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Meta-Analysis of NHT and STAD Learning Models on Elementary School Students' Mathematical Cognitive Learning Outcomes

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Abstract

Many studies showed the influence of the NHT and STAD learning models on the elementary school students' mathematics learning outcomes. It is necessary to conduct a thorough re-analysis in a study to see how much influence the NHT and STAD learning models have on students' mathematics learning outcomes with meta-analysis techniques. This study aims to determine the effect of the two learning models from various published experimental studies on mathematics learning outcomes. This study employed a meta-analysis method. The first step was to determine the problem, then searched the research articles' data on the internet through Google Scholar. The search results found 20 matching articles. The NHT learning model showed a mean increase of 82.31%, greater than the STAD learning model with 78.59%. The prerequisite test using the normality, homogeneity, and linearity tests revealed that the two learning models were normally distributed, homogeneous, and linear. The normality test utilizing the Shapiro-Wilk technique obtained a significance value of > 0.05. The pre-test data homogeneity test showed Sig. 0.081> 0.05, while the post-test data revealed Sig. 0.444 > 0.05. The linearity test of the two learning models uncovered a significance value of > 0.05. Besides, the ANCOVA test with univariate showed that the Partial Eta Squared value was 0.210, with Sig. 0.042 < 0.05, meaning that H_0 was rejected, and H_a was accepted. The results showed that there were significant differences. Effect size calculation revealed that the NHT and STAD learning models had a relatively small effect on mathematics learning outcomes.

Keywords: NHT, STAD, Mathematics Learning Outcomes, Elementary School

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Abstrak

Banyak penelitian yang menunjukkan pengaruh model pembelajaran NHT dan STAD terhadap hasil belajar matematika siswa sekolah dasar. Perlu dilakukan analisis ulang secara menyeluruh dalam suatu penelitian untuk melihat seberapa besar pengaruh model pembelajaran NHT dan STAD terhadap hasil belajar matematika siswa dengan teknik meta analisis. Penelitian ini bertujuan untuk mengetahui pengaruh kedua model pembelajaran tersebut dari berbagai penelitian eksperimental yang dipublikasikan terhadap hasil belajar matematika. Penelitian ini menggunakan metode meta-analisis. Langkah pertama adalah menentukan masalah, kemudian mencari data artikel penelitian di internet melalui Google Scholar. Hasil pencarian menemukan 20 artikel yang cocok. Model pembelajaran NHT menunjukkan peningkatan rerata sebesar 82,31% lebih besar dari pada model pembelajaran STAD sebesar 78,59%. Uji prasyarat menggunakan uji normalitas, homogenitas, dan linieritas menunjukkan bahwa kedua model pembelajaran tersebut berdistribusi normal, homogen, dan linier. Uji normalitas dengan teknik Shapiro-Wilk diperoleh nilai signifikansi> 0,05. Uji homogenitas data pre-test menunjukkan Sig. 0,081> 0,05, sedangkan data post-test Sig. 0,444> 0,05. Uji linieritas kedua model pembelajaran menemukan nilai signifikansi> 0,05. Selain itu, uji ANCOVA dengan univariat menunjukkan nilai Partial Eta Squared sebesar 0,210 dengan nilai Sig. 0,042 <0,05 artinya Ho ditolak dan Ha diterima. Hasil penelitian menunjukkan bahwa terdapat perbedaan yang signifikan. Perhitungan Effect Size menunjukkan bahwa model pembelajaran NHT dan STAD memiliki pengaruh yang relatif kecil terhadap hasil belajar matematika.

Kata Kunci: NHT, STAD, Hasil Belajar Matematika, Sekolah Dasar

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INTRODUCTION

Learning is a system consisting of various components closely related to one another. The various components include objectives, materials, methods, and evaluation. In determining the model or method to be used in the learning process, the teacher must pay attention to these four components. Ngaeni & Saefudin (2017) stated that mathematics is a discipline that cannot be separated from the world of education. Mathematics also has a vital role in real life. Consciously or unconsciously, everyone is always connected by mathematics to solve problems. Given the importance of the mathematics' role in a subject that students need to learn with effort and a series of learning activities, it is intended that students can foster their thinking patterns and have problem-solving abilities in their lives.

Regulation of the Minister of Education and Culture No. 21 of 2016 concerning content standards for mathematics in elementary schools explains that the objective of mathematics is to develop a positive attitude toward mathematics, namely logical, critical, careful and thorough, honest, responsible, the ability to work together, and not giving up easily in solving the problems at hand as a form of habitual implementation in mathematical inquiry and exploration. Mathematics is a crucial subject in elementary schools. Mathematics education prioritizes students to recognize, understand, and be adept at using science with abstract objects, and with development through reasoning, it can develop a model that applies an example of the system itself, which, in the end, is used to solve problem after problem in everyday life. Mathematical problems include (1) problems to find, where individuals try to construct all types of objects or information that can be used to solve the problem, and (2) problems to prove, in which individuals will show one of the statement's truths, whether the statement is true or false. This type of problem prioritizes the hypothesis or conclusion of a theorem whose truth must be proven (Polya in Ngaeni & Saefudin, 2017).

Basically, the learning mathematics' ultimate goal is to produce students who have the knowledge and skills to solve problems faced in the future in society. Setyo & Harmini in *Matematika untuk PGSD [Mathematics for PGSD]* said that to produce students with reliable competence in problem-solving, learning strategies are needed in problem-solving. It is in accordance with the objectives of learning mathematics as stated in the curriculum of school mathematics at all levels of education, which leads to the students' ability to solve problems faced in everyday life. Thus, elementary school students need to be trained from an early age to have the ability and skills in problem-solving, especially problem-solving related to mathematics.

Daryanto in *Inovasi Pembelajaran Efektif [Effective Learning Innovation]* explained that mathematics is learning that emphasizes students to think logically, systematically, critically, creatively, and collaboratively to develop skills in solving various daily problems. Thus, mathematics learning is a learning interaction process that involves students actively constructing mathematical knowledge. The process is a means that serves to make it easier for students to think in science and try to solve problems.

It affirms that learning mathematics has been considered difficult by students. It is because many students do not like mathematics, even though in everyday life, mathematics is essential for life in the environment. For example, it is necessary to learn mathematics with persistence and strong patience with intention and convince oneself to master mathematics learning in everyday life. Learning mathematics is not just learning carelessly but also to get the best grades, including adding to the science of mathematics lessons since, by learning, individual brains and reasoning can be honed well.

Based on the above opinion, it can be concluded that mathematics learning is learning that can improve students' ability to solve problems, which must be able to make students think more logically and have the ability to observe, ask, try, reason, present, and create so that learning is more meaningful and easy for students to remember. Thus, an educator can teach with various approaches and various learning models. With varied learning, students can follow a fun learning process, remembering that students are not only objects but also subjects in learning.

Learning mathematics is not only information obtained from the teacher, and students are not only used as subjects, but mathematics learning is also the process of providing learning experiences to students.

Based on the notion of mathematics stating that students must have the ability to observe, ask, try, reason, present, and create, even students must be able to think logically, systematically, critically, creatively, and collaboratively, there needs to be a learning model to have steps to solve the problem. The learning model that can potentially be applied in learning related to collaborative mathematical concepts is the NHT (Numbered Head Together) learning model. Sari (2015) defines the NHT learning model as various group discussions, with the characteristic that the teacher only appoints a student who represents the group, without first telling who represents the group. The NHT learning model emphasizes a special structure designed to influence student interaction patterns and increase academic mastery. Each student in the group is deliberately given a number to facilitate group work, compile material, and present, then get responses from other groups (Aristyadharma et al., 2014).

By conducting group discussions in implementing the NHT learning model, it can provide opportunities for students to exchange ideas or opinions and find the most appropriate answers collaboratively. Furthermore, another learning model relevant to mathematics learning is the STAD (Student Team Achievement Division) learning model. Wardana et al. (2017) stated that the STAD learning model emphasizes student learning activities by working together in groups. With the existence of cooperation in groups, it will train students to express opinions and increase their understanding of concepts collaboratively, which in turn can work together in groups well. Thus, students will be better able to understand existing concepts through the help of their friends.

Ihsan et al. (2019) revealed that the STAD learning model is one of the types of cooperative learning that emphasizes the students' cooperation in groups in solving a problem to achieve learning goals. Learning with the STAD model can create active, innovative, creative, and fun learning for students during the learning process. Juraini et al. (2016) describes the STAD learning model as a learning model in which learning activities are carried out by forming small groups with members in each group containing 4-5 students heterogeneously. Starting with the delivery of learning objectives, material delivery is then carried out, followed by group discussion, quizzes, and group awards.

Various studies on the effect of the NHT and STAD learning models have been available in various educational journals throughout Indonesia in the form of articles and theses. However, there is still a lack of research and studies on existing research results, especially at the elementary school level, leading to the summarized and re-tested the results' effectiveness in these studies using meta-analysis research. This research is also crucial to test how strong the relationship is or the difference between variables in each study. A new theory can be generated based on existing data on the theme under study. Besides, the results can also be used to strengthen the research results obtained previously. Various studies have used meta-analysis methods at various levels of education with various fields of study. However, currently, the NHT and STAD learning models' meta-analysis research at the elementary school level is still limited.

Based on a large number of similar studies, it is necessary to organize data, extract as much information as possible from the previous research obtained, and approach data comprehension with other purposes and concerning the absence of a meta-analysis study on some of these experimental studies. Hence, with the existence of this previous research, it is necessary to re-analyze as a whole in a study to see how much influence the NHT and STAD learning models have on elementary school students' mathematics learning outcomes using meta-analysis techniques.

Mathematical communication is defined as an event of dialogue or mutual relationship that occurs in the classroom environment, where messages are transferred, and messages transferred contain mathematical material studied by students, for example, in the form of a concept, formula, or problem-solving. Differences in each student's mathematical

communication skills also play a role in determining student mathematics learning outcomes. Thus, to facilitate this material's delivery, a learning model is needed that allows students to share insights, information, and thinking concepts from each student. Apart from learning strategies, mathematical communication skills also play a vital role in the learning process's success.

Observing the various potentials of both learning models and research results showing the efficacy of the two models empirically, the two learning models can certainly be applied by teachers and become quite innovative learning models since both models can be applied in collaboratively teaching mathematical concepts. Thus, it is necessary to prove further which model is more effective in learning mathematics. Therefore, the current research was conducted to reveal the magnitude of the NHT learning model's contribution compared to STAD in developing cognitive aspects by analyzing various research studies carried out. This study aims to examine the significant differences in the effectiveness of mathematics learning outcomes between the NHT and STAD learning models. This study's results will later become a reference for teachers to choose the suitable model to be applied in the learning process.

METHODS

This research applied meta-analysis research. A meta-analysis research activity is a research process that can be carried out by summarizing, reviewing, and analyzing research data carried out by other researchers. The data collection technique was by searching for online journals on the internet through Google Scholar. The keywords used in searching journals were "NHT", "STAD", and "Mathematics Learning Outcomes". From searching through these keywords, several journals matching the criteria for the research to be carried out were obtained. It could be seen by the presence of pre-test and post-test data in the form of the mean percentage score in the journal obtained. The data instrument employed was coding each of the journals obtained. Meanwhile, the data analysis technique utilized the ANCOVA test with Univariate and calculated the effect size to see the NHT and STAD learning models' effects on mathematics learning outcomes.

RESULTS AND DISCUSSION

Ten articles related to the NHT learning model and ten STAD learning models in improving elementary school students' mathematics learning outcomes were obtained. The data from the research report is still extensive, but only ten relevant articles were taken. The article data was processed by summarizing and determining the essence of the research results concerning the NHT and STAD learning models. Then, the data were reported back through descriptive qualitative and quantitative. The following is a table of data obtained in detail and in accordance with the research criteria.

Table 1. Percentage of Improved Mathematics Learning Outcomes with the NHT Model

No	Percentage (%)			
	Data Code	Pre-test Score	Post-test Score	Improvement
1	P1	75,33	84,52	9,19
2	P2	67,35	83,58	16,23
3	P3	61,36	80,90	19,54
4	P4	70,35	83,58	13,23
5	P5	67,60	84,38	16,78
6	P6	70,27	81,38	11,11
7	P7	61,60	80,40	18,80
8	P8	63,73	79,08	15,35
9	P9	66,16	89,71	23,55
10	P10	68,85	75,64	6,79
Mean		**67,26**	**82,31**	**15,05**

In Table 1 above, it can be seen that the NHT learning model could improve elementary school students' mathematics learning outcomes. The mean percentage increase in mathematics learning outcomes using the NHT learning model was 6.79% for the lowest score and 23.55% for the highest score, with a mean of 15.08%. The mean percentage of mathematics learning outcomes before using the NHT learning model amounted to 67.26%. The mean percentage of learning outcomes in mathematics learning after using the NHT learning model was

82.31%. The mean percentage before and after using the NHT learning model increased by 15.05%.

Table 2. The Percentage of Improved Mathematics Learning Outcomes with the STAD Model

No	Percentage (%)			
	Data Code	Pre-test Score	Post-test Score	Improvement
1	P1	36,87	71,94	35,07
2	P2	48,38	84,33	35,95
3	P3	58,17	81,33	23,16
4	P4	73,13	81,54	8,41
5	P5	50,10	80,00	29,90
6	P6	59,80	79,80	20,00
7	P7	54,78	69,34	14,56
8	P8	60.54	77.33	16,79
9	P9	62.59	76.03	7,44
10	P10	52,00	80,50	18,50
Mean		**54,15**	**78,59**	**20,97**

Table 2 above shows that the STAD learning model could improve elementary school students' mathematics learning outcomes. The mean percentage increase in learning outcomes of learning mathematics using the STAD learning model amounted to 7.44% for the lowest score and 35.95% for the highest score, with a mean of 20.97%. The mean percentage of learning outcomes in mathematics before using the STAD learning model was 54.15%. Meanwhile, the mean percentage of mathematics learning outcomes after using the STAD learning model was 78.59%. The mean percentage before and after using the STAD learning model increased by 20.97%.

Descriptive Comparison Results

In accordance with the percentage of pre-test and post-test scores with learning outcomes, it could be compared between learning outcomes using the NHT and STAD learning models. The results of measuring the comparison of the mean score in Table 3 above revealed that the mean pre-test score between the NHT and STAD learning models had a difference of 13.11%. Meanwhile, the mean post-test score between the NHT and STAD learning models had a difference of 3.72%.

Data Analysis Results

Data analysis was conducted to determine the two learning models' effectiveness levels in terms of elementary school students' mathematics learning outcomes. Data analysis was performed using the prerequisite test, carried out through the normality test, homogeneity test, and linearity test. The prerequisite test was done before going through the ANCOVA test. This ANCOVA test was to determine the effect of different learning models used on learning outcomes in learning mathematics. Before conducting the ANCOVA test, the prerequisite test consisted of the normality test, homogeneity test, and linearity test, which were normally distributed, homogeneous, and linear. The following are the test results.

Normality Test

The normality test was used to determine the data distribution in the two learning models, whether normally distributed or not. This study employed a normality test with the Shapiro-Wilk technique assisted by SPSS 22.00 for Windows. The following is a table of the normality testing results of learning outcomes in the pre-test and post-test scores of the NHT and STAD learning models.

Table 3. Normality Test for NHT and STAD Learning Models

Tests of Normality							
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	df	Sig.	Statistic	df	Sig.
Hasil Belajar Siswa	NHT pre-test	,137	10	,200*	,957	10	,746
	NHT post-test	,180	10	,200*	,964	10	,828
	STAD pre-test	,137	10	,200*	,975	10	,930
	STAD post-test	,234	10	,128	,916	10	,328

In Table 3 above, from the normality test of learning outcomes in mathematics learning on the pre-test and post-test scores of the NHT and STAD learning models, it has been explained that if a significance value obtained is > 0.05, then the data are normally distributed, and if the significance value is <0.05, then data is not normally distributed.

1. The significance level of the pre-test score for the NHT learning model was 0.746> 0.05, meaning that it was normally distributed.
2. The significance level of the post-test score for the NHT learning model was 0.828> 0.05, indicating that it was normally distributed.
3. The pre-test score for STAD learning model's significance level was 0.930> 0.05, signifying that it was normally distributed.
4. The significance level of the post-test score for the STAD learning model was 0.328> 0.05, suggesting that it was normally distributed.

Homogeneity Test

The homogeneity test was employed to determine whether the sample score articles collected concerning the NHT and STAD learning models were homogeneous or had the same variants. It can be said that the data have a homogeneous distribution if the significance value is > 0.05, and the data are not homogeneous if the significance value is < 0.05. The following are the pre-test and post-test scores for the two learning models' homogeneity test using SPSS 22.00 for Windows.

Table 4. Homogeneity Test of Pre-test Scores for NHT and STAD Learning Models

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Student learning outcomes	Based on Mean	3,415	1	18	,081
	Based on Median	3,362	1	18	,083
	Based on Median and with adjusted df	3,362	1	12,235	,091
	Based on trimmed mean	3,384	1	18	,082

Table 4 above displays the results of the pre-test score homogeneity test through Leven's Test method. The interpretation was done by looking at the mean (based on mean). The homogeneity value is seen from the significance value of 0.081> 0.05. It could be concluded that the NHT and STAD learning models had homogeneous or the same variance.

Table 5. Homogeneity Test of Posttest Score for NHT and STAD Models

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Student learning outcomes	Based on Mean	,614	1	18	,444
	Based on Median	,156	1	18	,697
	Based on Median and with adjusted df	,156	1	15,623	,698
	Based on trimmed mean	,559	1	18	,464

Table 5 above exhibits the results of the post-test score homogeneity test through Levene's Test method. The interpretation was done by determining one of the statistics, namely statistics carried out by looking at the mean (based on mean). The homogeneity value is seen from the significance value of 0.444 > 0.05. It could be denoted that the use of the NHT and STAD learning models had homogeneous or the same variance.

Linearity Test

A linearity test was utilized to determine whether, using the NHT and STAD learning models, the independent variables had a linear relationship or not toward the dependent variable significantly. This research used a linearity test assisted by SPSS 22.00 for Windows. The following are the pre-test and post-test scores for the NHT model.

Table 6. Linearity Test for the NHT Pre-test and Post-test Scores

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
Pre-tes * *Post-test*	Between Groups	Combined	160,842	8	20,105	4,468	,351
		Linearity	7,314	1	7,314	1,625	,423
		Deviation from Linearity	153,528	7	21,933	4,874	**,336**
	Within Groups		4,500	1	4,500		
	Total		165,342	9			

Table 6 above illustrates the linearity test for the NHT learning model's pre-test and post-test scores from one of the statistics, namely statistics carried out with Deviation from Linearity. According to the table above,

the pre-test and post-test linearity test results obtained a significance of 0.336 > 0.05. It could be inferred that the NHT learning model's pre-test and post-test scores had a linear relationship.

Table 7. Linearity Test for STAD Pre-test and Post-test Scores

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
*Pre-test * Post-test*	Between Groups	Combined	652,303	2	326,152	12,253	,005
		Linearity	649,593	1	649,593	24,404	,002
		Deviation from Linearity	2,710	1	2,710	,102	**,759**
	Within Groups		186,327	7	26,618		
	Total		838,630	9			

In accordance with Table 7 above, the linearity test for the STAD learning model's pre-test and post-test scores was seen from one of the statistics, namely statistics carried out with Deviation from Linearity. According to the table above, the pre-test and post-test linearity test results obtained a significance of 0.759> 0.05, signifying that the STAD learning model's pre-test and post-test scores had a linear relationship.

ANCOVA Test

From the prerequisite test results (normality test, homogeneity test, and linear test) carried out, it could be concluded that the data were normally distributed, homogeneous, and linear. After conducting the prerequisite tests, an ANCOVA test analysis could be performed with SPSS 22.00 for Windows. The ANCOVA test was conducted to determine whether there was a significant difference between the use of the NHT and STAD learning models on elementary school students' mathematics learning outcomes. The following is a table of the ANCOVA test analysis results.

Table 8. ANCOVA Test Results

Class	Mean	Std. Deviation	N
NHT post-test	82,32	3,780	10
STAD post-test	78,18	4,638	10
Total	80,25	4,633	20

The data analysis results using the ANCOVA test carried out on the NHT learning model had ten articles, with a mean of 82.32. Meanwhile, the STAD learning model with ten articles had a mean of 78.18. Thus, there were differences between the NHT and STAD learning models in terms of improving mathematics learning outcomes from these results. The NHT learning model was higher than the STAD learning model.

Table 9. ANCOVA Test Analysis Results

Tests of Between-Subjects Effects

Dependent Variable: learning outcome

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	85,657[a]	1	85,657	**4,786**	**,042**	**,210**
Intercept	128793,225	1	128793,225	7196,069	,000	,998
Learning Model	85,657	1	85,657	**4,786**	**,042**	,**210**
Error	322,159	18	17,898			
Total	129201,041	20				
Corrected Total	407,816	19				

a. R Squared = ,210 (Adjusted R Squared = ,166)

According to the ANCOVA test results in Table 10 found in the learning model column above, it could be concluded that the significance of the Sig. amounted to 0.042. The F-count obtained was 4.786, and the F-table from the above data was 3.59. The value of 3.59 was obtained using the formula df2 = nk, df2 = 20- (2 + 1), df2 = 20-3, df2 = 17. To find the 3.59 result, the F-table was adjusted based on the number of samples minus the number of variables (independent and dependent) so that the result of 3.59 was found.

Hypothesis Testing

In accordance with the ANCOVA test results, the hypothesis test was then carried out. Hypothesis testing was performed to determine whether the research hypothesis was accepted or rejected. The following is the hypothesis in this study.

H_0 : There is no significant difference in terms of the elementary school students' mathematics learning outcomes between the NHT and STAD learning models.

H_a : There is a significant difference in terms of the elementary school students' mathematics learning outcomes between the NHT and STAD learning models.

Decision-making criteria:

1. Using the Sig. coefficient, with the decision:
   a) If the value of Sig. count (probability) is > 0.05, H_0 is accepted.
   b) If the value of Sig. count (probability) is < 0.05, H_0 is rejected.
2. Using the t-count coefficient, provided that:
   a) If the coefficient of f-count < f-table, H_0 is accepted.
   b) If the coefficient of f-count > f-table, H_0 is rejected.

In accordance with the hypothesis calculation using the ANCOVA test through Univariate, the significance value was 0.042, which was less than 0.05 (0.042 < 0.05). ANCOVA test results have proven that f-count > f-table, namely 4.786 > 3.59, and the significance was 0.042 < 0.05, proving that H_o was rejected and H_a was accepted. It proves no significant difference between the use of the NHT and STAD learning models in terms of the elementary school students' mathematics learning outcomes.

Effect Size

The effect size showed standardized differences between the scores for using the NHT and STAD learning models. An effect size is a standard unit, meaning that it can be used to compare several different scales and compare several studies with different sample sizes. The effect size that could be used in this study was Cohen's d, indicating that the greater the value, the greater the difference between the NHT and STAD learning models. The effect size analysis results were carried out to see the differences between the NHT and STAD learning models.

In Table 9 above, related to the effect size test using the ANCOVA test for the NHT and STAD learning models, the results can be seen in the Corrected Model column, which was known that Partial Eta Squared was 0.210, with a Sig. amounting to 0.042. It indicated that the NHT and STAD learning models had a relatively small effect on the elementary school students' mathematics learning outcomes.

Discussion

This research was conducted to determine whether the learning mathematics outcomes with the NHT learning model from various published experimental studies were more effective than STAD. This research used meta-analysis research. The ANCOVA test carried out on the NHT learning model in ten articles had a mean post-test score of 82.32, while the STAD learning model with ten articles had a mean post-test score of 78.18. Thus, the NHT learning model outcomes were higher than STAD.

The prerequisite test for the NHT and STAD learning models had normal, homogeneous, and linear results. The normality test using the Shapiro-Wilk technique showed that the significance value was > 0.05, so it could be concluded that the NHT and STAD learning models were normally distributed. The homogeneity test revealed that the data had homogeneous results. It could be seen from the pre-test data on the NHT and STAD learning models, showing Sig. amounted to 0.081 > 0.05, while the post-test data from the NHT and STAD learning models showed a Sig. of 0.444 > 0.05. Therefore, it could be concluded that the use of the NHT and STAD learning models had a homogeneous distribution.

The linearity test seen from the pre-test and post-test using the NHT learning model got a significance of 0.336 > 0.05, so it could be concluded that the pre-test and post-test using the NHT learning model had a linear relationship. Besides, the pre-test and pos-ttest linearity test using the STAD learning model obtained a significance of 0.759 > 0.05, so it could be concluded that the pre-test and post-test using the STAD learning model had a linear relationship.

Based on the ANCOVA test results using Univariate, the significance value was 0.114, meaning that it was less than 0.05 (0.042 < 0.05). In accordance with the

ANCOVA test, f-count > f-table, namely 4.786 > 3.59, and the significance value was 0.042 < 0.05, proving that H_o was rejected and H_a was accepted. Thus, there was no significant difference in effectiveness between the effect of using the NHT and STAD learning models to improve the elementary school students' mathematics learning outcomes. Although the two learning models both influenced mathematics learning outcomes, the NHT learning model was superior to STAD. In accordance with Ridwanthi's opinion (2013), the NHT learning model or Numbering Thinking Together is a type of cooperative learning designed to provide opportunities for students to discuss and provide the most appropriate answers and encourage students to increase the spirit of collaboration in groups, and each group member is given a number from the teacher and has the opportunity to answer questions.

It could be proven through the data analysis results using the ANCOVA test, showing that the mean posttest score of the NHT learning model was 82.32, which was more effective than the STAD learning model of 78.18. Then, seen from comparing the data on the acquisition of an increase in scores from these two learning models, the NHT learning model was more effective, with a mean score of 15.05% compared to the STAD learning model that obtained a mean score of 20.97%. Hence, it could be concluded that the STAD learning model was more effective than the NHT learning model.

These results are supported by Kusumawati & Mawardi (2016), with the research's results showing that based on the ANCOVA test, the significant difference in mathematics learning outcomes was supported by the difference in the mean of the two research samples, where the mean learning outcomes in the implementation of the NHT learning model were 81. Meanwhile, the mean of learning outcomes in the application of the STAD learning model was 74. Learning treatment with the NHT model impacted learning outcomes, which were different and higher than the STAD learning model. In their research, Fatoyah et al. (2020) showed that the NHT learning model was more effective than the STAD learning model. It could be seen from the mean score of learning outcomes in mathematics, which was the mean percentage increase in learning outcomes in mathematics using the NHT learning model from the lowest score of 6.79% and the highest score of 23.55% with a mean of 15.05%. %. The mean percentage of mathematics learning outcomes before using the NHT learning model was 67.26%. The mean percentage of learning outcomes after using the NHT learning model was 82.31%. The mean percentage before and after using the NHT learning model increased by 15.05%.

This result is in line with the research conducted by Halimah (2017), stating that there was no significant difference in the effect of STAD and NHT strategies on student mathematics learning outcomes. The significant difference in mathematics learning outcomes was supported by the difference in the mean of the two research samples, where the mean learning outcomes in applying the STAD learning model were 77.89, while the mean learning outcomes in the application of the NHT learning model were 85.53. Furthermore, research carried out by Pradana (2016) showed that there were significant differences in mathematics learning outcomes between students learning using the NHT model and students learning using the STAD model. NHT learning had a mean value of 81.23, and STAD learning had a mean value of only 74.36. The research results are the same as those done by Gupitararas & Wasitohadi (2020). This study's results also proved that there were differences in understanding of the class applying the NHT model and the STAD model; the two classes were both active so that students had a sense of competing with each other between groups in one class. Thus, after doing the research, the results of the pre-test question work for the experimental class was 75.33%, while the control class was 67.73%, and for the post-test questions, the experimental class got 84.52%, and the control class received 74.42 %.

Furthermore, Setiawan & Setyaningtyas (2020) have proven that the NHT learning model was more effective than the STAD learning model. The results revealed that the NHT learning model was better than the STAD learning model, shown from the learning styles and student learning outcomes. It is different from the results of Indriastuti's research

(2016), revealing that there was no significant difference in the effect of STAD and NHT strategies on the fourth-grade students' mathematics learning outcomes at SDN 1 Siswodipuran Boyolali for the academic year 2015/2016. Besides, a study conducted by Susilowati & Sumarjono (2017) concluded that the learning outcomes in experimental group 1 using the Student Team Achievement Division (STAD) model were superior to those in experimental group 2 using the Numbered Heads Together (NHT) model. The results showed that the mean value of experimental class 1 was 82.71, while the mean value of experimental class 2 was 78.75. Supporting that previous research, Natalia et al. (2019) also conducted a study proving that learning using the STAD type cooperative learning model was more effective for increasing learning motivation and cognitive learning outcomes of natural science.

Furthermore, to calculate the two learning models' effect size, the ANCOVA test was used, known that the Partial Eta Squared was 0.210, with Sig. amounting to 0.042. It signified that the NHT and STAD learning models had a relatively small effect on mathematics learning outcomes. This study's results are expected to be used as an alternative and teacher's consideration in choosing a learning model to use the NHT and STAD learning models in the process of learning mathematics so that students can be more active, develop their ideas, and collaborate together with friends. Although the NHT and STAD learning models influenced the elementary school students' mathematics learning outcomes, the two learning models clearly had differences in terms of effectiveness. It could be seen from the post-test results after being given treatment from the two learning models.

CONCLUSION

Based on the results and discussion described, it could be concluded that there were differences between the two learning models. The NHT learning model was more effective in terms of mathematics learning outcomes. Besides, the NHT learning model was higher than the STAD learning model in terms of mathematics learning outcomes. It could be seen from the ANCOVA test results, showing the NHT learning model's mean value of 82.32. It was higher than the STAD learning model, which scored 78.18. The effect size test calculation showed that Partial Eta Squared was 0.210, with a Sig. amounting to 0.042. It indicated that the NHT and STAD learning models had a relatively small effect on mathematics learning outcomes. This study's results can provide benefits and opportunities for teachers in developing creativity and teaching to be more attractive and inviting all students to take an active role in participating in the learning process. Moreover, teachers can have input and an overview of the NHT and STAD learning models, influencing student mathematics learning outcomes.

Based on the conclusion, it can be understood that the use of the NHT learning model is more effective than STAD in improving mathematics learning outcomes. Therefore, researchers suggest that the NHT learning model can be used as a reference by teachers in the learning process in elementary schools, especially in improving mathematics learning outcomes.

REFERENCES

Aristyadharma, G. M. P., Putra, D. K. N. S., & Ardana I. M. (2014). Pengaruh model pembelajaran NHT berbantuan media kongkret terhadap hasil belajar IPA siswa kelas V gugus I Kuta, Badung tahun ajaran 2013/2014. *Mimbar PGSD Universitas Pendiddikan Ganesha, 2*(1), 1–8.

Fatoyah, S., Nayazik, A., & Wahyuni, A. (2020). Studi komparasi hasil belajar matematika menggunakan model pembelajaran kooperatif tipe Numbered Heads Together (NHT) dan Student Teams Achievement Division (STAD). *Jurnal Ilmiah Pendidikan Matematika Al Qalasadi, 4*(1), 50–55.

Gupitararas, B., & Wasitohadi, W. (2020). Pengaruh model Number Head Together (NHT) terhadap hasil belajar matematika siswa kelas IV SD. *Jurnal Cendekia:*

Jurnal Pendidikan Matematika, 4(1), 313–320.

Halimah, N. (2017). Perbedaan pengaruh model Student Teams Achievement Division (STAD) dan Numbered Heads Together (NHT) terhadap hasil belajar matematika siswa kelas V SD. *Scholaria: Jurnal Pendidikan dan Kebudayaan, 7*(3), 267–275.

Ihsan, I. A., Muhajir, M., & Saputra, H. J. (2019). Keefektifan model pembelajaran Student Teams Achievement Division berbantu media puzzle terhadap keterampilan berbicara siswa. *Jurnal Ilmiah Sekolah Dasar, 3*(4), 489–496.

Indriastuti, N. (2016). *Studi Komparasi Strategi Student Teams Achievement Division (STAD) dan Numbered Heads Together (NHT) terhadap Hasil Belajar Matematika Siswa Kelas IV SDN 1 Siswodipuran Boyolali Tahun Ajaran 2015/2016.* (Unpublished Thesis). Surakarta: Universitas Muhammadiyah Surakarta.

Juraini, J., Taufik, M., & Gunada. I. W. (2016). Pengaruh model pembelajaran kooperatif tipe STAD (Student Team Achievement Division) dengan metode eksperimen terhadap keterampilan proses sains dan hasil belajar fisika pada siswa SMA Negeri 1 Labuapi tahun pelajaran 2015/2016. *Jurnal Pendidikan Fisika dan Teknologi, 2*(2), 80–85.

Kusumawati, H., & Mawardi, M. (2016). Perbedaan penerapan model pembelajaran kooperatif tipe NHT dan STAD ditinjau dari hasil belajar siswa. *Scholaria: Jurnal Pendidikan dan Kebudayaan, 6*(3), 251–263.

Natalia, N., Kristin, F. & Anugraheni, I. (2019). Perbedaan efektivitas model pembelajaran kooperatif tipe STAD dan NHT ditinjau dari hasil belajar ipa siswa kelas 4 SD Gugus Joko Tingkir. *Vox Edukasi, 10(*1), 1–11.

Ngaeni, E. N., & Saefudin, A. A. (2017). Menciptakan pembelajaran matematika yang efektif dalam pemecahan masalah matematika dengan model pembelajaran problem posing. *Jurnal Aksioma, 6*(2), 264–274.

Pradana, P. H. (2016) Pengaruh pembelajaran kooperatif tipe NHT & STAD dan motivasi belajar terhadap hasil belajar matematika. *Jurnal Gammath, 1*(2), 9–17.

Ridwanthi, K. D. P., Japa, I. G. N., & Agung, A. A. G. (2013). Pengaruh model pembelajaran kooperatif tipe NHT berbantuan media Question Cards terhadap hasil belajar matematika siswa kelas IV SDN 6 Bondalem. *Mimbar PGSD Universitas Pendidikan Ganesha, 1*(1), 1–10.

Sari, E. D. A. (2015). Pengaruh penerapan model kooperatif tipe NHT terhadap hasil belajar siswa pada mata pelajaran IPS kelas IV. *Jurnal Penelitian PGSD, 3*(2), 1–10.

Setiawan, Y., & Setyaningtyas, E. (2020). Perbedaan model pembelajaran Numberhead Together (NHT) dengan model pembelajaran Student Team Achievement Division (STAD) terhadap gaya belajar dan hasil belajar tematik siswa kelas IV sekolah dasar. *Jurnal Ilmiah Wahana Pendidikan, 6*(2), 133–141.

Susilowati, S., & Sumarjono, S. (2017). Keefektifan model pembelajaran STAD dan NHT ditinjau dari hasil belajar IPA. *Jurnal Mitra Pendidikan, 1*(6), 768–777.

Wardana, I., Banggali, T., & Husain, H. (2017). Penerapan model pembelajaran kooperatif tipe Student Team Achivement Division (STAD) untuk meningkatkan hasil belajar siswa kelas XI IPA Avogadro SMA Negeri 2 Pangkajene (Studi pada materi Asam Basa). *Jurnal Chemica, 18*(1), 76–84.