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THE EFFECT OF THE NUMBERED HEADS TOGETHER (NHT) PROJECT-BASED COOPERATIVE LEARNING MODEL ON THE INTERESTS AND MATHEMATICS LEARNING OUTCOMES OF GRADE IV STUDENTS

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ABSTRACT

Mathematics learning in elementary schools often faces challenges in the form of low student interest and learning outcomes. This occurs because the learning process still tends to be one-way, so that students are less actively involved and less motivated in understanding concepts. This condition requires teachers to implement more innovative, interactive, and student-centered learning models to increase their involvement and understanding. Based on these problems, this study was conducted to determine the effect of the project-based Numbered Heads Together (NHT) cooperative learning model on the interest and learning outcomes of fourth-grade students at MI An-Nashar Timor-Timur, Makassar City. The study used an experimental method with a One Group Pretest-Posttest design involving 20 students as a sample. Research data were obtained through learning outcome tests, learning interest scores, and teacher and student observation sheets. All data were analyzed using normality tests, homogeneity tests, and hypothesis testing through ANOVA. The results showed that the application of the project-based NHT model was able to increase student interest in learning from the low category to the high category, as well as improve learning outcomes from the very low category during the pretest to the high category in the posttest. Teacher and student activity also experienced a significant increase. Statistical tests showed a significance value <0.05, indicating that the project-based NHT model had a positive and significant impact on mathematics interest and learning outcomes. Therefore, this study concluded that the project-based Numbered Heads Together (NHT) model is effective in improving the quality of mathematics learning in elementary schools.

1. INTRODUCTION

Education is a crucial instrument for improving the quality of human resources (HR) in facing global competition (Alannasir, 2016) Schools, as formal educational institutions, provide a structured

learning environment through a curriculum implemented in the learning process (Diana & Alannasir, 2023).

Educational institutions also play a role in improving the equity and quality of education. Therefore, teachers are required to create effective and enjoyable learning (Irviana et al., 2025). (Nugroho et al., 2017) emphasized that education has a significant impact on academic quality, including in mathematics, which is often considered difficult by students. This difficulty stems from the abstract nature of mathematics, which demands conceptual understanding and problem-solving skills. Therefore, innovative and effective learning approaches are needed to increase student interest and learning outcomes in mathematics.

According to (Wahid, 2019), elementary school education is the main foundation for the success of the teaching and learning process at the secondary and tertiary levels. The successful achievement of educational goals depends heavily on the quality of learning experienced by students starting in elementary school. At this stage, mathematics learning plays a crucial role in developing students' thinking skills. Children are trained to transform behavior from ignorance to knowledge through the development of the cognitive, affective, and psychomotor domains (Amanah et al., 2023). To improve the quality of learning, methods are needed that can stimulate student interest and learning outcomes.

Observations conducted at MI An-Nashar Timor-Timur Makassar from October 3–7, 2024, revealed a decline in interest and learning outcomes in mathematics. Students appeared less enthusiastic, did not focus on teacher explanations, and learning rarely used project-based activities. Interviews conducted on October 8, 2024, indicated that the implementation of the project-based Numbered Heads Together (NHT) model was suboptimal. Learning was still dominated by lectures, some students struggled with reading, and low enthusiasm made it difficult for students to understand the material. This was reinforced by test results, where only 11 out of 20 students achieved the Minimum Competency (KKM) (≥ 75), while the other 9 students fell below the KKM.

These issues directly impacted student interest and learning outcomes, necessitating more engaging and interactive learning solutions. Previous research has shown that collaborative learning models such as Numbered Heads Together (NHT) can improve participation and learning outcomes. This method encourages students to work together in small groups, resulting in greater activity, engagement, and understanding of the material (Setyowati & Inah, 2020). The NHT model, which emphasizes collaboration by assigning numbers to each group member, has been shown to increase student engagement, social skills, and communication skills.

Furthermore, projects allow students to apply knowledge in real-life contexts, thereby increasing motivation and interest in learning. The combination of the NHT model with project-based learning is expected to create a more engaging, meaningful, and in-depth learning experience for students. At MI An-Nashar Timor-Timur Makassar, low learning interest is often a barrier, especially when the teaching methods used are monotonous. This lack of student engagement in the learning process also contributes to low learning outcomes. By examining the simultaneous implementation of the Numbered Heads Together (NHT) model and project-based learning, this research is expected to contribute to designing more innovative and engaging learning strategies. This research also aims to provide recommendations to educators regarding appropriate methods tailored to student needs to improve the quality of learning for fourth-grade students at MI An-Nashar Timor-Timur Makassar.

Furthermore, this research is expected to provide insight into the importance of implementing innovative learning methods, both in face-to-face and online learning. The integration of the NHT model with project-based learning is seen as a solution to address learning challenges at the elementary school level.

2. METHODS

This study used an experimental method with a One Group Pretest–Posttest design. Experimental research aims to determine the effect of a treatment on the variables studied. In this

study, the treatment was the implementation of the Numbered Heads Together (NHT) project-based cooperative learning model, which was then evaluated by comparing pretest and posttest results to observe changes in students' interest and mathematics learning outcomes. The One Group Pretest–Posttest design was chosen because it involved only one group without a control group, allowing comparisons between initial and final conditions to directly demonstrate the effect of the treatment.

The independent variable in this study was the project-based NHT learning model, while the dependent variables included interest in learning and mathematics learning outcomes, encompassing cognitive, affective, and psychomotor aspects. An analysis of the relationship between the two variables was conducted to determine the significance of the model's influence on the dependent variable. This design allowed researchers to uncover and explain the changes that occurred after the implementation of structured cooperative learning.

The study was conducted at MI An-Nashar Timor-Timur, Makassar City, involving 20 fourth-grade students. The fourth-grade students were selected based on the stability of their cognitive and social abilities, which were suitable for the project activities and group discussions in the NHT model. The study took place over four sessions in October–November 2025.

The data collection procedure in this study involved three main techniques:

1. Tests (Pretest and Posttest)

Tests were used to measure students' mathematics learning outcomes in the topic of plane figures. The pretest was administered before the treatment to determine students' initial abilities, while the posttest was administered after the treatment to assess changes in abilities. The test instrument was designed based on learning indicators and underwent validity and reliability testing before use.

2. Learning Interest Questionnaire

The questionnaire was used to measure students' level of learning interest before and after the implementation of the project-based NHT model. The questionnaire used a Likert scale with categories of SS, S, TS, and STS. Students were first given an explanation to help them understand each statement and then filled it out according to their actual situation. This questionnaire served to assess changes in students' interests after participating in the learning process.

3. Observation Sheet

The observation sheet was used to observe teacher and student activities during the learning process, including student involvement in group discussions, project work, and affective and psychomotor skills that emerged during the activity. Observations were conducted using a sheet containing the indicators to be observed, ensuring a more focused and systematic data recording process.

4. Documentation

Documentation was used to collect data in the form of activity photos, student project results, worksheets, and notes supporting the learning process. This documentation serves as supporting evidence that the treatment was implemented according to plan and provides a concrete overview of the implementation of the learning model.

Through this series of methods, this study aims to obtain a comprehensive overview of the effect of the project-based NHT learning model on the interest and mathematics learning outcomes of fourth-grade students at MI An-Nashar Timor-Timur, Makassar City.

3. RESULTS AND DISCUSSION

RESEARCH RESULTS

a. General Description of the Implementation of the Project-Based Numbered Heads Together (NHT) Learning Model on the Interest and Mathematics Learning Outcomes of Fourth Grade Students of MI An-Nashar Timor-Timur, Makassar City

Based on the perception sheets and observation results, the implementation of the project-based Numbered Heads Together (NHT) model demonstrated that teachers had prepared materials, lesson plans, and project designs before the activity began. In this model, teachers not only delivered the material but also designed project activities that served as guidelines throughout the learning process.

Learning was carried out through several stages: dividing students into groups and explaining the objectives, presenting the material on geometric shapes, working in groups using worksheets (LKPD) to design and create projects, presenting the results of group work, and providing feedback and appreciation by the teacher. Teacher observations and perceptions served as important references in assessing the effectiveness of the project-based NHT model in improving the interest and learning outcomes of fourth-grade students at MI An-Nashar Timor-Timur in Makassar City.

Overall, the implementation of this model aimed to increase student activity, interest, and understanding through group collaboration and directed project activities.

Teacher perceptions of the implementation of the Numbered Heads Together (NHT) project-based cooperative learning model in mathematics learning are shown in the following table:

Table 3.1 Teacher Activity Observation Results

	Meeting I	Meeting II	Meeting III	Meeting IV	Meeting V
Maximum score/acquired score	*Pretest*	11/22	15/22	18/22	*Posttest* dan Angket
Percentage (%)		50%	68,18%	81,81%	
Category		Not enough	Enough	Very good	

Based on the table above, the indicators for the implementation of teacher activities at the first meeting were a pretest and questionnaire before treatment to determine the initial condition of student interest and learning outcomes. At the second meeting, a total score of 11 out of 22 was obtained with a success percentage of 50% which is included in the less category. Furthermore, at the third meeting, the score increased to 15 out of 22 with a success percentage of 68.18% which is included in the sufficient category. At the fourth meeting, the results showed a significant increase with a score of 18 out of 22 and a success percentage of 81.81%, which is in the very good category. Finally, at the fifth (last) meeting, a posttest and questionnaire were conducted after treatment to measure changes in interest and learning outcomes after the implementation of the project-based Numbered Heads Together (NHT) cooperative learning model.

Based on observations, students demonstrated enthusiasm and active engagement during the lesson. Through the implementation of the project-based Numbered Heads Together (NHT) cooperative learning model, students appeared to actively participate in thinking, collaborating, and completing group assignments with full responsibility. This type of learning activity is important to develop because it fosters effective interactions between teachers and students, thereby improving interest in and learning outcomes in mathematics.

Observations also showed that students collaborated well in groups, engaged in active discussions, and were actively involved in completing project assignments. The project-based NHT model helps students understand mathematical concepts more easily, develops critical thinking skills, and increases their confidence in expressing opinions and solving problems. Overall, the

implementation of this model has a positive impact on students' learning activities, motivation, and comprehension.

Based on the results of observations of student activities in the application of the Numbered Heads Together (NHT) type of cooperative learning model based on projects regarding interest and mathematics learning outcomes, it can be seen in the following table:

Table 3.2 Student Activity Observation Results

	Meeting 1	Meeting II	Meeting III	Meeting IV	Meeting V

Maximum score/acquired score	*Pretest*	14/22	17/22	20/22	P*osttest* dan Angket
Percentage (%)		63%	77%	90%	
Category		Not enough	Enough	Very good	

Based on the table above, it can be seen that the indicators of student activity implementation in the application of the Project-Based Cooperative Learning Model of the Numbered Heads Together (NHT) Type showed an increase in each meeting. In the first meeting, the researcher conducted a pretest and distributed questionnaires before the treatment to determine the students' initial abilities. In the second meeting, a total score of 14 out of a maximum score of 22 was obtained, with a success percentage of 63%, which falls into the fair category, as at this stage students were still adapting to the new learning model and group work processes had not yet run optimally.

Furthermore, in the third meeting, a total score of 17 out of 22 was obtained, with a success percentage of 77%, categorized as good, indicating that students had begun to adapt to project-based learning and showed increased activeness in discussions, asking questions, and collaborating within groups.

Then, in the fourth meeting, the score increased to 20 out of 22, with a success percentage of 90%, categorized as very good, as students were already able to collaborate effectively, complete projects responsibly, and actively participate in solving the given mathematical problems. Finally, in the fifth meeting, the researcher conducted a posttest and distributed questionnaires after the treatment to measure the improvement in students' interest and learning outcomes following the implementation of the model.

Overall, the results show that from the first to the last meeting, there was a significant increase in students' interest and learning outcomes in mathematics. This proves that the implementation of the Project-Based Cooperative Learning Model of the Numbered Heads Together (NHT) Type is effective in enhancing students' learning enthusiasm, group collaboration, and understanding of mathematical concepts among fourth-grade students at MI An-Nashar Timor-Timur, Makassar City.

b. The Influence of the Numbered Heads Together (NHT) Project-Based Cooperative Learning Model on the Mathematics Learning Interest of Fourth Grade Students of MI An-Nashar Timor-Timur, Makassar City

Based on the results of research conducted by researchers at MI An-Nashar Timor-Timur Makassar City, this research was conducted on July 21, 2025 to August 1, 2025 in the first semester of the 2025–2026 academic year. This research is entitled "The Effect of the Numbered Heads Together (NHT) Project-Based Cooperative Learning Model on the Interest and Mathematics Learning Outcomes of Grade IV Students of MI An-Nashar Timor-Timur Makassar."

The data regarding the interest and mathematics learning outcomes of grade IV stidents at MI An-Nashar Timor-Timur, Makassar City are as follows:

Tabel 3.3 Descriptive Test of Learning Interest Questionnaire

Descriptive Statistick									
	N Statistick	*Range Statistick*	*Minimum Statistick*	*Maximum Statistick*	*Sum Statistick*	*Mean*		*Std.Deviation Statistick*	*Variance Statistick*
						Statistick	*Std.Error*		
results	20	31.11	61.11	92.22	1598.89	79.9444	2.26562	10.13217	102.661
Valid N (listwise)	20								

Based on the results of descriptive statistical analysis of the questionnaire data processed using IBM SPSS Statistics version 26, the total number of respondents was 20. The questionnaire scores

showed a minimum score of 61.11 and a maximum score of 92.22, with a score range of 31.11. The total score from all respondents was 1598.89, and the average (mean) score obtained was 79.9444. This indicates that, in general, the respondents had a relatively high level of scores on the questionnaire before any treatment was given.

The standard deviation of 10.13217 indicates a considerable spread of data around the mean score. Meanwhile, the standard error of the mean, which is 2.26562, indicates the average sampling error in estimating the population mean. The variance value obtained was 102.661, which further supports the information regarding the level of data variability. All the analyzed data were declared valid, with a valid data count (Valid N) of 20 and no missing data.

Information regarding student classification according to guidelines from (Sipmiarti, 2023) can be seen in the following table:

Table 3.4 Distribution of Interests Based on Number of Students and Grade Range (%)

No.	Value Range	Number of People	Percentage (%)
1.	81% 100%	10 Person	50%
2.	61% - 80%	10 Person	50%
3.	41% - 60%	-	-
4.	21% - 40%	-	-
5.	0% - 20%	-	-

Based on the data presented, it appears that there are two value ranges that have a number of people, namely the range of 81%–100% and 61%–80%, each with 10 people or 50% of the total respondents. Meanwhile, in the value ranges of 41%–60%, 21%–40%, and 0%–20% there is not a single person included in them, so the number of people and the percentage are empty (blank). This indicates that all respondents are in the medium to high value category, with half reaching the highest value range (81%–100%). The absence of respondents in the low value range indicates that the overall performance or achievement of this group is considered good.

Meanwhile, the standard error mean value of 2.26562 indicates the average error rate of the sample relative to the population. The variance value obtained was 102.661, which confirms the level of data diversity. All analyzed data were declared valid, with a total of 20 valid data points (Valid N), with no missing data.

Tabel 3.5 Normality Test of Learning Interest Questionnaire

Tests Of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	*df*	*Sig.*	*Statistick*	*df*	*Sig*
category	*.152*	*20*	*.200*	*.906*	*20*	*.053*

Based on the results of the normality test conducted using two methods, namely Kolmogorov-Smirnov and Shapiro-Wilk, it is known that the data in the Category variable has a significance value (Sig.) of 0.200 for the Kolmogorov-Smirnov test, and 0.053 for the Shapiro-Wilk test. Both significance values are above the alpha limit of 0.05, which indicates that the data is normally distributed. The Shapiro-Wilk test is generally more recommended for small sample sizes ($n < 50$), and the results also show that there are no significant deviations from the normal distribution. Thus, it can be concluded that the data in the Category variable meets the assumption of normality and is suitable for analysis using parametric statistical tests.

c. The Effect of the Numbered Heads Together (NHT) Project-Based Cooperative Learning Model on the Mathematics Learning Outcomes of Fourth Grade Students of MI An-Nashar Timor-Timur, Makassar City

Based on the results of research conducted by researchers at MI An-Nashar Timor-Timut, Makassar City, from July 21 to August 1, 2025, data obtained through instruments revealed the initial

ability scores of fourth-grade students at MI An-Nashar Timor-Timut, Makassar City.

Information regarding the initial test results of fourth-grade students at MI An-Nashar Timor-Timut, Makassar City, can be found below:

Tabel 3.5 Descriptive Pretest Test

Descriptive Statistics

	N Statistic	Range Statistic	Minimum Statistic	Maximum Statistic	Sum Statistic	Mean		Std Devation Statistic	Variance Statistic
						Statistic	Std.Error		
Pretest Results	20	29.00	36.00	65.00	983.00	49.1500	2.14755	9.60414	92.239
Valid N (listwise)	20								

Based on the results of the pretest data analysis on 20 fourth-grade students, descriptive statistics were obtained. The analysis results showed that the average (mean) pretest score was 49.15 with a minimum score of 36.00 and a maximum score of 65.00. The range of scores of 29.00 indicates a significant difference between students with the highest and lowest scores. This indicates that students' initial abilities regarding the material taught still vary widely.

The standard deviation value of 9.60 and variance of 92.23 indicate that the data distribution is quite large, so it can be concluded that the level of heterogeneity of students' abilities in understanding the material before being given treatment is quite high. The total overall value (Sum) of 983.00 and the standard error of 2.14 indicate that the average estimation standard is quite accurate.

In general, the pretest results show that students' initial understanding of the material is still low because the average score is 49.15. Thus, it can be concluded that most students have not mastered the material before being given learning. This condition indicates the need for the implementation of innovative and interesting learning models to improve student understanding, one of which is through the project-based Numbered Heads Together (NHT) cooperative learning model. As categorized in the guidelines of the Ministry of Education and Culture (Dekdikbud), student information can be seen in the following table:

Tabel 3.6 Learning Outcome Frequency Categories

No.	Intervals	Frequency	Percentage %	Learning Outcome Category
1.	0-54	12	60%	Very Low
2.	55-64	4	20%	Low
3.	65-79	3	15%	Currently
4.	80-89	1	5%	Tall
5.	90-100	-	-	Very high
	Jumlah	20	100%	

Based on the learning outcomes data classified into five categories, it can be concluded that the majority of participants are in the very low category with a total of 12 people or 60% of the total 20 participants. Furthermore, as many as 4 people or 20% are included in the low category. Meanwhile, only 3 people or 15% are included in the medium category, but there are no participants who are included in the very high category (interval 90–100). This indicates that the majority of participants are still at a less than optimal level of achievement, so that efforts are needed to improve the learning process so that the distribution of learning outcomes can be more evenly distributed towards higher categories.

During the study, changes occurred in the class after the treatment was administered. These changes were reflected in the learning outcomes obtained after the post-test. These changes can be seen in the following data:

Data on the mathematics learning outcomes of fourth-grade students at MI An-Nashar Timor Timur, Makassar City, after implementing the Numbered Heads Together (NHT) project-based cooperative model.

Tabel 3.7 Descriptive Posttest

Descriptive Statistics									
	N Statistic	*Range Statistic*	*Minimum Statistic*	*Mximum Statistic*	*Sum Statistic*	*Mean*		*Std.Deviation Statistic*	*Variance Statistic*
						Statistic	*Std. Error*		
Posttest Results	20	27.00	72.00	99.00	1736.00	88.8000	1.85188	8.28188	68.589
Valid N (Listwise)	20								

Based on descriptive statistics, 20 participants took the posttest with scores ranging from 72–99, resulting in an average of 86.8, which is considered high. The total score of 1,736 participants with a standard deviation of 8.28 indicates that the majority of scores are close to the average, while the variance of 68.589 and standard error of 1.85 indicate a fairly representative average. These results reflect good participant performance, indicating that the Numbered Heads Together (NHT) project-based cooperative learning model is effective in improving learning outcomes. Although there are variations in understanding among students, the highest score is close to 100 and the lowest score is still in the moderate category, confirming the positive impact of this learning strategy on mastery of mathematical concepts. Subsequent learning outcomes can be categorized according to the guidelines of the Ministry of Education and Culture.

Tabel 3.8 Frequency Distribution Level of Learning Outcomes

No.	Interval	Frequency	Percentage %	Learning Outcome Categories
1.	0-54	0	0%	Very Low
2.	55-64	0	0%	Low
3.	65-79	4	20%	Medium
4.	80-89	9	45%	High
5.	90-100	7	35%	Very High
Amount		**20**	**100%**	Very Low

Based on the frequency distribution of post-test scores, none of the 20 students were in the very low (0–54) or low (55–64) categories. Four students (20%) were in the medium (65–79) category, nine students (45%) were in the high (80–89) category, and seven students (35%) were in the very high (90–100) category. These findings indicate that all students achieved good to excellent learning outcomes, with none falling below standard. This reflects the success of the learning process, as all students were able to achieve the targeted competencies.

After implementing the Numbered Heads Together (NHT) project-based cooperative learning model, the majority of students demonstrated optimal learning outcomes. The predominance of the very high category confirms that this model is effective in improving students' understanding and conceptual skills. The absence of students in the low or very low categories confirms that the implemented learning strategy has had a positive overall impact.

According to the research hypothesis, the implementation of the project-based NHT model has an impact on the interest and learning outcomes of fourth-grade students at MI An-Nashar Timor-

Timur, Makassar City. To test this hypothesis, inferential statistical analysis was used through ANOVA, after first conducting assumption tests in the form of normality and homogeneity tests.

Tabel 3.9 Normality Test of Learning Outcomes

Test Of Normality							
Results	Category	*Statistic*	*df*	*Sig*	*Statistic*	*df*	*Sig*
	1.00	.179	20	.094	.914	20	.077
	2.00	.112	20	.200	.943	20	.270

The table above shows that the pretest and posttest data are normally distributed. Based on the normality test, the p-value for the pretest is 0.077 and the posttest is 0.270, or described as Pretest 0.077>0.05 and Posttest 0.270>05, so the p-value (Sig) is 0.05. Thus, it can be concluded that the pretest and posttest are normally distributed.

A homogeneity test was conducted to determine whether the data from the sample class was homogeneous. The data to be tested for homogeneity were the results of the pretest and posttest. The homogeneity test was conducted using the System Statistical Package for Social Science (SPSS) version 26, with the testing criteria that if the significance value on the Based on Mean > 0.05, the data is homogeneous; otherwise, there is no homogeneity. The following data shows the results of the pretest and posttest homogeneity tests.

Tabel 3.10 Homogeneous Test of Learning Outcomes

Test of Homogeneity of Variance					
Results		Lavene Statistic	df1	df2	Sig.
	Based on Mean	1.293	1	38	.263
	Based on Median	.589	1	38	.447
	Based on Median and wist adjusted df	.589	1	35.995	.448
	Based on trimmed mean	1.238	1	38	.273

Berdasarkan Uji Levene, nilai signifikansi untuk Rata-rata Berbasis, Median Berbasis, Median Berbasis dan Sesuai, serta Rata-rata Berbasis Dipangkas masing-masing 0,263; 0,447; 0,448; dan 0,273, semuanya > 0,05, sehingga data memenuhi asumsi homogenitas variansi. Selanjutnya, untuk mengetahui perbedaan signifikan hasil belajar mahasiswa sebelum dan sesudah penerapan model pembelajaran kooperatif *Numbered Heads Together* (NHT) berbasis proyek, dilakukan analisis variansi (ANOVA). Hasil ANOVA disajikan pada tabel berikut.

Tabel 3.11 Uji Hipotesis Anova Hasil Belajar

Anova					
Results					
	Sum of Squares	df	Mean Square	F	Sig
Between Groups	14175.225	1	14175.225	76.277	.000
Within Groups	3055.750	38	80.414		
Total	17230.975	39			

The significance value of learning outcomes is known to be 0.00, meaning less than 0.05 (0.00 < 0.05), so it can be concluded that the variable X of the project-based Numbered Heads Together (NHT) cooperative learning model significantly influences the dependent variable (learning outcomes).

In accordance with the third problem formulation, namely how the project-based Numbered Heads Together (NHT) cooperative learning model influences the learning outcomes and interests of

Class IV students at MI An-nashar Timor Timur, Makassar City, when viewed from the data results above, it can be concluded that the project-based Numbered Heads Together (NHT) cooperative learning model influences students' learning outcomes.

DISCUSSION

1. Project-Based Numbered Heads Together (NHT) Cooperative Learning Model for Fourth-Grade Students at MI An-Nashar Timor Timur, Makassar.

The Numbered Heads Together (NHT) project-based cooperative learning model was implemented at MI An-Nashar Timor Timur, Makassar, over five sessions. In the first session, a pre-test and questionnaire were administered, which revealed that most students struggled with problem-solving, with average scores below the Minimum Competency (KKM). In the second through fourth sessions, students were divided into groups, assigned numbers, and actively engaged in projects that required collaboration, discussion, and shared decision-making. The teacher acted as a facilitator by providing contextual projects to encourage meaningful learning. This aligns with (Imam et al., 2022), which states that the NHT model encourages students to discover concepts through group discussions, thereby enhancing conceptual mastery.

This research makes an important contribution to learning strategies at the MI level. First, the implementation of project-based NHT in fourth-grade MI students is still rare, as previous research has focused primarily on junior high and high school levels. Second, this study analyzes the simultaneous influence of the NHT model on student interest and learning outcomes, a practice rarely explored. Third, the integration of NHT and project-based learning in elementary schools, particularly in Makassar, is still limited.

At the fifth meeting, a post-test and final questionnaire were administered to measure learning outcomes, motivation, and interest in learning. The results showed significant improvements in both the post-test and questionnaire, demonstrating that the project-based NHT model has been proven to improve student interest and learning outcomes.

2. Mathematics Learning Outcomes and Interests of Fourth Grade Students at MI An-Nashar Timor Timur, Makassar City

Research data was obtained through a pre-test and questionnaire before the treatment, as well as a post-test and questionnaire after the implementation of the interactive learning model to measure improvements in student understanding. The pre-test aimed to assess students' baseline knowledge before the intervention. This aligns with (Rahayu et al., 2020), which states that pre-tests are used to determine participants' initial knowledge levels before the program or research begins.

The pre-test results indicated that students' initial understanding was still low, with an average score of 49.15. Twelve students were in the low category, seven students in the medium category, and only one student in the high category. This distribution illustrates that 60% of students were in the low category, 35% in the medium category, and 5% in the high category, with no students reaching the very high category. This situation indicates that conventional learning methods are ineffective in helping students understand mathematics material, as they lack student interaction and learning activities.

Therefore, the project-based Numbered Heads Together (NHT) cooperative learning model was implemented to address students' difficulties in understanding concepts. This aligns with the opinion of (Ermitia Novitasari & M. Coesamin 2013, n.d.), who stated that NHT cooperative learning emphasizes numbering, requiring students to understand the material through discussion and group collaboration. This strategy is considered effective in increasing student interest and engagement.

After implementing the model, a post-test was conducted to assess student understanding. According to (Yulianti Yulianti et al., 2023), the post-test is administered at the end of the lesson to measure student achievement after receiving instruction. The post-test results showed a significant increase, with an average score of 86.80. No students were in the very low category; 35% of students were in the high category and 65% were in the very high category. These findings indicate an increase in material mastery after implementing the project-based NHT model.

In addition to cognitive improvements, positive developments were also seen in the affective and psychomotor domains. In the affective domain, students demonstrated improved motivation, attitudes, responsibility, and cooperation. They expressed their opinions more confidently, participated enthusiastically, and showed respect for their peers. These findings align with the notion that the affective domain encompasses attitudes, interests, values, and character. The project-based NHT model has been shown to foster positive attitudes toward mathematics learning.

In the psychomotor domain, students are able to apply mathematical concepts through project activities, work collaboratively in groups, solve problems, and produce simple products. This aligns with the view (Anhar, 2023), that the psychomotor domain reflects the ability to apply concepts in real-world situations. The project-based NHT model provides students with the opportunity to develop critical and creative thinking skills through meaningful, hands-on activities.

Overall, the implementation of the project-based Numbered Heads Together (NHT) cooperative learning model has a positive impact on student learning outcomes and interest.

3. The Effect of Using Project-Based Numbered Heads Together (NHT) Cooperative Learning on the Mathematics Learning Outcomes and Interests of Fourth Grade Students of MI AN-Nashar Timor Timur, Makassar City

The use of the Numbered Heads Together (NHT) project-based cooperative learning model for fourth-grade students at MI An-Nashar Timor in Makassar City demonstrated positive results based on statistical tests. The Kolmogorov-Smirnov normality test showed significance values of 0.055 (pretest) and 0.080 (posttest), while the Shapiro-Wilk test showed significance values of 0.158 (pretest) and 0.307 (posttest). All values were above 0.05, indicating that the data were normally distributed and met the requirements for parametric analysis.

The results of the Levene's test for homogeneity also indicated homogeneity of variance between the pretest and posttest data. Hypothesis testing using ANOVA yielded a significance value of 0.00 (<0.05) for the learning outcomes and learning interest variables, indicating that the implementation of the project-based NHT model significantly improved both.

This model is capable of increasing student engagement, engagement in discussions, and conceptual understanding through structured project activities. Thus, the project-based NHT model is recommended as an effective and innovative learning approach to improve mathematics interest and learning outcomes.

Analytically, these findings reinforce previous research that cooperative learning can enhance student social interaction and collaboration (Sappaile et al., 2023). The strength of this study lies in the combination of the NHT model with a project-based approach, which is still rarely implemented at the Madrasah Ibtidaiyah level. The results show that this combination has a synergistic effect on cognitive (learning outcomes) and affective (learning interest) aspects, and confirm that learning interest plays a significant role in moderating the success of the learning model.

Pretest implementation

(Picture 1)

Questionnaire processing

Project implementation explanation

(Picture 2)

Posttest and project work

Project work discussion

(Picture 3)

Project work results

(Picture 4)

(Picture 5)

(Picture 6)

4. CONCLUSIONS AND SUGGESTIONS

CONCLUSIONS

Based on the research findings, the following are presented in accordance with the problem formulation:

1. **Overview of the implementation of the project-based Numbered Heads Together (NHT) cooperative learning model on the mathematics learning interest of fourth-grade students at MI An-Nashar Timor-Timur, Makassar City.**

Based on observations and implementation during the learning process, the project-based Numbered Heads Together (NHT) model worked well and created an interactive learning environment. Students became more active in discussions, expressed their opinions, and were involved in every stage of the project activities. Each group member was responsible for completing the assignment, and the teacher acted as a facilitator, guiding the discussion. The increase in teacher and student activity from meeting to meeting demonstrated that this model was effective in building collaboration and increasing student learning engagement.

2. **Overview of Student Interest and Learning Outcomes in Mathematics Learning for Fourth Grade Students at MI An-Nashar Timor-Timur, Makassar City**

Questionnaire results showed an increase in student learning interest after the implementation of the project-based Numbered Heads Together (NHT) model. Students demonstrated greater enthusiasm for learning, appeared more focused, and demonstrated greater curiosity about the material. They preferred learning through group activities and projects relevant to their daily lives. Thus, the implementation of the project-based Numbered Heads Together (NHT) model has been proven to foster positive learning interest in fourth grade students at MI An-Nashar Timor-Timur, Makassar.

3. **The Effect of the Project-Based Numbered Heads Together (NHT) Cooperative Learning Model on the Mathematics Learning Outcomes and Interest of Fourth Grade Students at MI An-Nashar Timor-Timur, Makassar City**

Based on the pretest and posttest results, there was a significant increase in student learning outcomes. The analysis results showed a significant difference between the scores before and after treatment (significance value <0.05), so the alternative hypothesis (H_1) was accepted. This means that the implementation of the project-based Numbered Heads Together (NHT) cooperative learning model has a positive effect on improving students' mathematics learning outcomes. Students not only understand the concepts theoretically but are also able to apply them in project activities that require solving real-world problems.

SUGGESTIONS

Based on the research results, the authors concluded that the implementation of the Numbered Heads Together (NHT) project-based cooperative learning model had a positive impact on increasing students' interest and learning outcomes in mathematics. These findings are expected to benefit various parties in efforts to improve the quality of learning in elementary schools. Some recommendations to consider are as follows:

1. **For Schools**

Schools are advised to utilize the results of this study as evaluation material to improve the quality of learning. The NHT project-based cooperative learning model has proven effective and can be used as

a reference in developing learning policies. Furthermore, the results of this study can be used as a reference in assessing teacher performance regarding the innovation and effectiveness of student-centered learning methods.

2. For Teachers

Teachers are expected to implement the NHT project-based learning model as an alternative strategy in mathematics learning. In this model, teachers not only deliver material but also act as facilitators, encouraging student collaboration, creativity, and responsibility. The implementation of this model can enhance teacher professionalism and enrich teaching strategies with more active, innovative, and enjoyable learning.

3. For Students

Students are expected to be more active and participate in learning through the NHT project-based model. This model provides opportunities for collaborative, creative, and problem-solving learning, thereby increasing self-confidence, enthusiasm, and a deeper understanding of mathematical concepts.

4. For Future Researchers

This research can serve as a reference for other researchers who wish to examine the application of the project-based NHT model in other subjects or at different educational levels. Further research could expand the variables, such as the model's influence on students' motivation, critical thinking skills, or collaboration skills, thereby contributing more broadly to the development of innovative learning strategies in elementary schools.

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