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## IMPROVING PHYSICS LEARNING OUTCOMES WITH COOPERATIVE LEARNING NUMBERED HEAD TOGETHER TYPE ON OPTICAL DEVICES OF CLASS XI STUDENTS AT SMAN 1 SECANGGANG

M. Surya Irawan Lubis<sup>1</sup>, Derlina<sup>2</sup>

<sup>1</sup> State University of Medan, Medan 20113, Indonesia

Email: [suryalubis0501@gmail.com](mailto:suryalubis0501@gmail.com), [derlina.nst@gmail.com](mailto:derlina.nst@gmail.com)

### *Abstract*

This study aims to improve students' physics learning outcomes by applying NHT learning on optical instrument material. The population in this study were students of class XI of SMAN 1 Secanggang in the academic year 2023/2024. The samples in this study were XI MIPA 2 class as a control class totaling 30 students who were given conventional learning, and XI MIPA 3 class as an experimental class totaling 30 students who were given NHT learning. The sampling method used was quasi-experiment and used pretest-posttest control group design. Data on physics learning outcomes were collected using a test instrument in the form of 10 questions. The improvement of students' physics learning outcomes is seen by comparing the average value of hypothesis tests that are normally distributed and homogeneous in both classes. Based on the results of the study, it is concluded that the application of NHT learning on optical devices material can significantly improve student learning outcomes.

**Keywords:** NHT learning, Optical Devices, Learning Outcomes

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### *INTRODUCTION*

A very important activity for the life of every living being is learning in order to easily interact with the environment and change behavior. Learning is a process of interaction with all the circumstances that surround the individual. Humans will grow and develop as mature individuals with education. Human efforts to develop individual abilities and personality both outside and within themselves are pursued through education.

The world of education is a place for the learning process experienced by students in order to gain knowledge, improve abilities, and improve attitudes through teaching by the teacher. This is in accordance with the meaning of Law no. 20 of 2003 that education is a planned form of awareness to create a learning atmosphere and teaching and learning process so that students actively develop their own abilities so that they have religious spiritual expertise, intelligence, personality, noble character and self-control needed by themselves, society, nation, and country. Education is an awareness to be able to improve the development of both personality and skills that we get from inside or outside of school this will last a lifetime which is created from the family, school and community environment (Manalu, et al., 2021).

In principle, learning is doing, in which case students will carry out activities to change behavior. One of the central institutions of learning activities is the school. School is one of the central institutions for learning activities with activities that are quite complex and varied (Agustin, 2017).

The progress of the school as one of the central institutions for learning activities is largely determined by the quality of human resources. Education plays the most important role in nation building because successful development in education will greatly affect development in other fields. If it fails to develop human resources, a nation will not succeed in developing its country. Therefore, the development and development of human resources is one of the important conditions in development (Damanik, et al., 2020). With developments in the field of education, it certainly affects the progress of science and technology. This can be seen by the increasingly rapid development of science and technology today which has resulted in many new findings in the field of science and technology.

Educational activities in Indonesia can run well and achieve goals very much depend on the way teachers carry out learning activities. Teachers always apply various teaching models so that students do not experience boredom and learn optimally. Conventional learning means that a child's mind is like a blank slate that is still clean and ready to wait for the teacher's scribbles. In another sense, a child's brain is like a bottle filled with the knowledge and wisdom of the teacher (Kahar, et al., 2020).

The old learning paradigm, the teacher imparts knowledge to students passively, the teacher lacks mastery of the proper teaching and learning process, student only knows how to convey what he knows into the memories of students who are ready to receive it. Some teachers think this paradigm is the only way. They teach with the lecture method students are expected to sit, be silent, listen, take notes, and memorize and compete with their students.

The learning model that is often used in schools that accompanies conventional learning is competitive learning. In competitive learning, sometimes it can lead to divisions between students. This is because in competition learning there is a placement of students starting from the most intelligent to the least intelligent. Teachers provide motivation to students by giving rewards to students who get the highest ranking. This learning can cause jealousy for students who are in low rankings.

So it is necessary to update the paradigm in assessing student learning processes and interactions between students and teachers. In addition, the flow of the learning process does not have to originate between the teacher and students. Students can also study with other students. The learning system should provide opportunities for students to work together with

other students in structured assignments. This learning system is also called cooperative or group learning, where students carry out learning activities in small groups, so they can help each other, work together, discuss in studying a subject matter or in doing group assignments given by the teacher. Cooperative learning can help develop cooperative skills and better relationships between students in their academic learning. Students are required to be active in learning and the teacher is a facilitator, so that students can build their knowledge actively. Students can improve the quality of learning because there are wider opportunities to seek their own knowledge by asking questions and discussing (Pakpahan, 2022).

In the school physics curriculum, the objectives of giving physics include mastering concepts, principles, having the skills to develop knowledge and self-confidence as a preparation for continuing education at a higher level and being able to develop science and technology. To fulfill these objectives, it is hoped that education can determine good teaching methods and appropriate teaching methods.

The classic problem in physics education in Indonesia is the low value of students' physics learning outcomes and the lack of motivation and desire for physics learning in schools. Because this problem is a serious problem and needs to get the full attention of all parties, both the government, schools, and the students themselves. The low value of student learning outcomes is caused by many factors, one of which is caused by the inaccuracy of the learning method used by the teacher, so that students feel bored and bored when learning takes place. It can also be caused by the method of presentation or delivery of material that does not attract students' attention, so that students are indifferent when the material is delivered by the teacher. In addition, it is also caused by teachers who are less competent in managing teaching and learning strategies that can arouse student learning interest or also because learning methods are still traditional in nature where students are only slightly involved in the learning process and class activity because they are dominated by the teacher.

To achieve this goal, the teacher is expected to be able to determine a good way of teaching with the appropriate method because each method has advantages and disadvantages. It will be even better if the use of teaching methods can be varied according to the needs of the material and students. Because if you only use certain methods, it will not give students the opportunity to build creativity and thinking power and create a feeling of boredom in students. Of the many problems in physics education listed above, the teaching approach is an aspect of the problem that requires serious handling. The constructivism learning model uses an approach called cooperative learning. Paul Suparno considers knowledge to be a construction (formation) of

people who know something themselves, especially emphasizing the active role of students because knowledge or understanding is formed by students actively and not just passively received by students from the teacher (Febiola & Siregar, 2022).

Based on the initial observation of physics learning conducted at SMAN 1 Secanggang, during the process of teaching and learning activities 80% of students stated that the teacher explained more using the lecture method, so that students were less actively involved in learning. From interviews conducted with teachers, it was found that students would prefer group learning to individual learning. In other words, students' needs to understand physics learning are cooperative learning models. The following phenomena were also found: 1) There are still students who daydream and busy themselves with their stationery without listening to the teacher while students do not understand the material presented. 2) There are still a few students who respond to the teacher's questions when learning takes place regarding the material presented. 3) Still found students who do not want to express opinions during the teaching and learning process takes place. 4) There are still students who do not do the assignments given properly.

Based on the description presented above, the researcher tries to use the right learning model by applying the numbered head together (NHT) cooperative learning model. This technique gives students the opportunity to share ideas with each other and consider appropriate answers. In line with that, this technique also encourages students to increase the spirit of cooperation among them.

The NHT model requires students to be able to answer questions when the number is called randomly by the teacher, where this can be a motivation for students because the points earned are not only for personal gain but for the group. This certainly can be a solution so that we can manage learning in a class with a large number of students properly (Permana, 2016).

Therefore, through the explanation above, the NHT type cooperative learning model is expected to improve student learning outcomes in the learning process, so that students no longer feel bored and can take part in active learning and create a more effective learning atmosphere.

## ***METHOD***

This research was conducted at SMAN 1 Secanggang, located at Jl. Besar Secanggang. The population in this study were all XI class students at SMAN 1 Secanggang. The sampling technique used is cluster random sampling. The sample in this study was two classes taken from the population

where class XI MIPA 3, the experimental class, was given NHT learning, and class XI MIPA 2, the control class, was given conventional learning.

In this study, both classes were given a pretest before being given different treatments to determine the student's initial abilities in both classes. NHT learning was applied in the experimental class, while conventional learning was applied in the control class. Student learning outcomes were obtained from the posttest given to both classes after being given different treatments. The research design is described in Table 1

**Table 1. Pretest-Posttest Control Group Design**

Class	Pretest	Treatment	Posttest
Experiment	$T_1$	X	$T_2$
Control	$T_1$	Y	$T_2$

Information:

$$T_1 = T_2$$

$T_1$  : pretest in both class

$T_2$  : posttest in both class

X : treatment using differentiated learning

Y : treatment using conventional learning

Data collection in this study was carried out using a learning achievement test instrument in the form of multiple choice. The test instrument used was intended to assess students' higher order thinking learning outcomes..

Data on learning outcomes that have been obtained are tested by testing the hypothesis using the t-test. The average value of learning outcomes is compared to the t-test of the experimental and control classes, which are usually homogeneous distributions. The data obtained were averaged and previously analyzed the data with the following steps: 1) calculating the average and standard deviation, 2) Normality test, 3) Homogeneity test, 4) Hypothesis test (t-test).

**RESULTS AND DISCUSSION****Result**

The results obtained from the research that has been done are that the pretest value in the experimental class is 52.33, and the pretest value in the control class is 45. The following are the pretest values in the experimental class and control class in the following table:

**Table 2.** Pretest value data

No	Value	Exp. Class	Control Class
		Frequency	
1	10 – 19	0	1
2	20 – 29	2	5
3	30 – 39	2	0
4	40 – 49	5	7
5	50 – 59	8	10
6	60 – 69	5	3
7	70 – 79	7	4
8	80 – 89	1	0

The two classes were given different treatments where. The experimental class was given NHT learning, and the control class was given conventional learning. The average post-test learning outcomes for the experimental class was 78.667, and the average post-test for the control class was 65.33. Based on the learning outcomes in the post-test, the scores in the experimental class are higher than the control class. Post-test scores in the experimental class and control class are described in the following table:

**Table 3.** Posttest value data

No	Value	Exp. Class	Control Class
		Frequency	
1	41 – 50	0	1
2	51 – 60	2	5
3	61 – 70	2	0

4	71 – 80	5	7
5	81 – 90	8	10
6	91 – 100	5	3

### ***Discussion***

The results of this study indicate that the use of the NHT type cooperative learning model has a significant effect on students' high order thinking learning outcomes on the material of optical devices in class XI SMA Negeri 1 Secanggang in the 2023/2024 academic year. This is evidenced by the average student pretest score in the experimental class of 52.33 with a medium category and the average posttest score of 78.33 with a high category, while in the control class the average student pretest score is 45 with a medium category and the average posttest score is 65.33 with a medium category.

From the normality test results, it was found that the samples were normally distributed because the normality test results obtained were  $L_{count} < L_{table}$ . In addition, the results of the homogeneity test also show that the sample used is representative of the entire population, with  $F_{count} < F_{table}$ .

Therefore, the hypothesis test was carried out using a two-sample t-test for pretest data and a one-sample t-test for posttest data. The two-sample t-test results were  $t_{count} < t_{table}$  or  $1.761 < 2.002$ , 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. Based on the one-sample t-test, it is obtained that  $t_{count} > t_{table}$  or  $3.768 > 1.671$ , so it can be concluded that the NHT type cooperative learning model has a significant effect on students' higher order thinking skills.

This is in line with previous research conducted by Ardillah and Novita (2015), Nursyamsi and Corebima (2016), and Dewi Sartika Br Tambunan (2017) which stated that the average posttest score in the experimental class was higher than the average posttest score in the control class.

Student learning outcomes are better with the NHT type cooperative learning model compared to conventional learning because students in the experimental class learn by exchanging ideas. During the learning process, students were more active in finding solutions to problems given by the teacher compared to students in the control class who used conventional learning models.

In this study, the researcher applied the NHT type cooperative learning model which had an impact on student learning outcomes. Although the researchers had followed the

procedures that had been made at the planning stage, there were still obstacles encountered when using this model at each stage. The obstacles encountered included student confusion and inactivity, the indiscipline of some students when forming groups, the lack of discipline and confidence of a small number of students in conducting discussions and experiments, and some students had difficulty in concluding the learning.

However, this can be managed well to achieve better results with the same learning model. Researchers can cooperate with subject teachers at the school so that teachers can directly observe the atmosphere and teaching and learning activities during the research. Teaching and learning activities during the research. It is also beneficial for researchers to exchange ideas and share information with subject teachers. The researcher can collaborate with the subject teacher at the school so that the researcher can directly observe the learning environment and practices during the research. In addition, it would be beneficial for the researcher to exchange concepts and disseminate knowledge with teachers who specialize in the field under study.



## CONCLUSION

Research carried out at SMAN 1 Secanggang has concluded that the learning outcomes of students who are given NHT learning are higher than those of students who are given Conventional learning. This can be seen based on the average learning outcomes of experimental class students who received NHT learning of 78.67 while the learning outcomes of control class students who received Conventional learning were 65.33. There was a significant influence on student learning outcomes of SMAN 1 Secanggang on Optical Devices Topic through cooperative learning model numbered head together (NHT) type.

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