



## The Effect of Discovery Learning Model On The Learning Outcomes of Sciences (Physics) In Junior High School Students

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**Abstract:** This study aims to determine the effect of the discovery learning model on student learning outcomes on simple aircraft material in class VIII UPT SMP Negeri 12 Medan. The research method used was a quasi experiment with a population of 284 students of class VIII UPT SMP Negeri 12 Medan. The sampling technique used was purposive sampling, namely class VIII 6 and VIII 7 each as an experimental class and control class. The instrument used was a multiple choice test of learning outcomes as many as 20 questions. Before being given treatment, a prerequisite test was first carried out to determine whether the sample came from a normally distributed and homogeneous population. Furthermore, the pretest was given to the experimental class and control class with an average score of 48.83 and 48.67 respectively with a standard deviation of 16.59 and 16.45. After the treatment was followed by giving the posttest, the average score was 80.83 and 66.00 respectively with a standard deviation of 11.52 and 15.05. To see the difference in the two classes, a one-sided t-test was conducted with  $\alpha = 0.05$ , it was found that the t-count was greater than the t-table which indicated that there was a difference in learning outcomes in the two classes. Furthermore, the magnitude of the effect of the discovery learning model on learning outcomes was carried out a simple regression test, with the equation  $Y = 57.19 + 0.11X$ . Finally it was concluded that there was a significant effect of the discovery learning model on the learning outcomes of students of SMP Negeri 12 Medan on simple aircraft material.

**Keywords:** *Discovery Learning, Learning Outcomes, Science (Physics).*

### 1. INTRODUCTION

Education makes this generation a role model of the previous generation's teaching. Until now, education has no boundaries to explain education completely because of its complex nature such as its target, namely humans (Rahman et al., 2022, page 2). Education is a universal activity in human life, because anywhere and anytime in this world there is education. Education is essentially a human effort to humanize humanity itself, namely civilizing humans or ennobling humans. (Saragih, N, A., et al, 2021). Education is one of the efforts made to help the development and abilities of children to benefit the interests of their lives as individuals and as citizens.

The development of technological progress in the era of globalization at this time can demand quality human resources. Increasing human resources is one of the conditions that make the nation progress and develop. Education plays a very important role in ensuring the survival of the nation and state. This is because education is a vehicle to improve and develop the quality of human resources. The Ministry of Education and Culture as the agency responsible for organizing education has reformed the education system. These efforts include improving the curriculum, facilities and infrastructure, and improving the quality of teachers (Malik, 2018, page 236).

The factor that determines the development of the nation is through the quality of education that runs in the country. The existence of quality education quality then the nation will be running in the same direction. stated that the Competency Standards for graduates in the 2013 curriculum learning are based on 21st Century competencies, these competencies contain soft skills competencies. Framework Partnership of 21st Century Skills formulates it as "The 6C skills", namely: character, citizenship, critical thinking, creativity, collaboration, and communication. One of the characteristics of the implementation of the 6C skills in language teaching in

the 21st century is the emergence of humanist aspects in education, such as education and curriculum centered on values and character, no longer focusing only on mastering subject matter. This means that the needs of life in the 21st century in the world of education require a shift in educational goals by preparing students to face an increasingly tight world in the struggle for thought and creativity. mastery of soft skills as mentioned above will be more useful than just mastering hard skills Learning in the 21st century requires various skills that must be owned and mastered by students, so it is hoped that current physics teachers can prepare students to master various skills.

Important skills in the 21st century are still relevant to the four pillars of life including learning to know, namely knowing mastery of material, learning to do, namely learners must learn to work, learning to be, that learners who have basic cognitive competencies are individual qualities and identities, and learning to live together is learning together will provide opportunities for learners to become actively involved in discussions, continue to monitor them learn strategies and achievements and become critical thinkers. In addition, learners are required to have the ability to learn and master science and technology. (Maulidah, 2019, page 141-142). Learning in the 21st century requires various skills that must be owned and mastered by students, so it is hoped that current physics teachers can prepare students to master various skills. Important skills in the 21st century are still relevant to the four pillars of life including learning to know, namely knowing the mastery of material, learning to do, namely learners must learn to work, learning to be, that learners who have basic cognitive competencies are individual qualities and identities, and learning to live together is learning together will provide opportunities for learners to become actively involved in discussions, continue to monitor them learning strategies and achievements and become critical thinkers. In addition, learners are required to have the ability to learn and master science and technology. (Dinantika et al., 2020).

Curriculum 2013 is a new curriculum that has been established by the Indonesian Ministry of Education and Culture to replace the education unit level curriculum (KTSP). The 2013 curriculum not only adapts 21st century competencies in it, but also adopts two other key concepts, namely authentic assessment and the scientific approach. According to (Abidah & Yuliani, 2020, page 420) says that learning is a relatively permanent change in behavior as a result of experience or practice. Learning is a result of the interaction between stimulus and response. Stimulus is anything that the teacher gives to students, while the response is the reaction or response of students to the stimulus given by the teacher. So that what is given by the teacher (stimulus) and what is received by students (response) can be observed and measured. (Septiani, n.d., 2018, Page 10). Learning is a process of acquiring knowledge and experience in the form of changes in behavior and ability to react that are relatively permanent or settled due to individual interaction with the environment deliberately by educators to convey knowledge, organize and create environmental systems with various methods so that students can carry out learning activities effectively and efficiently and with optimal results (Festiawan, 2020).

Learning is a process or effort made by each individual to get changes in behavior, both in the form of knowledge, skills, attitudes and positive values as a practice of various materials that have been learned. (Wardana & Ahdar Djamaluddin, 2021, page 2) defines learning as all psychological activities carried out by each individual so that his behavior is different between behavior or response, because of new experiences, having knowledge after learning and practice. Based on the opinions of the experts above, learning is defined as a process of activities carried out deliberately to make changes in attitudes and behaviors whose conditions are different from before the individual is in a learning situation and after taking similar actions and which are permanent. The learning model is a design that describes the process and creates environmental conditions so that students can interact, change and develop. This model is basically a form of learning that is presented specifically by the teacher. Learning is the process of learners developing their potential broadly based on initial understanding. (Hasriadi, 2022, page 9).

Discovery learning is a learning process that is not given in its entirety but involves learners to organize, develop knowledge and skills for problem solving. (Ana, 2018, page 22). Discovery learning is a learning model that invites students to discover concepts through observation or experimentation. (Santosa, 2020, page 24). Discovery learning is a learning process that requires students to think critically to find the concept of learning material themselves. (Hendrizal, Jendriadi, 2018, page 25). Discovery learning is a learning method to develop an active way of learning for students in discovering understanding or concepts that are taught independently through established research procedures so that the knowledge is more cognitively persistent. (Siti Ma'rifah Setiawati, S.P, 2018, page 404). In discovery learning, learners are encouraged to learn independently. Learners

are actively involved in the discovery of various concepts and principles through problem solving or the results of abstraction from various cultural objects. Concepts and rules in mathematics can be fully mastered by students, if students are actively involved in thinking, finding, and reconstructing mathematical knowledge that is being learned. (Simamora et al., 2018, page 65). Every lesson educators must create a learning atmosphere that provides opportunities for learners to express ideas and ideas that they get their own way, so students to dare to argue, be more confident, and creative. (Batubara, 2019, page 119).

Based on the results of interviews with principals, science teachers, and students at UPT SMP Negeri 12 Medan, found that in the learning activities of students, teachers are more dominant in providing theory, more concerned with memorization and solving physics problems, and science teachers are more likely to use the lecture method. According to (Hidayati, 2022) "the lecture method is oral explanation and narration by the teacher in front of students and in front of the class, especially with the character of self centered and instantaneous students affecting their learning discipline and response during learning". Teachers do not maximally use learning media when delivering subject matter and only explain the material, so that students are less active because they are only limited to seeing, hearing and taking notes. Science (physics) is not just mastering theory, but experiments are needed so that students can find their own knowledge with the material they are studying and can develop their creative and innovative thinking skills. In addition, teachers do not empower the potential of students to think creatively in finding science (physics) concepts in everyday life because teachers are more likely to use the lecture model, which affects students to be lazy to follow learning and sometimes sleepy." Basic teaching skills relate to some fundamental skills or abilities that teachers must master. These skills are very important if you want to become a professional teacher, so in addition to having to master the substance of the field of study being taught, basic teaching skills are also supporting skills for success in the teaching and learning process. (pare pare, 2019, page 2). Physical science lessons are one of the lessons that are feared by students. Based on this, it is because teachers are more likely to explain the formulas of physics than to provide its application in everyday life. Based on this background, one of the learning models that is considered to be able to solve these problems is by using discovery learning entitled "The effect of discovery learning model on science learning outcomes (Physics) in junior high school students".

## 2. METODE

In this study, the type of research used was quasi-experimental research using two classes as research samples, namely VIII-6 and VIII-7 classes as experimental and control classes, respectively. In this case the two classes will be given different treatments, namely in the experimental class using the discovery learning model and the control class using the conventional learning model. The method used in this research is a quantitative approach with a nonequivalent control group design as listed in Table 1.:

**Tabel 1.** Nonequivalent Control Group Design

Class	Pretest	Treatment	Posttest
Experiment	O <sub>1</sub>	X	O <sub>2</sub>
Control	O <sub>1</sub>	-	O <sub>2</sub>

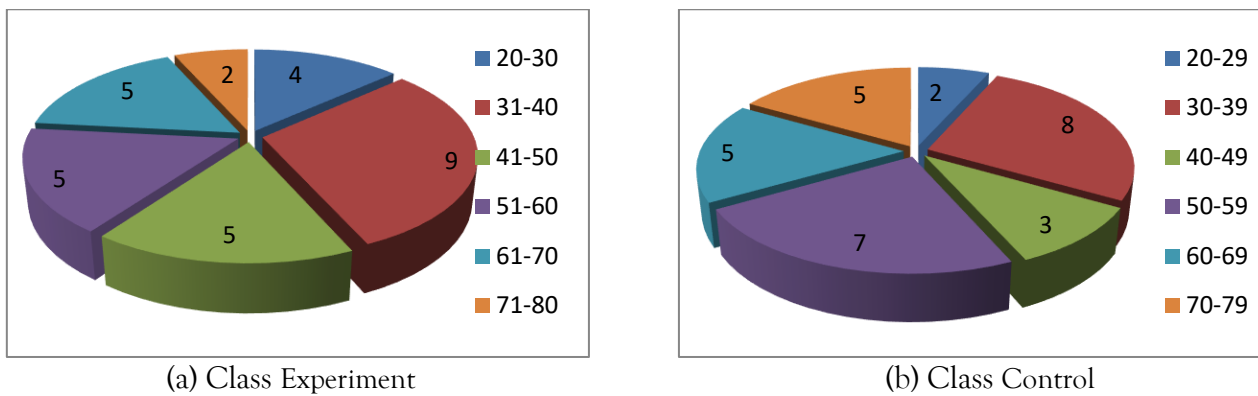
Source: (Sugiyono, 2018, page 120) (Tuckman et al., 2012, page 130).

The population in this study were all class VIII UPT SMP Negeri 12 Medan which amounted to 288 students. In this study, researchers took samples of classes VIII-6 and VIII-7, each of which amounted to 30 students. Sample withdrawal was carried out using purposive sampling. The reason for using this purposive sampling technique is because students in both classes are heterogeneous such as gender, ethnicity, religion, ethnicity. In addition, the selected sample is in accordance with the research objectives, easy to meet or approach. Based on this sampling technique, class VIII-6 was chosen as the experimental class and class VIII-7 became the control class. This study uses two variables, namely the learning model as the independent variable (X) and the learning outcomes of science (Physics) as the dependent variable (Y). The instrument used in this study is a test of student learning outcomes on simple aircraft material. The learning outcomes test used to measure the ability of students in the form of multiple choice of 20 questions on simple aircraft material. The learning outcomes tests used for pretest and posttest were then collected and analyzed quantitatively. To determine the effect of the model used, a hypothesis test was conducted. However, before the hypothesis test data analysis is carried out, the data prerequisite analysis test is carried out, namely the normality test and homogeneity test using excel.

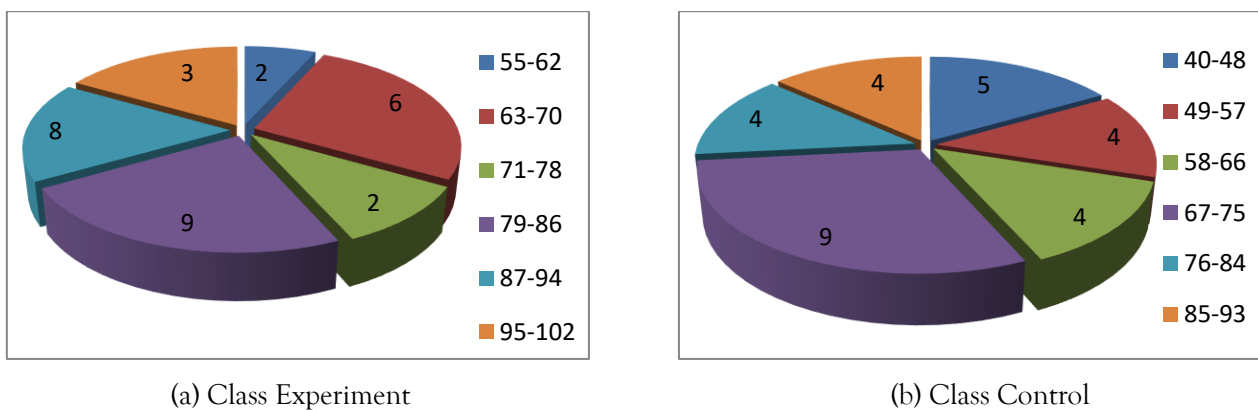
### 3. FINDINGS AND DISCUSSION

#### Findings

The results of the data described in this study are the learning outcomes of students on simple aircraft material in class VIII UPT SMP Negeri 12 Medan who are given different treatments, namely: 1) discovery learning model, 2) conventional learning model. Based on the results of the research conducted, it shows that there is an effect of increasing student learning outcomes in class VIII UPT SMP Negeri 12 Medan on simple aircraft material. The increase in student learning outcomes can be evidenced from the results of giving the pretest and posttest of both classes can be seen in Figure a and Figure b below:



**Figure 1.** Distribution of pretest results of experimental class (a) and control class (b)



**Figure 2.** Distribution of pretest results of experimental class (a) and control class (b)

Based on Figure 1 and Figure 2, it is obtained that each of the lowest values in the value interval 20-30 is 4 people and 20-29 is 2 people and the highest value in the value interval 71-80 is 2 people and 70-79 is 5 people. The lowest posttest scores of the experimental class and control class were obtained respectively in the value interval 55 - 62 as many as 2 people and 40-48 as many as 54 people and the highest score was 95 - 102 as many as 3 people and 85 - 93 as many as 4 people. Based on the overall data analysis, it is concluded that there is an increase in student learning outcomes in class VIII-6 as an experimental class using the discovery learning model. A summary of the pretest and posttest data normality test results is presented in Table 2.

**Table 2.** Summary of normality test results

Data	Class	$L_{count}$	$L_{table}$	Conclusion
Pretest	Experiment	0,131	0,161	Normality
	Control	0,134		
Posttest	Experiment	0,101		
	Control	0,123		

The criteria for testing data normality if  $L_{hitung} < L_{tabel}$ , so the data is normally distributed (Sudjana, 2016, page 230). A summary of the homogeneity test results can be shown in Table 3.

**Table 3.** Summary of pretest and posttest data homogeneity test calculations

Data	Class	Variance	$F_{count}$	$F_{table}$	Conclusion
Pretest	Experiment	275,32	1,017	1,860	homogeneity
	Control	270,57			
Posttest	Experiment	132,64	1,707	1,860	homogeneity
	Control	226,55			

Data homogeneity testing criteria, if  $F_{count} < F_{table}$  homogeneity sample data (Sudjana, 2016, page 250)

Based on observations that have been made by observers, it is found that the activity of students has increased positively, in the experimental class at the first meeting the average student activity is 61.67, the second meeting is 65.58 and the third meeting is 71.67.

To find out the effect of the discovery learning model on the learning outcomes of physical science in UPT SMP Negeri 12 Medan students, it can be seen through the simple regression mathematical equation  $Y = a + bX$  (Sudjana, 2016, page 250). Based on the results of the study with the average value of the discovery learning model student activity observation sheet obtained results for three meetings of 66.39 and the average value of the experimental class posttest obtained results of 80.33, then a simple linear regression equation can be obtained, namely  $Y = 57.19 + 0.11X$ .

## Discussion

Research using the quasi-experimental method is research used to seek the effect of certain treatments on others under controlled conditions. This research begins with giving a pretest to the two samples that have been selected non-randomly, if the initial ability of the experimental class and the control class is the same then proceed with the implementation of different treatments for each class. The effect of each treatment can be known by analyzing the data from giving the posttest to the two classes that have undergone treatment.

The pretest score of students in the experimental class has an average value of 48.83 with a standard deviation of 16.59 and in the control class has an average value of 48.65 with a standard deviation of 16.45. Based on the results of the calculation of the two-party t test hypothesis for  $\alpha = 0.05$  and  $dk = 58$ , it is obtained  $t_{count} = 0.040$  and  $t_{table} = 2.002$ , so it can be concluded that the initial ability of students in the experimental class is the same as the initial ability of students in the control class before being given treatment. Moving on from the same initial ability of students, the research continued with the provision of treatment through the discovery learning model to the experimental class and the conventional learning model in the control class as a comparison of results. In the experimental class, the posttest scores of students in the experimental class were obtained with an average value of 80.33 and a standard deviation of 11.52 while the control class had an average value of 66.00 with a standard deviation of 15.05. Based on the results of one-party t-test analysis at  $\alpha = 0.05$  and  $dk = 58$ , the  $t_{count} = 4.464$  and  $t_{table} = 1.671$  with  $t_{count} > t_{table}$ ,  $H_a$  is accepted and  $H_o$  is rejected. (Sudjana, 2016, page 239). So it can be concluded that there is a significant effect of the discovery learning model on the learning outcomes of physical science in UPT students of SMP Negeri 12 Medan. In the experimental class, observation of learning activities using the discovery learning model obtained an average student score of 66.39. Furthermore, the results of the posttest and student activity were carried out a simple regression test to see the relationship between the two variables, and obtained  $Y = 57.19 + 0.11X$ , which interpreted that student activity could increase learning outcomes by 0.11 every time one unit of student activity rose. Finally, it is concluded that the discovery learning model can improve the learning outcomes of physical science in UPT students of SMP Negeri 12 Medan.

## 4. CONCLUSION

Based on research data and data analysis, it can be concluded that: 1) The pretest value of students in the experimental class has an average value of 48.83 with a standard deviation of 16.59 and in the control class has an average value of 48.67 with a standard deviation of 16,45. Based on the results of the two-party t-test hypothesis calculations,  $t_{count} = 0.040$  and  $t_{table} = 2.002$ , so  $t_{count} < t_{table}$ , so it can be concluded that the initial abilities of students in both classes before being given the same treatment. 2) The posttest scores of students in the experimental class have an average value of 80.33 and a standard deviation of 11.52 and those in the control class have an average value of 66.00 with a standard deviation of 15.05. Based on the results of one-party t-test

calculations,  $t_{count} = 4.464$  and  $t_{table} = 1.671$  with  $t_{count} > t_{table}$ , then  $H_a$  is accepted and  $H_o$  is rejected, so it can be concluded that the ability of students after being given treatment in the experimental class and the control class is different. The average observed value of the discovery learning model in the experimental class is 66.39, with simple linear regression, namely:  $Y = 57.19 + 0.11X$ . 3) Based on the analysis of the data as a whole, it can be concluded that there is a significant influence of the discovery learning model on the learning outcomes of Science Physics in UPT SMP Negeri 12 Medan students.

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