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THE IMPLEMENTATION OF THE NUMBERED HEAD TOGETHER (NHT) COOPERATIVE LEARNING MODEL TO ENHANCE STUDENT LEARNING OUTCOMES IN THE TOPIC OF MECHANICAL MEASURING INSTRUMENTS AT SMKN 1 TUNJUNG TEJA

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Abstract

In this study, the researchers want to find out how much better students learn mechanical measuring instruments when they use the NHT type of joint learning model compared to when they use the traditional model of learning at SMKN 1 Tunjung Teja. A non-equivalent control group approach is used in this kind of study, which is kind of like an experiment. The people who took part in this study were students in class X at TKRO SMKN 1 Tunjung Teja. A learning outcome test was used as a study tool, and the T-test and N-gain test were used to analyze the results. The results showed that the experimental class that used the NHT learning method learned a lot. They got an average score of 22.80 on the pretest and 90.80 on the posttest. The control class had an average score of 21.47 on the pre-test and 49.26 on the post-test for learning results. A significant value of 0.00 ≤ 0.05 was found when the independent sample t-test test was used to test the claim. The N-gain number for the experimental class was 88.10% with high criteria, while it was 35.71% for the control class with intermediate criteria. This shows that the students learned more. What this means is that using the NHT type group learning model makes learning about mechanical measuring tools much more effective.

Keywords : Learning Outcomes, Mechanical Measuring Instrument Material, NHT Cooperative Learning Model, Vocational School Students

Abstrak

Penelitian ini tujuannya mengukur hasil belajar dan menguji peningkatan hasil belajar siswa pada materi alat ukur mekanik dengan penerapan model pembelajaran kooperatif tipe NHT jika dibandingkan dengan hasil belajar model konvensional di SMKN 1 Tunjung Teja. Non equivalent control group design digunakan dalam jenis penelitian eksperimen semu. Siswa kelas X TKRO SMKN 1 Tunjung Teja menjadi populasi pada penelitian ini. Instrumen penelitian yang dipergunakan ialah tes hasil belajar, dan uji T-test serta N-gain dipergunakan dalam menganalisis data. Hasil penelitian menunjukkan bahwa kelas eksperimen yang menggunakan metode pembelajaran NHT bahwa hasil belajar diperoleh nilai rata-rata 22,80 pada pretest dan 90,80 pada posttest. Kelas kontrol mempunyai nilai rata-rata pre-test 21,47 dan hasil belajar sebesar 49,26 pada post-test. Hasil signifikansi 0,00 ≤ 0,05 ditemukan ketika uji independent sample t-test dipergunakan dalam menguji hipotesis. Nilai N-gain kelas eksperimen yaitu 88,10% dengan kriteria tinggi, sedangkan kelas kontrol sebesar 35,71% dengan kriteria sedang. Hal tersebut menunjukkan bahwa hasil belajar siswa meningkat. Hal tersebut menunjukkan bahwa dengan model pembelajaran kooperatif tipe NHT membuat pembelajaran tentang alat ukur mekanik jauh lebih efektif.

Katakunci: Hasil Belajar, Materi Alat Ukur Mekanik, Model Pembelajaran Kooperatif NHT, Siswa SMK.

Introduction

Education has a key role to play in preparing young people for upcoming challenges. Its function is to maximally explore and develop students' potential and skills (Solikhin, 2020). Vocational High School (SMK) as one type of formal education with the aim of helping students become better at following changes in art, science, and technology independently. It also helps students prepare for the world of work and build a professional attitude (Khurniawan, 2016). Basic automotive engineering work (PDTO) is part of a scientific discipline that can help work-ready students (Alwi, 2019). Therefore, PDTO subjects play an important role as basic material for students to do work on other competencies in the automotive field.

Basic Work Automotive Engineering or PDTO as a subject contained in the 2013 curriculum. In 2021, there was a simplification of the 2013 curriculum into a prototype curriculum due to COVID-19, which was later renamed the independent curriculum (Qomariyah &; Maghfiroh, 2022). PDTO subjects in the independent curriculum were eliminated and changed to Automotive Engineering Basics (DDTO). Good learning outcomes indicate that students have achieved learning competencies or learning outcomes. One of the learning outcomes (CP) about measuring instruments at the end of phase E of the DDTO course, students are expected to understand the basics of automotive engineering. Students must be able to use measuring instruments because they are fundamental skills and are often used in engineering (Irawan, 2016).

Based on the findings of interviews and documentation studies with the vice principal for curriculum at SMKN 1 Tunjung Teja, Serang Regency, it was found that students had difficulty understanding the material of measuring instruments, especially calipers and screw micrometers. Student learning outcomes seen in the end-of-semester assessment of PDTO subjects for the 2022-2023 school year found that 48.10% of 79 students had graduated above KKM (minimum completeness criteria), as many as 38 students and 51.90% of 79 students were still below KKM as many as 41 students where the school KKM score was 75. The results of observations on grade 12 TKRO students in the practicum workshop of SMKN 1 Tunjung Teja, it was found that students still had difficulty in reading micrometer measuring instruments and calipers in the subjects of Chassis Maintenance and Power Transfer. In the classroom, learning still often focuses on the teacher's primary role, where students listen to explanations from the teacher and are then given tasks to complete individually. Active student participation in the learning process in the classroom is still relatively low.

In every educational environment, the teaching and learning process must create interactions that are dynamic, inspiring, full of challenges, and able to motivate students while still making learning a fun experience (Maharitas, 2018). Evaluation of student achievement is the main benchmark in assessing the effectiveness of the learning process. Therefore, it is important to constantly look for innovative teaching techniques and methods to stimulate optimal development of student learning outcomes. The cooperative learning paradigm as one that has been proven successful in increasing the level of student cooperation and improving learning outcomes (Haniyah et al., 2014).

Learning problems related to the lecture model, where the classroom is teacher-centered, are anticipated to be solved with the NHT cooperative learning model that is able to create an interactive learning environment (Manafe et al., 2022). This learning model has advantages that match its name, namely, emphasizing peer dialogue and pointing to numbers written on the heads of each group member (Shofa &; Azizah, 2022). Student interest in learning the subject may be triggered by the teacher randomly placing numbers in their heads. Students must be attitudefully prepared to come to the front of the class and offer their solutions to their classmates because they do not know who the teacher will choose. Despite the fact that NHT has been used in a number of

previous studies, more research is still needed to fully understand its potential to improve student learning outcomes.

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Methods

Researchers in this study used the non-equivalent control group method to conduct research similar to experiments. The experimental class and control class were randomly selected which were fair (Abraham &; Supriyati, 2022). The traditional learning model was used by the control group, in contrast to the NHT cooperative learning model used in the experimental group. Those who participated in this research were students of SMKN 1 Tunjung Teja class X Automotive Light Vehicle Engineering (TKRO). The experimental class was called X TKRO 1 and with a total of 25 students. The control class is called X TKRO 2 and has a total of 34 students. This study was established using a saturated sampling approach.

The NHT Cooperative Learning Model is the independent variable of this study. Meanwhile, the dependent variable is student learning outcomes. A written test was used to collect the data needed for the study. A multiple-choice test is conducted. There are tests before and after learning. There are various ways to analyze data, such as validity, reliability, descriptive analysis, normality, homogeneity, *independent sample t-test*, and N-gain.

Results and Discussion

Normality Test

This test is done before hypothesis testing because it needs to be proven that the data is normally distributed. The Kolmogorov-Smirnov test with a significance level of 5% (0.05) was used for the normality test on SPSS 23. After testing, the normality test results are as follows:

Table 1. Normality Test Results

Kelas	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Pre test eksperimen	.143	25	.198
Post test eksperimen	.156	25	.121
Pre test kontrol	.125	34	.195
Post test kontrol	.138	34	.102

A significance value of 0.198 was found in the experimental class pre-test in table 4.4, and a significance value of 0.121 was found in the experimental class post-test. The significance value of the control class pre-test was 0.195, and the control class post-test significance value was 0.102. When the Sig value exceeds 0.05, it indicates that the data is normally distributed. All previously described data show a significance value of >0.05. So, the conclusion is that the data from both groups have a regular (normal) distribution.

Homogeneity Test

The Levene test was used in SPSS 23 to carry out the test. The following table shows the results of these tests:

Table 2. Homogeneity Test Results

	Levene Statistic	df1	df2	Sig.
Based on Mean	37.474	1	57	.000
Based on Median	36.809	1	57	.000
Based on Median and with adjusted df	36.809	1	39.643	.000
Based on trimmed mean	37.776	1	57	.000

From the table above, the significance value achieved is 0.00 which indicates that the distribution of data is not uniform or heterogeneous because it is less than 0.05. The normality test is a requirement that must be met to proceed to the hypothesis test, while the homogeneity test is not an absolute requirement (Hasyim et al., 2021).\

Independent Sample T-Test

To decide whether to accept or reject a claim, hypothesis testing is used to ensure its statistical correctness (Muchdar &; Firmansyah, 2023). To compare the differences between the two groups, the t-test is a hypothesis test whose decision: if the significance value > 0.05 then the hypothesis is refuted. The claim may be accepted if the significance value is <0.05. There are two initial assumptions or hypotheses about this study, which can be elaborated as follows:

Ho: $\mu 1 = \mu 2$

Ha : $\mu 1 \neq \mu 2$

Information:

$\mu 1$ = Average learning outcomes in experimental classes

$\mu 2$ = Average learning outcomes in the control class

As shown in the following table, the independent sample t-test uses SPSS 23:

Table 3. Test Results t

	t-test for Equality of Means						
	t	df	Sig (2-tailed)	Mean difference	Std. Error Difference	95% Confidence Interval of the Difference	
						lower	upper
Equal Variances not assumed	11.432	40.925	.000	41.535	3.633	34.198	48.873

From the table, the value of t is calculated is 11.43 so that tcalculate > ttable where ttable = 2.02. The significance value (2-tailed) is 0.000 (<0.05). This shows that there are differences in learning outcomes between the control and experimental classes. So Ho is rejected and Ha is accepted.

N-Gain

Method in comparing the increase in values before and after treatment (Eliza et al., 2022). The following is the result of calculating the N-gain value using SPSS:

Table 4. N-gain Test Results

	Kelas		Statistik
N-Gain %	Eksperimen	Mean	88.10
	Kontrol	Mean	35.71

From the N-gain data recorded in the table above, it appears that the experimental class using the NHT type cooperative learning model managed to achieve an average N-gain of 88.10% or 0.88. Meanwhile, the control class with conventional learning models only achieved an average N-gain of 35.71% or 0.35. According to the N-gain test criteria available in table 3.4, the conclusion is that the increase in learning achievement through the use of NHT-type cooperative learning models is included in the high category, while conventional models are included in the medium category.

This proves Saleh and Samsul Hadi's research that the learning outcomes of students applying the NHT type cooperative learning model to mechanical measuring instrument material are better than using conventional models (Saleh &; Hadi, 2015). This positive result is supported by the research of Vitani Damanik et al in 2022. The results of the journal they wrote, namely the application of the NHT learning model with Mind Mapping media, showed that student learning outcomes in class XI MAN 3 North Aceh elasticity material had a significant increase (Damanik et al., 2022). Research by Rina Neneng Ambar Wati et al in 2022 shows that the average learning outcomes of students in Physics subjects increase significantly after applying the NHT learning model (Ambar Wati et al., 2022).

Judging from the data obtained, the number of students in the experimental class is less than that of the control class. Classes that have many students have an average learning outcome score that is no better than classes that have fewer students. A large number of students in a class does not always result in ineffectiveness in the learning process, and vice versa. The number of students in one class does affect students' social cognitive, but the effect is not significant (Nafi'ah &; Islakhudin, 2020). Success in the learning process is not solely due to the small number of students, but more related to meeting the right learning process standards, the teacher's ability to activate students, mastery of learning materials, the ability to attract students' interest and attention, and expertise in motivating them to be actively involved in learning (Wahyuningsih et al., 2019).

During learning, students discuss with their groups in working on LKPD so that students who have more understanding will help students who do not understand so that each group member masters the material and is responsible for their group answers. Random calling of head numbers by teachers makes students actively involved in discussing with their group mates because students must be prepared if their head number is mentioned, they must come forward to present the results of the discussion (Imam et al., 2022). The use of the NHT type cooperative learning model is not entirely perfect, of course, this model also has weaknesses such as not calling all group members to present the results of group discussions (Rusmawati et al., 2013).

Conclusion

Students of SMKN 1 Tunjung Teja experienced an improvement in their learning outcomes about mechanical measuring instruments when used the NHT Type Cooperative Learning Model. This is better than when conventional models are used. This is indicated by the significance value of the T test, which is 0.00 < 0.05 which means that learning outcomes increase significantly. So teachers can think of this NHT learning model as they find new ways to teach. More research needs to be done on other things that can help improve student learning outcomes.

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