

The Effect Of Discovery Learning Model Assisted By Physics Comics On Student Learning Outcomes

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Abstract

This research aims to determine student learning outcomes using the discovery learning model assisted by physics comics on temperature and heat subjects. The population in this study were all class XI students in the SMA Negeri 2 Percut Sei Tuan with the sampling technique being purposive sampling. Class XI-C as the experimental class and class XI-D as the control class, each with 36 students. The learning outcomes test instrument is a multiple choice test of 20 questions which has been validated by experts. The results showed that the pretest average in the experimental and control classes was 33.75 and 33.61. In testing normality and homogeneity, the pretest and posttest data for both classes had a normal and homogeneous distribution. The results of the pretest t test obtained $t\text{-count} < t\text{-table}$, namely $0.075 < 1.994$, so H_0 was accepted, meaning that the initial abilities of students from the experimental class and the control class were the same. Meanwhile, the average posttest score in the experimental class and control class was 74.58 and 65.14. The results of the posttest t test show that $t\text{count} > t\text{-table}$, namely $4.037 > 1.666$, so the alternative hypothesis is accepted. Based on the research, it was concluded that there was an effect of the discovery learning model assisted by physics comics on student learning outcomes in the subject of temperature and heat.

Keywords: Discovery Learning, Learning Outcomes, Physics Comics, Temperature and Heat.

INTRODUCTION

The way of life and perspectives of humans have evolved due to the rapid advancement of technology. Both developed and developing countries have utilized these technological advancements. Information and communication technology is very important in the field of education because education is an important pillar for the progress of a nation. Physics, a subfield of natural science, is an interesting topic that requires more understanding than memorization. Physics belongs to the natural sciences, where students study themselves and their environment. However, physics is often considered difficult and uninteresting for students. Apparently, this makes everyday physics tasks more difficult for students. Temperature and heat are physics subjects in senior high school (SMA) class XI in even semester.

The results of observations and interviews at SMA Negeri 2 Percut Sei Tuan show that physics learning outcomes on temperature and heat material in class XI are less than optimal. This is indicated by the number of students who completed the evaluation stage by 48% and the number

of students who did not complete the evaluation by 52%. The value of the minimum completeness criteria (KKM) for physics lessons is 70. Teachers still teach by lecturing. Students can only sit and listen, take notes and remember, so there is no active learning process. In addition, the ineffective use of media due to the large number of devices and time needed to prepare for learning, makes students tired, and makes temperature and heat difficult to understand, which has an impact on their learning outcomes. One of the teacher's efforts is to be able to present learning conditions to feel exciting so that students remain dynamic in learning. Based on these problems, it can be seen that the right solution to improve student learning outcomes is to use the right learning model and media.

One of the active learning models is the discovery learning model. The discovery learning model optimizes students' ability to acquire and discover things (objects, people, or events) systematically, critically, logically, and analytically (Arends, 2008; Helmiati, 2012). In this model, students actively participate in a developing experience by answering questions and solving problems to discover important concepts (Setiani & Priansa, 2015)

Media also plays an important role in the learning process. Therefore, in addition to choosing the appropriate learning model, the determination of media use must also be considered. The use of media helps physics learning activities to be better and varied. Comics are a type of learning media that can be utilized. The type of animation that reveals characters and plays a story that is closely related to the image is called comics. Almost everyone knows comics, from children to adults. Comics are popular with children, and they even prefer comic books to textbooks. For a long time, comics have also been used to teach physics. The results of research by Muliwati et al. (2021) concluded that physics digital comics can be used as physics learning media, and the combination of visuals and stories in this comic can integrate learning messages, there is also research which states that the use of visualized comics has a variety of unique depictions that can encourage students to understand and learn science material more deeply because it can make complex images easier to understand through a strong story (Fauziah & Kuswanto, 2021). The results showed that learning models and learning media can help students learn better. In a study by Ula et al. (2019) on how effective discovery learning with comic media is on line and angles topic, it was found that (1) 7 out of 8 student activities were carried out in the appropriate length of time, (2) educators managed to organize learning well, and (3) 80% of all students reached the minimum completeness criteria score (KKM).

METHOD

The research will be conducted at SMA Negeri 2 Percut Sei Tuan located at Jalan Pendidikan, Bandar Klippa, Percut Sei Tuan District, Deli Serdang Regency, North Sumatra 20371. The research time was held in May-June of the 2022/2023 academic year. The type of research conducted is quantitative research with a pseudo-experimental or quasi-experimental method (Sugiyono, 2015). The design in this study uses an experimental group and a control group, the experimental group is a group that is given treatment during the learning process with a discovery learning model assisted by physics comics, while the control group will use conventional learning (Sugiyono, 2015).

This study aims to compare two groups that are given different treatments, namely one group is given the treatment of discovery learning model assisted by physics comics and one class is used as a comparison class or control class with a conventional model or commonly used in the school. Both groups were given a pretest and posttest (Arikunto, 2017). The pretest aims to determine the extent of students' understanding of temperature and heat material before treatment is given to each class group. Posttest aims to determine the effect of treatment that has been given to the experimental group and control group.

The population in this study were students in class XI of MIPA specialization at SMA Negeri 2 Percut Sei Tuan in the even semester of the 2022/2023 academic year consisting of four classes and each class numbered 36 students so that the total population of this study was 144 students. The sample of this study was taken by purposive sampling method. The selected class is a class that has similar characteristics of its students and the same physics teacher who teaches. The samples of this study were class XI-C as the experimental class and class XI-D as the control class. With each class totaling 36 students.

Data collection techniques in this study were interviews with physics teachers, pretests, and posttests. This research instrument is a learning outcome test with multiple choice questions totaling 20 questions that have been validated. The research involved two classes that were given different treatments, namely the experimental class and the control class. The experimental class applied the discovery learning model assisted by physics comics, while the control class applied the conventional model. However, both sample classes conducted a pretest before receiving treatment to detect students' initial proficiency in the given material. Before the end of the

learning activity, students were asked to do a posttest in order to know their final proficiency after receiving the treatment.

Table 1. Two group research design (pretest and posttest)

Class	Pretest	Implementation	Posttest
Experimental	T ₁	X	T ₂
Control	T ₁	Y	T ₂

The data analysis technique in this study was the two mean equality test, both for pretest and posttest data. In addition, the data from the pretest and posttest results were also calculated for normality and homogeneity. To process the data in the post-test the same as in the pre-test, prerequisite tests were carried out, namely the normality test and the homogeneous test. After the data is normally distributed and homogeneous, a one-party test (final posttest ability test) will be used to find out whether student learning outcomes apply discovery learning to heat and temperature subject.

RESULTS AND DISCUSSION

Result

After conducting the research in accordance with the research procedures, the research data were obtained in the form of pretest data and posttest data for each class, namely the experimental class and control class. To see in detail the results of the pretest of the two classes are depicted in Figure 1.

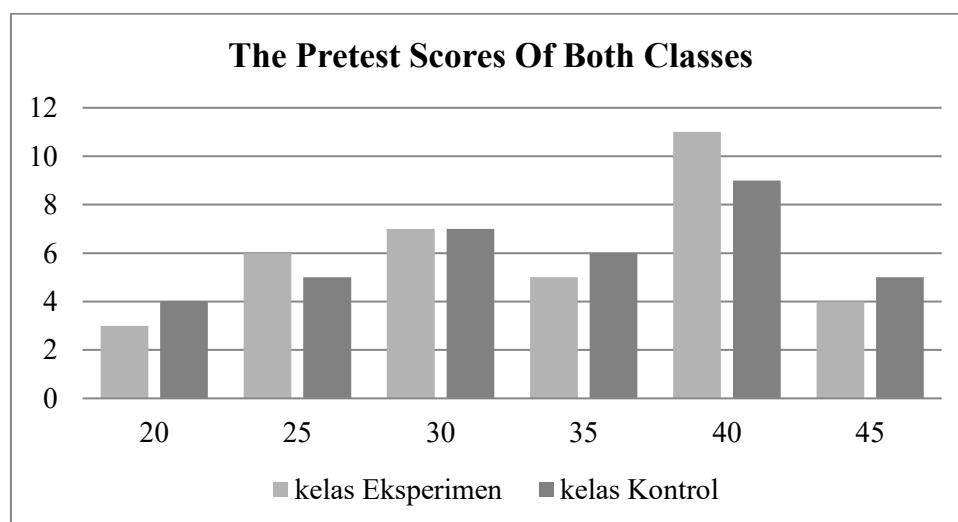


Figure 1. Comparison of class pretest data experiment and control

In the two classes above, it can be seen that the initial knowledge of students after the pretest in the experimental class obtained an average value of 33.75 with a standard deviation of 7.68. Then in the control class after the pretest, the average value was 33.61 with a standard deviation of 7.98. The results of the two-party t-test calculation of the pretest results conducted in both classes have the same initial ability or in other words, there is no significant difference between the experimental class and the control class. Thus, the pretest scores for the experimental and control classes are not much different.

After being given different treatment, in the experimental class with discovery learning models and the control class with conventional learning, it was found that the posttest score data in the experimental class which has an average of 74.58 and a standard deviation of 9.52. To see in detail the results of the post-test for both classes can be seen in Figure 2.

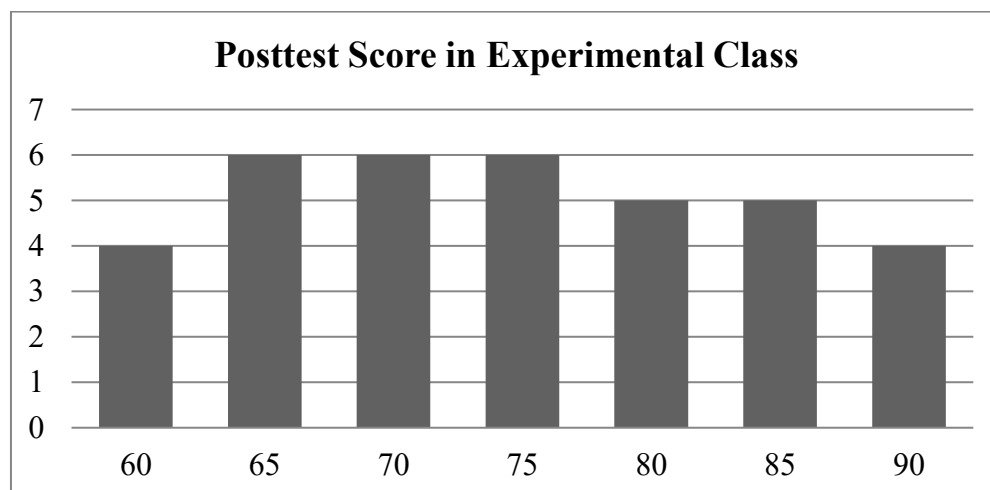


Figure 2. Posttest score in experimental class

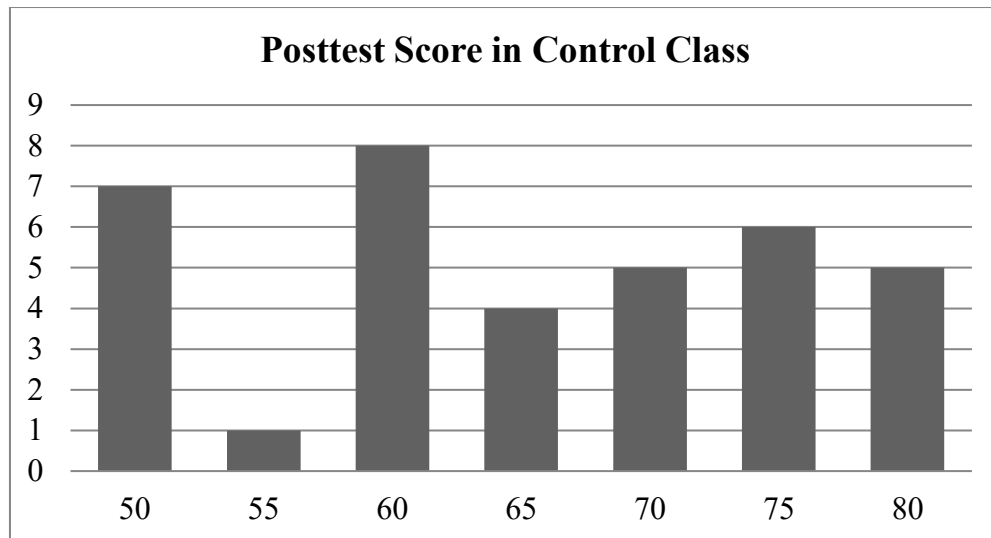


Figure 3. Posttest score in control class

In the experimental class after giving the posttest, it can be seen that the score range of 80 to 90 has a total frequency of 14 students, scores of 80 and 85 each amounted to 5 students and a score of 90 each amounted to 4 students. For the score range of 65 to 75, it has the same frequency, namely 6 students each. Thus, the posttest score data in the experimental class has reached the minimum completeness criteria (KKM) for temperature and heat material in this study which uses physics comics as the learning media.

Hypothesis test calculations for post-test data were carried out with a one-party t-test. In summary, these calculations are presented in Table 2. It was found that there were differences in the effect of learning outcomes in the experimental class and the control class.

Table 2. Summary of post-test ability hypothesis calculations

Posttest Data	Average	t _{count}	t _{table}	Conclusion
Eksperimental Class	74.58	4.03	1.66	There is an effect on student learning outcomes
Control Class	65.14			

Discussion

By using the testing criteria of t-count greater than t-table (4.0379 greater than 1.6669), it can be concluded that student learning outcomes are better after using the discovery learning

model assisted by physics comics compared to conventional learning models on temperature and heat material. This difference shows that student learning outcomes in the experimental class are better when compared to student learning outcomes in the control class.

There are differences in student learning outcomes between the experimental and control classes. The difference in student learning outcomes is due to the difference in treatment in the experimental and control classes. The significant difference shows that the application of discovery learning model assisted by physics comics has an effect on student learning outcomes. This situation shows that the learning outcomes of students who apply discovery learning model learning on temperature and heat material are better than the learning outcomes of students in the control class who apply conventional learning models. The significant difference in learning outcomes between the experimental and control classes is due to the use of the discovery learning model which has syntaxes or phases in learning that are not owned by conventional learning where the discovery learning model emphasizes full student involvement to be able to find the material they learn and connect it to real life situations (Arends, 2008; Helmiati, 2012). This is in accordance with Kadri's research (Kadri & Rahmadani, 2015) which states that learning outcomes tend to be good in experimental classes because it is caused by the application of the discovery learning model which emphasizes students to get involved in learning activities in order to find the concept of the material they learn so that students can be encouraged to apply it in their daily lives.

On the experimental class, learning is carried out by applying a discovery learning model that emphasizes student activity in understanding the material or concepts being studied more deeply and independently. The learning steps are designed in such a way based on the discovery learning model proposed by J.S. Bruner (Bruner, 1961) which states that providing stimulation will stimulate students' curiosity so as to increase students' thinking ability towards a phenomenon or material being studied and the opportunity to explore knowledge will strengthen memory and train thinking skills. In addition, the discovery learning model makes students more active in learning, because with this model, the knowledge and skills obtained by students are not expected to be the result of remembering a set of facts, but the result of discovering themselves (Setiani & Priansa, 2015). With this model, students can also work together in groups. The level of understanding obtained by students is deeper because students are directly involved in the process

of finding answers to existing problems and directly practicing them so that the learning process is more effective and efficient.

Students in the control class who learn conventionally are characterized by students taking notes after the teacher explains and doing questions or exercises. The learning process can cause students to tend to be passive and bored in participating in learning activities. Students tend to memorize the concepts given without understanding the concepts that have been given. This kind of learning process is less able to provide opportunities for students to play an active role in the learning process. Lack of student understanding can affect students' concept understanding ability. This causes mastery of temperature and heat material to be less than optimal. Experimental class students learning by using the discovery learning model assisted by physics comics requires students to play an active role in the learning process. This is because the learning setting that provides opportunities for students to search and find solutions to problems provided by the teacher and the utilization of physics comic media makes students more interested and enthusiastic in learning (Fauziah & Kuswanto, 2021; Ula et al., 2019). Improved learning outcomes are strongly influenced by teachers, students, and learning models used in teaching and learning activities.

The learning model greatly affects students' interest and motivation to learn so that it can determine the level of understanding and knowledge of students. The difference in learning outcomes of students who use the discovery learning model focuses more on the enthusiasm and activeness of students to seek and find the concepts being studied. The discovery learning model is able to make students to be able to learn actively in finding solutions independently from the problems discussed and develop their knowledge so as to improve student learning outcomes on temperature and heat material. The discovery learning model can be used as an alternative in training students' concept understanding skills. The reason is because discovery learning emphasizes students to learn to solve problems independently.

CONCLUSION

Based on the results of the data analysis, it can be concluded that applying the Discovery Learning model assisted by physics comics on the subject of temperature and heat significantly improves student learning outcomes. This is demonstrated by the experimental class achieving an average posttest score of 74.58, which falls into the passing category, alongside effect size results

confirming a significant positive impact of this integrated learning model and media on overall student achievement.

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