560	1.0662	1.56	Homogeneous
Control Class Posttest	9.5573			

Based on the data in table 6, the Posttest data is obtained, namely the F-count value = 1.0662 with F-table = 1.56 with a significance level of α = 0.05 and n = 36 so that the F-count value in the pretest data meets the testing criteria, namely F-count <F-table, then it can be concluded that the Posttest value data for both classes is declared homogeneous.

7. Initial Ability Test/Student Pretest (Two-Part T Test)

The two-sample t test is used to determine the similarity of students' initial abilities in the two sample groups. The calculation of the hypothesis test for the pretest abilities of the experimental class and the control class can be seen in the appendix and is briefly presented in Table 7.

Table 7. Hypothesis test of students' initial ability/Pretest

Data	Mean	t_{Count}	t_{table}	Conclusion
Experiment Class Pretest	48	0,97	1,994	H_0 Accepted
Control Class Pretest	46			

Based on table 7, it is obtained that for the pretest value t-count = 0.97 t-table = 1.994 with the testing criteria t-count < t-table, namely 0.97 < 1.994, then H0 is accepted so that it can be concluded that the initial ability of students in the experimental class is the same as the ability of students in the control class. After obtaining the pretest data for both normal, homogeneous classes, there was no significant difference. The two sample classes were given different treatments; the experimental class was given treatment by applying the discovery learning model, and the control class was given treatment by applying the conventional learning model.

8. Final Ability Test/Posttest of Students (One-Part T-Test)

The one-party t-test is used to see the effect of an application, namely the discovery learning model assisted by E-LKPD, on student learning outcomes. The results of the similarity of the mean posttest scores of the two samples are shown in Table 8. Based on Table 8, the posttest value of t-count = 4.860, t-table = 1.666, with the testing criteria of t-count> t-table, namely 4.860> 1.666, then H0 is rejected and Ha is accepted, so it can be concluded that there is an influence of the discovery learning model assisted by E-LKPD on learning about business and energy.

Table 8. Final Ability Test/Posttest of students (one-party t-test)

Data	Mean	t_{count}	t_{table}	Conclusion
Experiment Class Postest	76	4.860	1.666	H_a Accepted
Control Class Posttest	64			

DISCUSSIONS

1. Learning implementation stages

Based on the previous explanation of the problem, the researcher tried to conduct a study on the effect of the discovery learning model assisted by E-LKPD on students' physics learning outcomes. The procedure for this classroom action research consists of 3 meetings. Before entering the stage in the first meeting, which includes the activity of giving a pretest, an initial reflection/observation activity was carried out first, which aims to identify student needs through interview activities with students and observations of student learning activities collected using the observation method, namely by using student observation sheets that have been prepared. One of the statements is "I need teaching materials in the form of E-LKPD that are interesting and interactive, so that they motivate me to learn physics and make it easier for me to understand physics material and relate the subject matter to applications in everyday life." In this statement, students said yes as much as 78% and no as much as 22%. This research is similar to the previous research result that Students' attention and learning outcomes have not increased when traditional learning paradigms have been applied to them. Students' interest in and performance in biology classes can both be improved by implementing the discovery learning paradigm. This demonstrates that the discovery learning paradigm is an effective one that teachers may use to boost students' enthusiasm for learning objectives[18].

The first meeting includes the activity of giving an initial test (pretest) to both sample classes with a total of 15 multiple-choice questions. The average pretest in the experimental class was 48, and the control class was 46. Based on the two-party hypothesis testing, 0.97 and 1.994 were obtained, so that it can be concluded that the initial abilities of students are the same. Furthermore, the two classes will be given different treatments, namely, the experimental class is taught using the discovery learning model with the help of E-LKPD, and the control class is given a conventional learning model. Then continued with the beginning of learning with the sub-material of effort. The learning activities of the experimental class are based on the syntax of discovery learning and assisted by E-LKPD. The learning activities of the control class are the delivery of material by the teacher and the provision of practice questions. The second meeting continued with different treatment learning. The experimental class is taught using the discovery learning model with the help of E-LKPD, and the control class is given a conventional learning model. Then continued with the beginning of learning with the sub-material of the relationship between effort and energy. The learning activities of the experimental class are based on the syntax of discovery learning. The learning activities of the control class are the delivery of material by the teacher and the provision of practice questions. The third meeting continued with an evaluation of learning about the material of effort and energy. Furthermore, both classes were given 15 posttest questions. The average posttest in the experimental class was 76, and the control class was 64. Based on the one-party hypothesis test that for the posttest value t_count = 4.860, t_table = 1.666, with the testing criteria t_count> t_table, namely 4.860> 1.666, then H0 is rejected and Ha is accepted so that it can be concluded that

there is an influence of the discovery learning model assisted by E-LKPD on learning effort and energy. This research similar to previous to the Discovery Learning learning model is the results of the study that there is an increase in the average student score after being given treatment seen from the average posttest score has increased, this shows that learning the model of Discovery Learning with LKPD media has a significant effect on the learning outcomes of students in SMPN 14 Padang[19].

2. Effects in Implementation

Learning that applies the discovery learning model assisted by E-LKPD has a significant influence on student learning outcomes. The discovery learning model assisted by E-LKPD has the characteristic of linking real-world problems, encouraging students to ask questions, formulate answers, and conclude so that the discovery learning model assisted by E-LKPD helps to encourage students to investigate themselves, build on past experiences and knowledge, use intuition, imagination, creativity, seek new information to find facts, correlations, and new truths. The discovery learning model has 6 phases/stages of learning that provide a positive influence on the student learning process.

The first phase of the discovery learning model assisted by E-LKPD begins with students being given stimulation or stimulus that invites their curiosity. In the study, the teacher provided stimulation such as exploring learning by demonstrating simulations related to the concept of effort, so that students were able to observe and demonstrate simulations related to the concept of effort (positive effort, negative effort, and zero effort), so as to encourage students to actively seek and find their own answers.

The second phase of the discovery learning model assisted by E-LKPD is Problem Statement (Problem Identification). In the study, the teacher provides an introduction and orientation to the problem and responds to students' answers. Students are able to create their own hypotheses for problem formulations related to work material and the relationship between work and energy. Furthermore, students fill it in on E-LKPD.

The third phase of the discovery learning model assisted by E-LKPD is Data Collection. This stage functions to answer questions or prove whether the hypothesis made is true or not. Students collect various relevant information from the videos presented in E-LKPD. The consequence of this stage is that students learn actively to find something related to the problems faced; thus, students unintentionally connect the problem with the knowledge they already have. The next stage is that students collect temporary answers in small notes. To strengthen the temporary answers that have been recorded by students, educators provide videos as reinforcement of the material being studied. Students interpret the video in E-LKPD, collecting the answers that students have recorded.

The fourth phase of the discovery learning model assisted by E-LKPD is Data processing. In this phase, activities are carried out to process data and information that have been obtained by students, both in the E-LKPD provided. Data processing is also

called categorization, which functions as concept formation and generalization. From this generalization, students will gain new knowledge about alternative solutions that need to be proven logically.

The fifth phase of the E-LKPD-assisted discovery learning model is drawing evidence. At this stage, students conduct careful examinations to prove whether or not the hypothesis that was set earlier is true, with alternative findings connected with the results of data processing.

The sixth phase of the E-LKPD-assisted discovery learning model is drawing conclusions. The next process is that students decide on an action or draw conclusions made by each student, namely by giving students the opportunity to convey solutions to problems. Through a series of activities carried out, students have built their thinking skills. Based on the results of the verification, the principles underlying generalization are formulated. After drawing conclusions, students must pay attention to the generalization process, which emphasizes the importance of mastering lessons on the meaning and rules or broad principles that underlie a person's experience, as well as the importance of the process of organizing and generalizing from those experiences.

The six phases/stages play an important role as results to prove that the e-LKPD-assisted discovery learning model has an influence on improving student learning outcomes. Students in the experimental class of SMAN 1 Medan students so that students explore/express their thoughts in learning through the existing phases and stages. In contrast to the control class, which applies the conventional model. Students tend to get learning with lecture methods, questions and answers, and tend to take notes and listen to the teacher's explanation, so that students are still less active in learning.

The discovery learning model is a student-centered learning model to train critical thinking skills, problem solving, and the ability to find new knowledge independently by discovering concepts and principles through active learning experiences, so students are expected not to be the result of memorizing a set of facts, but the result of finding it themselves. This statement is supported by previous research that discovery learning is a model for developing students' active learning methods to find it themselves, investigate it themselves, so the results obtained will be loyal and long-lasting in memory, and will not be easily forgotten by students[20,21]. In accordance with research that there is a positive influence of the application of the discovery learning model on improving physics learning outcomes for students[22]. This research result is similar to the results of the study showed that there was an influence of the use of the discovery learning model on students' physics learning outcomes. By using the discovery learning model, many students are involved in the teaching and learning process, but in discovery activities, students get guidance or assistance from the teacher, so that they are more focused on the teaching and learning process[23]. There was a difference in students' physics learning outcomes between the experimental class and the control class. The physics learning outcomes obtained by the experimental class that applied the discovery learning model were higher than the learning outcomes of the control class that applied conventional learning. The

implementation of physics learning using the discovery learning model on improving student learning outcomes was relatively high, and not only that, students better understood the concept of the material given because students could be actively involved directly in the teaching and learning process.

During the research, the researcher experienced several obstacles. These obstacles were the lack of preparation of the researcher in managing time in the learning process. This can be seen in the second phase of problem identification and the third phase of the independent and group data collection process. In this phase, students tend to need explanations and directions from the researcher personally. In the third phase, students need a lot of time in the discussion process, so that the time estimation in this phase does not run according to the time it should. This results in a lot of time being wasted. The next obstacle was a power outage, which disrupted the signal in the learning process, so that the video display process needed for learning was slow because each student used a cellphone with various signal strengths. This resulted in students being less coordinated in the video observation process. The obstacles faced by students were that some students were still less confident in their abilities. This was evident from several students who still tended to ask researchers and other peers. Other obstacles, such as some students sitting behind, had less intention to learn, so that sometimes it had an impact on other students who followed suit.

Based on the results of the description of the results of the implementation of the research, it is concluded that the discovery learning model has a good influence on student learning outcomes. Based on this, the research hypothesis can be accepted and stated that there is an influence of the discovery learning model assisted by e-LKPD on student learning outcomes in the material of effort and energy of class X SMA Negeri 1 Medan. Based on the research data, the following can be suggested: first, for the teachers, try to implement the discovery learning model during teaching and learning activities, where the discovery learning model is an alternative to maximize students' physics learning outcomes. And The Second, subsequent researchers, be disciplined in using time to implement the discovery learning model, so that learning can be carried out using the appropriate duration.

CONCLUSION

Learning outcomes in the control class increased after being given learning, but the score was still in the low category. This happened because during learning in the control class, students did not form groups and did not conduct investigations that could deepen their understanding. Students only listened to explanations about the material taught by the teacher, then wrote it down in a book, and worked on the questions. There was an increase in student learning outcomes due to the application of the discovery learning model assisted by E-LKPD on the material of effort and energy in class X at SMAN 1 Medan. It can be concluded that the application of the discovery learning model assisted by E-LKPD can improve student learning outcomes in the experimental class. There was a significant influence on student learning outcomes by using the

discovery learning model assisted by E-LKPD on the material of effort and energy in class X at SMAN 1 Medan.

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