PALAPA
Jurnal Studi Keislaman dan Ilmu Pendidikan

p-ISSN : 2338-2325
e-ISSN : 2540-9697

Terindeks : DOAJ, EBSCO, SINTA 4, Dimensions, MIAR, Garuda, Google Scholar, etc

https://doi.org/10.36088/palapa.v12i1.4684

META-ANALYSIS OF THE NUMBERED HEAD TOGETHER LEARNING MODEL ON LEARNING MOTIVATION AND COMPARISON OF ITS EFFECTIVENESS AT THE ELEMENTARY TO SENIOR HIGH SCHOOL IN INDONESIA

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Abstract

Learning motivation becomes a driving force that exists from within and outside students, thus causing desire and enthusiasm in learning to achieve a goal. However, not all students have high motivation in their studies to produce academic achievements. To overcome the problem of low student learning motivation, researchers are trying to find the right solution. And the NHT type cooperative learning model is a solution as a learning model that can motivate students to learn actively, creatively, and critically in teaching and learning activities. This research is a type of meta-analysis research that summarizes similar research relevant to the topic and then draws a general conclusion. The software used in data analysis is JASP. The results of the analysis of the summary effect using a random effect model showed that there was a positive influence of the NHT learning model on student learning motivation with an estimate score of 0.841. It can be concluded that the Numbered Head Together (NHT) learning model has an effect on increasing student learning motivation because it can be seen from the results of 14 studies analyzed using meta-analysis to get a mean effect size of 0.841 or an effect of 84%. In analyzing the moderation effect of educational levels, elementary schools (SD) rank first with an effect size of 1.513 and a Q value of 24.85. Senior high schools (SMA) rank second with an effect size of 0.841 and a Q value of 125.384. Lastly, junior high schools (SMP) rank third with an effect size of 0.557 and a Q value of 45.209. It can be concluded that the effectiveness of the NHT model depends on the educational level.

Keywords *: NHT; Effectiveness; Meta-Analysis; Comparison; Elementary to Senior High School; Indonesia*

INTRODUCTION

Learning motivation becomes a driving force that exists from within and outside students, to cause and increase desire and desire and enthusiasm in learning to achieve a certain goal (Syachtiyani & Trisnawati, 2021). (Uno, 2021) defines learning motivation as internal and external factors that encourage students to engage in behaviors that support learning. These factors include wants, needs, goals, future goals, rewards, and a conducive learning environment. (Sardiman, 2018) further explained that learning motivation is the driving force within students that causes learning activities, guarantees their continuity, and provides direction to the achievement of desired goals.

Not all students have high motivation to study in their studies, resulting in academic achievement, most of which are classified as just graduating. However, if students have increased motivation in learning then it can be expected that it can make students achieve higher academic achievement, (Hidayah &; Hermansyah, 2016). In fact, the graduation rate of elementary, middle and high school students from year to year has not shown satisfactory results. This can be seen from the fact that there are still students who have not reached the required graduation level, although various efforts have been made to prepare themselves for the final school exams to summative exams organized by the education unit (Kemdikbud, 2020). One indicator that may be the cause of the less than optimal graduation rate is the determination and motivation of students in the learning process (Kholid, 2017)

Based on the description above, to overcome the problem of low student learning motivation, researchers are trying to find the right solution (Pradana &; Danisa, 2016). Finally, an alternative solution was found, namely by using the NHT type cooperative learning model in learning, as a learning model that can motivate students to learn actively, creatively, and critically in teaching and learning activities (Lestari & Yudhanegara, 2018). The NHT-type cooperative learning model is designed to influence student interaction patterns as an alternative to traditional classroom structures. NHT involves many students in studying the material covered in a lesson and checking students' understanding of the content of the lesson (Hosnan, 2014). Total involvement of all students will have a positive impact on student learning motivation. Moreover (Aji & Kurniasih, 2015) put forward several objectives to be achieved in NHT type cooperative learning, namely: (1) Deepen student understanding in learning. (2) Develop curiosity from the students themselves. (3) And can increase students' confidence both in making decisions and socializing with friends.

The Numbered Head Together (NHT) type cooperative learning model has been widely used and can affect student learning outcomes (Yenni, 2016). There are many research results that prove that the use of the Numbered Head Together type cooperative learning model affects student learning outcomes. One of them is research conducted by Imam et al (2022) with the title "The Effect of the Numbered Head Together (NHT) Type Cooperative Learning Model on the Learning Outcomes of Class X Students of SMAN 1 Studio for the 2021/2022 Academic Year" proves that there is an influence of the use of the Numbered Head Together type Cooperative learning model on improving the learning outcomes of SMAN 1 Sanggar students for the 2021/2022 academic year.

The Numbered Heads Together type cooperative learning model aims to develop students' ideas or ideas about a particular problem in learning, as well as reconstruct ideas or ideas based on observations (Thabroni, 2021). In this learning model, students are expected to be more active, so that obstacles that often occur, namely less active learners can be overcome. They are required to be more active in the learning process (Shoimin, 2017). By using the Numbered Heads Together learning model, learners are active in finding their own concepts or principles through group discussions (Huda, 2013). This makes them more active in the learning process because they can think and find concepts and principles that are not yet known, so that the mastery of students' concepts will be better (Juliani Noor & Megawati, 2014). Analysis of the effectiveness of the NHT type Cooperative learning model using meta analysis has been done previously by Hartatik & Kasiyun. (2021) With variable Y learning outcomes. It was found that NHT affects learning outcomes in elementary school students. Gracia et al. (2021) with variable Y learning outcomes show the results that NHT has a positive effect on learning motivation. Retti Yuselmi Fitri Asih et al. (2021) in his research using variable Y learning outcomes obtained NHT improved learning outcomes. Based on previous research. In Indonesia, no one has examined the effect of the NHT learning model on learning motivation using meta-analysis. And based on the results of a single study that examined the NHT learning model on learning motivation that produced mixed results. Therefore, this study aims to determine the effect of using the Numbered Head Together type cooperative learning model on student learning outcomes through a meta-analysis research method that is expected to provide answers related to the consistency of previous peelitian results and analyze variables that can affect the effectiveness of this learning model on increasing student learning motivation in Indonesia

METHODS

This research is a type of meta-analysis research that summarizes similar research relevant to the topic and then draws a general conclusion. It is a form of data synthesis that statistically incorporates the results of primary research studies (Tierney et al., 2023) The stages or steps in conducting a meta-analysis research are as follows: 1). Looking for problems from research 2). Collect research that is in accordance with the meta-analysis research tophics, 3). Determine criteria or capture research to get research that meets the criteria set. 4). Analyze and interpret the results of meta analysis 5). Describe or give a description of the results using writing. (Card, 2012; Utami & Helmi, 2017) because according to Cuijpers et al. (2017) Approach *pre-post contrast* prone to bias so in this study used is to use an approach *contast group* . That is to compare the magnitude of the effect of the two groups. The data collected are research conducted less than the last 10 years in English and Indonesian. Here are the inclusion criteria in this meta-analysis study:

1. Research published from the last 10 years
2. The research was conducted in Indonesia
3. The research was conducted at elementary, junior high and high school levels
4. Articles in English and Indonesian
5. Research is carried out by quantitative analysis and in the form of experimental research
6. The study reported the mean, sample size, and standard deviation of both groups

In capturing research, researchers aborted studies that did not fit the predetermined inclusion criteria, from a total of 87 studies collected, there were only 12 studies that fit the criteria, specifically reporting mean, sample size and standard deviation or standard deviation. Of the 12 studies, there were 2 double studies or conducted 2 studies once. So the total studies obtained amounted to 14 studies. Because the research that is used as data uses different measurement scales. So to calculate the effect size, this study uses *standardized mean difference*. SMD *(Standarddisated Mean Difference)* is a statistic that can be used to compare mean differences between groups when different assessment instruments are used across studies (Andrade, 2020). But because of this, the effect size cannot be obtained only by inhaling the average difference between the two groups. So it is necessary to calculate by dividing by the standard deviation in order to obtain the average difference with the difference from the

scale in all studies (Retnawati et al., 2018). Here is the formula used to calculate the Effect size:

$$S_{within} = \sqrt{\frac{(n_1 - 1)\, S_1^2 + (n_2 - 1) S_2^2}{(n_1 - 1) + (n_2 - 1)}}$$

$$d = \frac{X_{bar1} - X_{bar2}}{S_{within}}$$

$$V_d = \frac{n_1 + n_2}{n_1 n_2} + \frac{d^2}{2\,(n_1 + n_2)}$$

$$SE_d = \sqrt{V_d}$$

Because d has a bias in its calculations. So to reduce bias, Hedges convert d to g by multiplying it by J or the correction factor (Hedges, 1981) Then the following formula is obtained:

$$df = X_{bar1} + X_{bar2} - 2$$

$$\mathrm{J} = 1 - \frac{3}{4df - 1}$$

After getting J, then we can get the effect size or g with the following formula:

$$g = J\ x\ d$$

After getting the value of g we find the variance g to find the standard error g or SEg with the following formula:

$$V_g = J\ x\ V_d$$

$$SE_g = \sqrt{V_g}$$

After getting g or effect size and SEg or standard error from g then, the results are used for analysis in this meta-analysis study. For the model, the estimation of this study uses random effects with the aim that the results of the study can be generalized to the population and can be analyzed moderation variables. It does not only apply to the conclusion of data findings. The condition that must be met is that the data is heterogeneous, so the researcher does a Q test with Alpha = 0.05 and to receive H0 the p-value must be > 0.05 = (a)

RESULTS

Here is the calculation result of the *effect size*

Table 1. Effect Size Results

Author	Mean	SD	n	Mean	SD	N	Education	Control	G	Seg
Syamfarida,(2018)	90,62	5.536	40	86,58	5,60	38	Elementary	Conventions	0,72	0,23
Sudewiputri &; Dharma(2021)	118,94	10,914	35	105,97	9,4	35	Elementary	Conventions	1,26	0,26
Mansyur &; Dervish (2021)	81,66	7,18	15	72,22	7,5	15	Junior	Direct	1,25	0,40
Uki (2018)	52,07	4,226	30	50,2	6,0	30	Senior	STAD	0,35	0,26
Uki (2018)	52,07	4,226	30	50,11	5,2	30	Senior	Conventions	0,41	0,26
Mariamah (2014)	119,39	4,184	27	124,47	4,8	32	Senior	STAD	-1,11	0,28
Purnamasari (2019)	105,55	11,118	38	98,82	10,0	38	Junior	Conventions	0,63	0,23
Indayaroh (2018)	81,17	6.854	30	64,82	3,84	29	Elementary	Conventions	2,89	0,37
Maryoto (2016)	41,25	8,187	32	32,35	6,3	32	Junior	Conventions	1,21	0,27
Maryoto (2016)	41,25	8,187	32	38,2	6,5	32	Junior	TPS	0,41	0,25
Mustami (2018)	89,03	5,69	39	80,41	6,4	39	Senior	Direct	1,41	0,25
Enlisted (2016)	70,43	3,451	30	64,93	4,8	28	Elementary	Jigsaw	1,30	0,29
Sulfitry (2017)	74	9,132	21	80,52	8,3	23	Junior	TGT	-0,74	0,31
Nurhasana (2020)	84,34	6,332	29	80,31	6,3	29	Junior	Conventions	0,63	0,27

Based on table 1 above, we can see that the distribution of effect size data from several studies is very diverse, some even get a negative effect size, which is -1.11 to the largest 2.89, therefore with the difference in the results of the effect size researchers want to provide conclusions based on the effect size that has been obtained. Researchers also grouped several variables such as the level of education consisting of the elementary level

which amounted to three studies, at the junior high school level there were four studies and at the senior high school level four studies. And in the type of treatment there are six conventional and other treatments consisting of two STAD studies, two direct studies and TPS one study so that it can be concluded that there are five other treatments. Education and this type of control treatment will be used as moderation variables which will later be analyzed and known whether the moderating variables affect the results of previous research

Table 2. Hetergoenity Test

	Q	**I2**	**df**	**P**
Heterogeneity	125.384	92	13	<.001

Based on the results of the analysis above, it shows that the effect size of the 14 studies analyzed is heterogeneous or diverse with Q = 125,384 and p-value <0.001 or smaller than alpha = 0.05 and I2 gets 92%. With the following results according to Riley et al. (2011) The most suitable model used to estimate the effect size of the 14 studies analyzed was the random effect model. The results of this analysis can also be the reason that there is potential to test moderator variables that affect the results of the influence of the NHT learning model on student learning motivation.

Table 2. Summary *Effect Size Results*

				95% CI	
Estimate	**SE**	**Z**	**P**	**Lower**	**Upper**
0.841	0.286	2.939	0,003	0.280	1.402

The results of the analysis of the summary effect using the random effect model resulted that there was a positive influence of the NHT learning model on student learning motivation with an estimate score of 0.841. To find out whether the value is significant or not can be seen at the value of Z= 2.939, p-value = 0.003 or <0.05 with a 95% confidence interval of 0.280;1.402. So it can be concluded that there is an influence of the NHT learning model on student learning motivation.

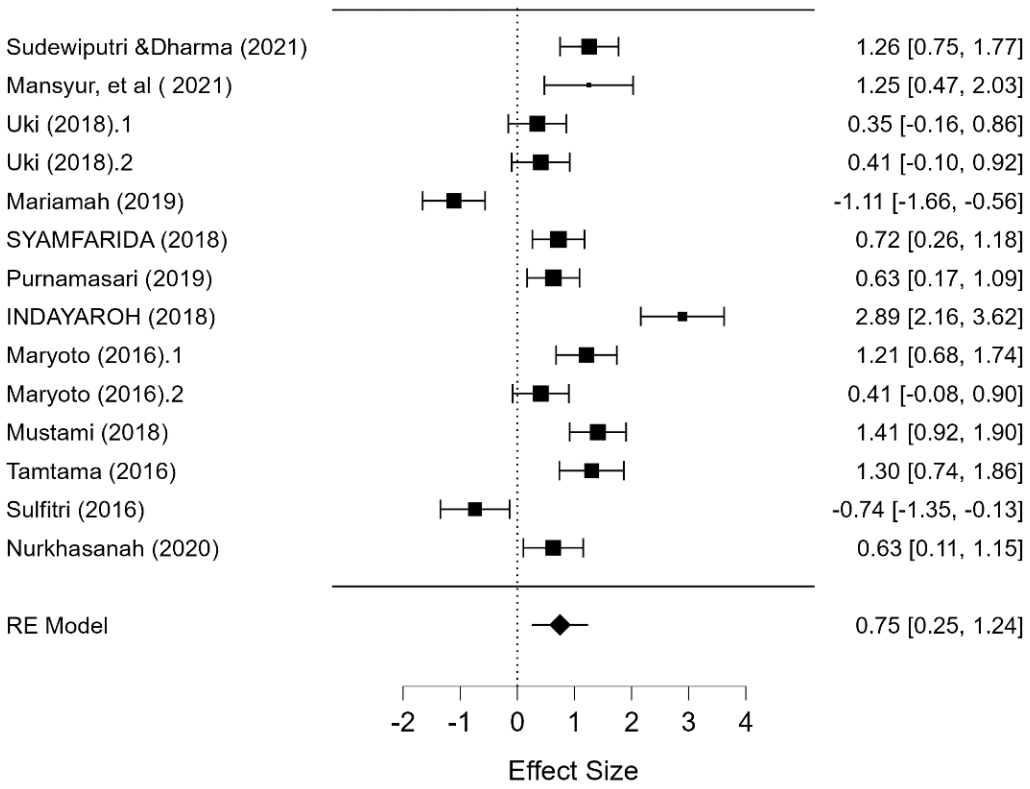

Figure 1. Forest Plot 14 Study

Forest plot is a summary of the effect size of all studies analyzed. From the results of the forest plot output, it can be interpreted that the effect size of the analyzed research varies from -1.11 to 2.89 with an RE model of 0.84 with a lower limit of 0.28 and an upper limit of 1.40

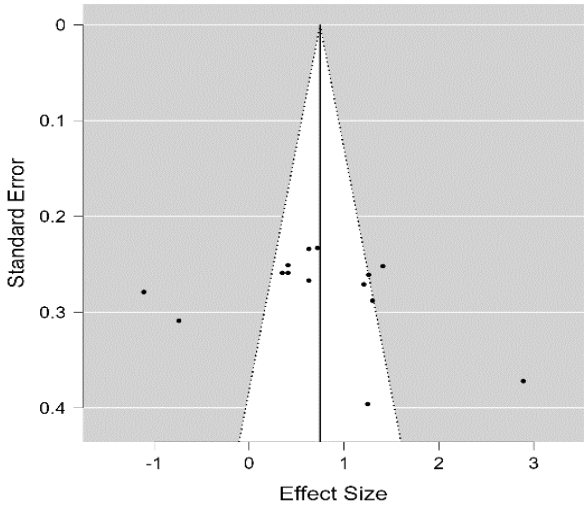

Figure 2. Funnel Plot

From the funnel plot, it can be seen that there is no publication bias evidenced by a symmetrical plot form, but to draw conclusions based on plots with a small amount of research analyzed will be difficult to justify and will be subjective. Therefore, to prove whether the funnel plot above symmetrical needs to be done a statistical test, namely Egger's Test

Table 4. Egger's Test Results

Regression test for Funnel plot asymmetry ("Egger's test")		
	Z	**P**
Sei	1.298	0.194

Based on the results of Egger's Test obtained p-value = 0.194 or >0.05, it can be concluded that the forest plot above is symmetric, this can be interpreted that there is no publication bias in the research used as meta-analysis data.

Table 5. Analysis File Drawer Results

File Drawer Analysis			
	Fail-safe N	**Target Significance**	**Observed Significance**
Rosenthal	483.000	0.050	<0.001

The Fail Drawer Analysis is a publication bias test, for its interpretation is to compare between the value of Fail-safe N or the possibility of research that failed publication due to errors or bias with Rosenthal's formula of 5k + 10, if the value of Fails-safe N l >5k + 10 is concluded that there is no publication in the meta-analysis study. In this study K = 14, the Rosental formula is obtained as follows: 5(14) + 10 = 80 and based on the analysis above, Fail-safe N is obtained at 483,000 with a target significance of 0.05 and a p-value of <0.001. Because the Fail-safe N value > 5k + 10, it can be concluded that there is no publication bias in this meta-analysis study.

Moderation Analysis

Education Level

Table 6 Description of education levels

Elementary		Junior		Senior	
Mean	**Q**	**Mean**	**Q**	**Mean**	**Q**
1,513	24,85	0,557	45,209	0,841	125.384

From the results of descriptive statistical tests can be seen in the level group, with the elementary level getting a Mean effect size of 1.513 with a Q value of 24.85. at the junior high school level get a Mean effect size of 0.557 with a Q value of 45.209 and at the senior high school level get a Mean effect size of 0.841 with a Q value of 125.384. From the results of the descriptive statistics above, it can be seen that the largest mean effect size is at the elementary level, followed by the senior high school level and at the junior high school level which gets the smallest effect size. To find out more about whether the difference is meaningful or not, researchers conducted a Chi square test.

Table 7. Chi Square Results

Chi Square			
Qw	Qb	Df	P-value
98,929	26,455	2	0,0000

When viewed from the table above, it can be concluded that there is a significant difference in the effect size of treatment in the form of learning using the NHT Model on learning motivation between elementary, junior high and high school levels with a P-value of 0.000 or <0.05. In other words, there is an influence of the level of education on motivation using the NHT learning model

Types of Control Group

Table 8. Description of treatment types

Other treatments		Conventional	
Mean	**Q**	**Mean**	**Q**
0,405	73,11	1,079	38,493

Based on the table of descriptive statistical results, it was found that the mean effect size of other treatments was 0.405 with a Q value of 73.11 and in conventional type control treatment a mean of 1.079 was obtained with a Q value of 38.493. From the results above, it can be seen that there are differences, other types of treatment control classes have mean and Q values greater than conventional type control treatments.

Table 9. Chi Square Test

Chi Square			
Qw	Qb	df	P-value
111,603	13,781	1	0,0002

From the table above, it can be concluded that there is a significant difference in the effect size of the treatment in the form of learning using the NHT Model on learning motivation between other treatments and conventional methods as a control group treatment with a P-value of 0.0002 or <0.05.

DISCUSSION

The problem of lack of learning motivation in students is increasingly becoming a concern for many researchers and educators. Plus recently the world has just risen from the covid 19 pandemic, this has greatly affected the motivation to study students in Indonesia. According to research reports courtesy of (Fatmayanti &; Susantri, 2023) COVID-19 has greatly affected the learning motivation of Indonesian students. Then it needs an appropriate approach to increase student learning motivation. i.e. through the right learning model. The Number Head Togheter model has been proven to increase student learning motivation, as evidenced by the results of this study which examines the NHT model on student motivation

using meta-analysis. The results showed that the NHT learning model had an effect on increasing learning motivation, these results were obtained from 14 studies that discussed the relationship of the NHT model and its influence on learning motivation as evidenced by the results of the mean effect size of 0.841 or an effect of 81.1%. The results of this study are also in line with the results of the purchase of (Retnaningsih, 2016) Research shows that the NHT type cooperative learning model can increase learning motivation, as seen from changes in behavior such as student health have an interest and attention in learning. In the first cycle learning increased by 25% and in the second cycle increased by 10%. The stages in the NHT learning model are the first, the scolding, the second, thinking together and the third is answering questions.

By applying this NHT learning model, it can be a learning vehicle for students. Students can feel learning as if they were playing. This model can also train the courage to express their opinions in public and students can learn to cooperate with their peers (Hidayat et al., 2024) Because this model is based on student centerd learning. Which this learning can encourage active participation and student involvement in the learning process (Walidaini, 2023). This SCL focuses on the interests, needs and abilities of individual students (Marfu'ah, 2019)

The Numbered Head Together Learning Model is suitable for adult learning because it can improve student learning outcomes (Damayanti et al., 2022) NHT learning can improve cognitive and affective skills (Rini, 2017) In addition, the NHT Model is proven to improve critical thinking in students. Therefore, the NHT learning model is very suitable for adults (Giarti, 2023) But on the results of this study. The influence of the moderation variable is obtained from the level of education which includes. elementary, middle and high school. From the results of the study, it was found that the application of the NHT learning model is most appropriate for elementary school students, this is based on the results of statistical analysis of chi square getting a p-value of 0.000 with the elementary level getting a mean effect size of 1.513 followed by the high school level with an effect size of 0.841, and finally at the junior high school level with an effect size of 0.557. Based on this desire, the NHT type cooperative learning learning model is not only effective for junior and senior high school students. Precisely in this study shows that learning at the elementary level is very suitable for applying the NHT learning model to increase learning motivation. The second moderation variable is the type of control, namely other and conventional treatment. From this study, it was found that there was an influence of the type of treatment of the control

group in the effectiveness of the NHT learning model. In control treatment with other types of treatment when compared to NHT has little or little effect, in other words NHT learning is slightly better than other treatments, but in conventional control groups when compared to NHT. NHT is much better than conventional models. (Shortcomings of this research) compare the education system with other countries.

CONCLUSION

From the results of research and discussion. So it can be concluded that the number head Together (NHT) learning model has an effect on increasing student learning motivation. This can be seen from the results of 14 studies analyzed using meta-analysis getting a mean effect size of 0.841 or an effect of 84%. Based on the results of the moderation variable test, it was found that the NHT model is very suitable for use at the elementary level, then followed by the high school level and finally at the junior high school level. For the moderation variable of the type of treatment, it was found that the type of treatment using other models compared to NHT. NHT tends to be slightly better than other models, and in conventional types of treatment, NHT is much better.

This study only discusses the effectiveness of *the numbered head togheter learning model in the context of* research conducted in Indonesia. There may be some things that can be considered in future research, such as how the effectiveness of the NHT learning model when compared on a global scale which will later be used as a moderator variable. And maybe added some other moderator variables that can affect the results of previous research.

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