Implementation of the Numbered Heads Together Learning Model to Improve Students' Learning Outcomes

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ABSTRACT

This study aims to determine how the implementation of the Numbered Heads Together (NHT) learning model contributes to the improvement of students' learning outcomes. The method used was a pre-experimental approach with a One-Group Pretest–Posttest design, involving only one class as the experimental group, without a control class. Data were collected through a pretest and a posttest, and then analyzed using the Normality test and the Hypothesis test (Paired Sample T-Test) with the SPSS Version 25 program. The research results showed that the average posttest score was 80.34, with the Paired Sample T-Test yielding a t-value of 9.396 and a significance level of 0.000 ($p < 0.05$), exceeding the established Minimum Mastery Criteria. These findings show that implementing the Numbered Heads Together learning model significantly improved students' learning outcomes. Therefore, Numbered Heads Together can be used as an effective learning model to enhance the effectiveness of the learning process.

Keywords: NHT, learning outcomes, computer systems

INTRODUCTION

Education plays an important role in improving the quality of existing human resources. Education is a process that aims to equip students to adapt to their environment as effectively as possible. One of the key factors that contributes to student success is learning achievement [1]. Teachers have a crucial role in guiding this process, thereby enabling the expected changes to be achieved in accordance with the predetermined objectives [2]. As explained by [3], several factors need to be considered in students' development in order to improve their learning outcomes. Factors such as interest and motivation are very important in achieving learning objectives.

According to [4], learning objectives can be achieved effectively, among others, through the implementation of interactive learning models. Learning is an effort carried out to transfer knowledge, organize, and structuring the environment in various ways so that the learning system can conduct the learning process efficiently and effectively to achieve satisfactory learning outcomes and to make learning more interesting, meaningful, and varied, because students are given the opportunity to be directly exposed to real world situations related to what they are learning; thus, learning does not become monotonous and lacks variation.

A learning model is an approach, strategy, method, technique, or tactic in the learning process that organizes lessons into a coherent and systematic sequence, thereby forming an integrated learning framework. In cooperative learning, students are given opportunities to communicate and engage in social interaction, meaning that during the learning process, students are required to be active and responsible for the learning outcomes that are achieved [5]. Based on what is explained by [6], success in learning is supported by the strategies or methods employed. Effective learning is very important because it can facilitate the learning process and enable optimal outcomes.

From the results of the study on the Numbered Heads Together learning model and students' learning outcomes conducted by [7], there were clear differences and significant improvements in the learning process before and after the implementation of the Numbered Heads Together model. The posttest results showed an average score of 73.24 in the experimental class and 58.62 in the control class. In other words, the average score of the class that used the NHT model was higher than that of the conventional class. These findings indicate that a learning model can be highly effective when properly implemented.

However, based on the results of the observations and interviews conducted, the data indicated that Class VIII D had the lowest average score, namely 72.76. Several students stated that one factor contributing to this condition was that learning remained teacher-centered, leaving students passive during the learning process. This situation indicates the

need for more innovative learning models, especially in Informatics, which requires practical and procedural understanding.

As explained by [8], low student learning outcomes are caused by the ineffectiveness of the teaching methods used by teachers in managing learning activities. As a result, the learning process has not actively engaged students in the classroom. In fact, student activeness in learning is a key factor in their success. Therefore, as stated by [9], it is necessary to increase the participation of all students in the learning process by providing them with opportunities to take an active role. Therefore, every teacher must be truly well prepared in their profession and possess a variety of skills, including the ability to apply diverse learning strategies, utilize various learning media, and educate students effectively [10]. As stated in [11], a learning model can be an appropriate option, meaning that teachers can select learning models that are suitable and efficient in order to achieve their educational objectives.

In the context of Informatics learning, particularly in the computer systems component, students are required to recognize the functions and interrelationships among hardware, software, and brainware comprehensively. Therefore, a learning approach is needed that can enhance students' activity and learning outcomes in the Informatics subject [12]. Through the Numbered Heads Together learning model, students are encouraged to think critically and analyze information. This technique motivates students to solve the given problems or questions and provides opportunities for students to participate actively [13]. The Numbered Heads Together learning model offers an effective and sustainable approach. By actively engaging students, encouraging cooperation within groups, and developing critical thinking skills, NHT can help students deepen their understanding of the material while also enhancing their self-confidence [14].

As stated in [15], the implementation of this model aims to enhance students' academic mastery by emphasizing their ability to transfer and apply knowledge, understanding, and skills to other students. As explained by [16], this model has the advantage of encouraging students to be more proactive and take full responsibility for understanding the learning material, both in group activities and in individual learning.

Thus, to address these problems, this study offers the application of the Numbered Heads Together (NHT) learning model as an alternative in Informatics learning. Through the implementation of the NHT model, students are encouraged to actively participate in group discussions, exchange ideas, and take individual responsibility for their learning. It is expected that this learning model can increase student engagement, strengthen conceptual understanding, and create a learning process that is more interactive and effective than conventional learning.

Therefore, in this context, this study aims to implement learning by applying the Numbered Heads Together learning model to examine the improvement in students' learning outcomes before and after its implementation in the Informatics subject, specifically on the topic of computer system components.

RESEARCH METHOD

This study is experimental research. This research examined the implementation of the Numbered Heads Together learning model to improve students' learning outcomes in the subject of computer system components. This study employed a pre-experimental, one-group pretest-posttest design, with only one class serving as the experimental group and no control group. The research design is presented in Table 1 as follows.

Table 1. One-Group Pretest–Posttest Research Design

Group	Pretest	Treatment	Posttest
One-Group	O_1	X	O_2

The population in this study consisted of all students in Classes VIII B to VIII D, totaling 91 students. The sample was determined using purposive sampling based on certain criteria [17], including a class with an average score still below the Minimum Mastery Criteria (specifically Class VIII D), with a total of 29 students. Data collection in this study was conducted through a pretest and a posttest. The pretest was administered before the model's implementation, and the posttest was conducted afterward to measure students' learning outcomes. The test used was a multiple-choice test. The data collection instruments used were tests and observation sheets. The data analysis techniques included the Normality test [18] and the Hypothesis test (Paired Sample T-Test) using the SPSS Version 25 program [19] and [20].

hypothesis test [20]. These tests were intended to identify improvements in students' learning outcomes following the implementation of the learning model. Furthermore, the findings were analyzed and discussed by relating them to relevant learning theories and previous research to provide a deeper understanding of the Numbered Heads Together learning model.

This study administered a pretest before the implementation of the learning activities began. After the pretest, the class used the Numbered Heads Together learning model for three learning sessions. After the treatment, a posttest was administered. All pretest and posttest data were statistically analyzed to evaluate improvements in learning outcomes.

RESULTS AND DISCUSSION

This study began with the presentation of a series of statistical tests, including the normality test and the

Table 2. Normality Test

	Shapiro-Wilk		
	Statistic	df.	Sig. (2-tailed)
Pretest	0.932	29	0.062
Posttest	0.934	29	0.069

Based on the results of the Shapiro–Wilk normality test in Table 2, significance values of 0.062 and 0.069 were obtained for the pretest and posttest data. Because both significance values are greater than 0.05 (> 0.05), it can be concluded that the pretest and posttest data are normally distributed, which indicates that there is a difference in students' conceptual understanding after the application of the Numbered Heads Together learning model. These results show that the data meet the normality assumption. In accordance with the statement of [21], the normality test is a procedure used to determine whether learning outcome data obtained through the Numbered Heads Together (NHT) learning model are normally distributed or not.

A normal data distribution functions as an initial indicator that the implementation of the learning model exerts a consistent effect on students' learning [22]. This means that the NHT learning model makes a substantial contribution to learning outcomes [23]. In line with the findings of [24], these results indicate the importance of student-centered learning approaches and the provision of guidance that enables students to construct concepts independently, which ultimately strengthens their understanding.

Next, a Paired Samples T-Test was conducted to determine whether there was a difference in students' learning outcomes before and after learning using the NHT model. The basis for decision making in this Paired Sample T-Test is that if the obtained Sig. (2-tailed) value is < 0.05, then an improvement in learning outcomes is indicated.

Table 3. Paired Samples Statistic

	Mean	N	Std. Deviation
Pretest	56.03	29	15.663
Posttest	80.34	29	6.399

Based on Table 3, the descriptive statistics of the pretest and posttest scores show a significant increase in the mean score from 56.03 on the pretest to 80.34 on the posttest. The standard deviation decreased from 15.663 to 6.399, indicating that the distribution of students' scores became more homogeneous after the treatment and that learning outcomes improved.

Based on the analysis presented in Table 3 above, the improvement in students' learning outcomes was due to the successful implementation of the learning model, which positively affected students' skills and fostered an active learning atmosphere during the learning process. In line with the statements reported in the studies by [25] and [26], Melalui keterlibatan aktif dalam diskusi kelompok, pengamatan, dan penyelesaian masalah secara bersama, siswa dapat mengembangkan keterampilan proses belajar mereka secara signifikan dan memudahkan siswa untuk lebih memahami materi.

Table 4. Paired Samples Test

	Paired Difference			
	Mean	t	df.	Sig. (2-tailed
Pretest - Posttest	24.310	9.396	28	0.000

Based on Table 4, which presents the results of the paired sample t-test, a t-value of 9.396 and a significance level of 0.000 (p < 0.05) were obtained. These results provide strong statistical evidence for rejecting H0 and accepting Ha. Thus, there is a significant difference in the students' mean scores before and after implementing the Numbered Heads Together (NHT) learning model. This finding is supported by the study of [27], which states that improvements in learning outcomes indicate that learning designed to involve group activities can facilitate a more optimal understanding of the learning material. Similarly, [28], also explains that this condition makes each student more prepared to demonstrate their understanding, thereby having a positive impact on the improvement of learning outcomes.

Theoretically, these findings are in line with constructivist theory, which emphasizes that students construct knowledge through active engagement in the learning process [29]. In addition, these results support Vygotsky's view regarding the importance of social interaction in cognitive development. Therefore, the implementation of the Numbered Heads Together (NHT) model, which emphasizes collaboration and active participation, has a strong foundation in modern educational theory for enhancing both cognitive and social abilities. Similarly, as stated in [2] In this context, the teacher plays a facilitative role, guiding the learning process and enabling students to be more actively involved in constructing meaningful knowledge. In addition, the results of this study are consistent with [30], who found that NHT has a significant effect on communication skills. Through this learning strategy, students' abilities to think systematically, logically, and critically are developed, or, in other words, their intellectual abilities are strengthened as an integral part of the learning process. Similarly, [31] proves the effectiveness of NHT in relation to the functional understanding of the learning material. In addition, the study by [32] on the effectiveness of NHT in junior high school learning was also shown to be superior to conventional teaching methods.

Overall, the fact that NHT successfully improved learning outcomes, both in terms of students'

conceptual understanding of Informatics and overall learning effectiveness, indicates that this model is effective and can be applied across various subjects, including the Computer System Components material examined in this study. This condition further strengthens students' understanding of the concept of Computer System Components. Supported by the studies of [7] and [33], interactions during the learning process also contribute to the creation of a collaborative and effective learning atmosphere, thereby positively impacting students' overall learning outcomes. Although the subject matter examined differs from that of previous studies, this research offers novelty in applying the Numbered Heads Together (NHT) learning model to Computer System Components, while maintaining the same objective: improving students' learning outcomes.

The study by [9] also shows that the cooperative learning model Numbered Heads Together (NHT) improves students' learning outcomes. This is further strengthened by [34] which states that through the implementation of the NHT learning model, students do not merely become passive recipients or listeners of information, but are actively involved in discussions, thereby strengthening their understanding and mastery of the material being taught. This condition creates a more dynamic learning atmosphere and makes students more enthusiastic in the learning process [35]. In addition, studies conducted by [10] and [36], show that the use of the Numbered Heads Together model can significantly improve students' learning outcomes and promote the development of problem-solving skills through group collaboration and decision-making practice.

Based on the research analysis and the discussion above, it can be concluded that the Numbered Heads Together (NHT) learning model has proven to be an effective and innovative strategy for improving students' learning outcomes, particularly in Computer System Components. Overall, these findings indicate that the Numbered Heads Together (NHT) learning model not only enhances learning outcomes but also increases student engagement in collaborative learning, critical thinking, and knowledge sharing. This model fosters students' sense of responsibility, participation, and self-confidence through group discussions and opportunities to express their ideas. In addition, NHT develops communication and collaboration skills by creating an interactive, open, and inclusive learning environment for all students.

CONCLUSION

This study proves that implementing the interactive Numbered Heads Together (NHT) learning model effectively improves the learning outcomes of Grade VIII students in the Computer Science subject at SMPN 48 Samarinda. Based on the data analysis, there was a significant improvement in students' learning outcomes, with the average pretest score of 56.03 increasing to 80.34 in the posttest. The paired-samples T-test yielded a t-value of 9.396 (p < 0.05), indicating that the Numbered Heads Together learning model effectively enhances students' learning outcomes and exceeds the established Minimum Competency Criteria (KKM).

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