Journal of Mathematics and Mathematics Education
https://jurnal.uns.ac.id/jmme

p-ISSN 2089-8878; e-ISSN 2715-8276
Vol. 12, No. 02, December 2022

MATHEMATICAL LEARNING EXPERIMENT USING NUMBERED HEADS TOGETHER AND THINK PAIR SHARE MODELS, EXAMINED FROM THE LEARNING STYLE

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Abstrak: Tujuan penelitian untuk mengetahui pengaruh model pembelajaran NHT dan TPS terhadap hasil belajar matematika, pengaruh gaya belajar terhadap hasil belajar matematika dan pengaruh interaksi model pembelajaran dan gaya belajar siswa terhadap hasil belajar matematika. Jenis penelitian kuantitatif dengan desain kuasi-eksperimen. Sampel penelitian terdiri dari dua kelas (eksperimen dan kontrol) yang diambil dengan cara *Cluster Random Sampling* dari populasi seluruh siswa kelas VIII SMP 4 Muhammadiyah Surakarta tahun ajaran 2021/2022. Teknik pengumpulan data dengan teknik angket dan tes. Sebelum dilakukan penelitian, terlebih dahulu dilakukan uji keseimbangan untuk mengetahui kedua sampel memiliki kemampuan awal yang sama. Uji normalitas, dan uji homogenitas merupakan uji prasyarat analisis pada penelitian ini. Teknik analisis data dengan menggunakan analisis variansi dua jalan sel tak sama dengan taraf signifikansi 5%. Hasil penelitian menunjukkan bahwa model pembelajaran NHT dan TPS berpengaruh terhadap hasil belajar matematika. Hasil belajar matematika siswa yang diberikan model pembelajaran NHT cenderung lebih baik dari hasil belajar matematika siswa yang diberikan model pembelajaran TPS. Gaya belajar berpengaruh terhadap hasil belajar matematika. Siswa dengan gaya belajar auditori cenderung mendapatkan hasil belajar yang lebih baik dibandingkan gaya belajar visual dan kinestetik. Interaksi antara model pembelajaran NHT dan TPS terhadap hasil belajar matematika ditinjau dari gaya belajar siswa.

Kata kunci : *Gaya belajar*, *Hasil belajar*, *Model pembelajaran NHT*, *Model pembelajaran TPS*

Abstract: This study aims to determine the effect of the NHT and TPS learning models on mathematics learning outcomes, the impact of student learning styles on mathematics learning outcomes, and the result of the interaction of learning models and student learning styles on mathematics learning outcomes. This type of quantitative research with a quasi-experimental design. The research sample consisted of two classes (experimental and control) which were taken using Cluster Random Sampling from the population of all course VIII students of SMP 4 Muhammadiyah Surakarta in the academic year 2021/2022. Data collection techniques with questionnaires and tests. Before the research, a balance test was conducted to determine whether the two samples had the same initial abilities. The normality test and homogeneity test are prerequisite analysis tests in this study. The data analysis technique using two-way cell analysis of variance is different, with a significance level of 5%. The results showed that the NHT and TPS learning models affected mathematics learning outcomes. The mathematics learning outcomes

Accepted: October 12, 2022 Approved: November 10, 2022 Published: December 01, 2022
DOI: 10.20961/jmme.v12i2.67990

of students who were given the NHT learning model tended to be better than those who were given the TPS learning model. Learning styles affect the results of learning mathematics. Students with an auditory learning style get better learning results than visual and kinesthetic learning styles. The interaction between the NHT and TPS learning models on mathematics learning outcomes in terms of student learning styles.

Keywords: *Learning style, Learning outcomes, NHT learning model, TPS learning model*

INTRODUCTION

Mathematics is a complicated and challenging subject; it is a statement often made by most students. Many formulas in each problem-solving made some students express this perspective. Of course, this contradicts the definition of mathematics itself, that mathematics is the science of logic regarding shape, composition, quantity, and related concepts (Rahmah, 2018). The use of the reason in question is not just memorizing formulas. This perspective on mathematics has a low influence on student learning outcomes in mathematics. According to (Salam et al., 2019), students' learning outcomes in mathematics in Indonesia tend not to meet expectations. This condition can be seen from the data from the Program for International Study Assessment (PISA) and the results of the National Examination.

The results of a survey conducted by the Organization for Economic Co-operation and Development (OECD) through the Program for International Student Assessment (PISA) in 2015, Indonesia ranked 62 out of 72 with a mathematical ability of 386. Then in 2018, Indonesia ranked 71st of the 77 participating countries, with a reading ability score of 371 and a math ability score of 379 (OECD, 2019). This result is, of course, very far from what was expected. TIMSS was developed by the International Association for Evaluation of Educational Achievement (IEA). Based on the 2015 TIMSS survey results, Indonesia was ranked 44th out of 49 countries participating in TIMSS (Mullis et al., 2015). As for the 2019 TIMSS survey results, no Indonesian students were found to have participated in the study.

Assessment of learning outcomes at the national branch offices is carried out per school using the National Examination. Based on data from the Education Assessment Center, the average grade for junior high school mathematics exams in the 2015/2016 school year was 49.91, the 2016/2017 school year rose to 51.16, the 2017/2018 academic year decreased to 43.08, and in 2018/2019 academic year to 46.19 (Kemendikbud, 2019). The average national exam score from year to year has fluctuated in the 40s and 50s, where this score could be better. The low results of learning mathematics are not without reason. Various factors caused this to happen. According to Sukardjo & Salam (2020), there were two

p-ISSN 2089-8878; e-ISSN 2715-8276

factors for low learning outcomes, namely external factors, namely from outside, such as learning models and internal which came from within the students.

The learning process in the classroom is a reflection of student learning outcomes. Kember et al. (2010) stated that the learning process determines how learning outcomes will be obtained. In the learning process, the main thing that must exist is the learning model. The selection of a learning model will improve the teaching and learning process in the classroom. Therefore a teacher must have the ability to be wise in determining which model to apply. The fact is that many teachers in Indonesia have yet to be able to apply a learning model that follows the material and character of students, even the learning model used is monotonous from meeting to meeting in class. This perception is supported by Husna et al. (2019) in their research, which states that the current learning model used by teachers is still monotonous, so students are not motivated to take part in learning. Holman & Hanson (2016) also states that conventional learning models with lectures are ineffective for application in class, so an increase in learning outcomes does not occur. Some of these studies can be said that the conventional learning model with lectures and monotonous learning models, which are currently still rampant, are ineffective if they continue to be applied in learning.

The learning model that makes students more motivated and makes them more active in participating in teaching and learning activities is the cooperative learning model (Silalahi & Hutauruk, 2020). Students previously inactive in learning began participating in the problem-solving process provided with this learning model (Damayanti & Tarmedi, 2018). The Numbered Head Together (NHT) learning model and the Think Pair Share (TPS) learning model are part of the cooperative learning model (Razak, 2016). The NHT learning model is a model that aims for students to be able to interpret concepts on their own by discussing them with each other (Mursalin et al., 2018). According to Haydon et al. (2010), this learning model can increase activity relevant to learning (on-task). The learning outcomes will increase because this model prioritizes learning with collaboration between friends. Then the TPS learning model is a learning model that can make students discuss with their bench mates or smaller groups where they can be in pairs (2 people) (Hidayat & Muhson, 2018). Research by Nasution & Surya (2017) states that Think Pair Share (TPS) cooperative learning effectively improves student learning outcomes.

Learning style is one of the internal factors that influence student learning outcomes. Lehmann & Ifenthaler (2012) in their research stated that each student has their characteristics in learning; these characteristics are learning styles. Learning styles consist of 3 types, namely visual, auditory learning styles, and kinesthetic learning styles (Hernacki, 2002). Students with a visual learning style will dominantly absorb what information is seen (eye senses), auditory learning styles will tend to absorb

what information is heard easily, and those with a dominant kinesthetic learning style will easily absorb information through various physical movements (Hussein Ibrahim & Hussein, 2015).

Many studies only focus on examining the effect of the NHT and TPS learning models on learning outcomes (Baskoro, 2020; Kusuma & Maskuroh, 2018; Rahayu & Suningsih, 2018; Zuraida & Karyati, 2018). This research will extend these studies by involving student learning style variables. Therefore this study aims to determine the effect of the NHT and TPS learning models on mathematics learning outcomes, the effect of student learning styles on mathematics learning outcomes, and the effect of the interaction of learning models and learning styles on mathematics learning outcomes.

RESEARCH METHOD

The type of research used in this research is quantitative with a quasi-experimental research design. Quasi-experimental is an experiment treating impact measurements and experimental units but does not use random samples (Sugiyono, 2017). Using the class VIII student population of SMP Muhammadiyah 4 Surakarta, the samples were taken using two classes. The number of students was 31 for each class and for groups of students treated with the NHT learning model and the TPS learning model.

The research instrument used was a matter of learning achievement tests on the material of flat-sided geometric shapes and learning style questionnaires. At first, the feasibility test was carried out by conducting reliability and validity tests. Before being given treatment, both classes were tested for their initial ability to determine whether the two samples had the same abilities. The test used the t-test (Independent Sample t-Test)—techniques for instrument testing using validity and reliability tests. Test the validity of the test and questionnaire using the Product Moment correlation formula. Test the reliability of tests and questionnaires using Cronbach's Alpha formula (α). Normality and homogeneity tests were carried out as prerequisites for conducting data analysis, then the data analysis used was a two-way ANOVA test with different cells.

RESULTS AND DISCUSSION

Before data collection, learning was carried out for approximately one month to explain the flat-sided spatial material with a predetermined experimental class. Then the researcher began distributing questionnaires to determine student learning styles and conducting tests on students to determine learning outcomes. The results of the tests can be seen in Table 1, which shows the average value. Then the data obtained is carried out through prerequisite tests by testing the level of normality and homogeneity. The test results are shown in Table 2 and Table 3. It can be seen that the normality test

p-ISSN 2089-8878; e-ISSN 2715-8276

shows a value of Sig > 0.05, meaning that the data is usually distributed. Then in the homogeneity test using the Levene test, which has a Sig value of 0.215, it comes from homogeneous data.

Table 1. Average and marginal average

Model Pembelajaran	Gaya Belajar			Rerata Marginal
	Visual	Auditori	Kinestetik	
NHT	81.54	88.36	71.40	82.94
TPS	76.93	77.00	65.67	72.58
Rerata Marginal	79.15	85.37	67.35	77.84

Table 2. Normality test 1

	Gaya Belajar	Kolmogorov-Smirnova	Shapiro-Wilk
		Sig.	Sig.
Hasil Belajar	Visual	0.200	0.522
	Auditori	0.164	0.413
	Kinestetik	0.153	0.732

Table 3. Normality test 2

	Gaya Belajar	Kolmogorov-Smirnova	Shapiro-Wilk
		Sig.	Sig.
Hasil Belajar	NHT	0.200	0.182
	TPS	0.200	0.390

After the data is usually distributed and the data obtained is homogeneous, the two-way ANOVA test is continued with different cells.

Table 4. Results of two-way analysis with different cells

Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	3727.172a	5	745.434	11.137	0.000
Intercept	302113.887	1	302113.887	4513.606	0.000
Model	669.744	1	669.744	10.006	0.003
Gaya Belajar	1611.084	2	805.542	12.035	0.000
Model * Gaya Belajar	112.644	2	56.322	0.841	0.436
Error	3815.240	57	66.934		
Total	389276.000	63			
Corrected Total	7542.413	62			
a. R Squared = .494 (Adjusted R Squared = .450)					

In Table 4 are the results of the Anava obtained which will then be interpreted. The learning model line has a significant value of 0.003, which is smaller than 0.05. This result shows that H0 is rejected, so it can be concluded that the NHT and TPS learning models influence mathematics learning outcomes. Then the learning style row has a significant value of 0.000, which is also smaller than 0.05, this result

shows that H0 is rejected, so it can be concluded that there is an influence of visual, auditory and kinesthetic learning styles on mathematics learning outcomes. Lastly, the line of interaction between learning models and learning styles has a significant value of 0.436, which is greater than 0.05. This result shows that H0 is accepted, so it can be concluded that there is no interaction between learning models (NHT and TPS) and student learning styles (visual and auditory). And kinesthetic) on mathematics learning outcomes.

The test results show that two hypotheses are rejected, namely the first and second hypotheses. So it needs to be followed up to determine which learning model has a better influence on learning outcomes and which learning styles have a better influence on learning outcomes. In the first hypothesis, there are only two categories (the NHT and TPS learning models), so to see which one is better, it is enough to look at the marginal average without needing further tests. Table 1 already shows the marginal average, which shows that the group of students treated with the NHT learning model had a marginal average of 82.94. In contrast, the group of students treated with the TPS learning model had a marginal mean value of 72.58, so it can be concluded that the NHT learning model provides a better effect than the TPS learning model on mathematics learning outcomes on the subject of comparison.

The second hypothesis has three types of learning style models (visual, auditory, and kinesthetic), so a post hoc test is carried out to determine which learning style has a better influence on learning outcomes. This post hoc follow-up test uses the assumed equal variances because the number of samples between practical classes is the same. Post hoc follow-up test results can be seen in Table 5.

Table 5. Post Hoc Follow-up Test

(I) Learning_Style	(J) Learning_Style	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Visual	Auditory	-6.22*	2.450	0.036	-12.12	-0.32
	Kinesthetic	11.80*	2.533	0.000	5.70	17.89
Auditory	Visual	6.22*	2.450	0.036	0.32	12.12
	Kinesthetic	18.02*	2.731	0.000	11.44	24.59
Kinesthetic	Visual	-11.80*	2.533	0.000	-17.89	-5.70
	Auditory	-18.02*	2.731	0.000	-24.59	-11.44

To find out which learning style has a better influence on learning outcomes, it can be seen from the Mean Difference column that if it has a negative value, then the learning style in column I is not better than column J type of learning. More specifics will be presented one by one according to the table. The relationship between visual learning style and auditory learning style has a Mean Difference value of -6.22, which means that the visual learning style is not better than the auditory learning style in

p-ISSN 2089-8878; e-ISSN 2715-8276

influencing learning outcomes. The relationship between visual learning styles and kinesthetic learning styles has a Mean Difference value of 11.80, which means that visual learning styles are better than kinesthetic learning styles in influencing learning outcomes. The relationship between auditory learning styles and kinesthetic learning styles has a Mean Difference value of 18.02, so auditory learning styles are better than kinesthetic learning styles in influencing learning outcomes. From these three statements, the auditory learning style has a better influence than other learning styles on learning outcomes, followed in a hierarchy by the visual and kinesthetic learning styles so that the sequence of learning styles that has a more substantial influence on learning outcomes is auditory learning style, visual, and kinesthetic.

The first hypothesis shows that the NHT learning model is better than the TPS learning model regarding student learning outcomes. This is in line with Rahayu & Suningsih (2018) which also revealed that the NHT learning model produces an average learning outcome higher than the TPS learning model. According to Rosita & Leonard (2015), this is because the TPS learning model is a simple cooperative learning model that allows students to work alone and with others. This is different from the NHT learning model, which conditions students to think together in groups where each student is given a number and has the same opportunity to answer the problems posed by the teacher through random number dialing.

The research results on the second hypothesis that learning styles influence learning outcomes. Then further tests were carried out, and the results of the learning style hierarchy in giving a more substantial influence on learning outcomes were auditory, visual, and kinesthetic learning styles. These results are identical to the results of research conducted by Nurlaela et al. (2018) that learning styles significantly influence student learning outcomes. Then Halim (2012) states that the auditory learning style tends to obtain higher mathematics learning outcomes than other groups. This is because the auditory learning style tends to listen when understanding a material. One way is to provide opportunities to discuss in groups and present findings (Wahyuni, 2017). This is very suitable when learning to apply cooperative learning models such as the NHT and TPS models.

The third hypothesis shows that with a two-way analysis test with different cells, H0 is accepted. This shows no interaction between the NHT and TPS learning models with student learning styles on mathematics learning outcomes. Based on this description, it can be concluded that in research conducted at SMP Muhammadiyah 4 Surakarta, there was no interaction between the learning model given and the student's style on students' mathematics learning outcomes.

CONCLUSIONS AND SUGGESTIONS

Based on the findings and discussion, it can be concluded that the NHT and TPS learning models affect mathematics learning outcomes. The mathematics learning outcomes of students who were given the NHT learning model tended to be better than those who were given the TPS learning model. Learning styles affect the results of learning mathematics. Students with auditory learning styles get better learning results than visual and kinesthetic learning. Visual learning styles tend to get better learning results than kinesthetic learning styles. Finally, there is no interaction between the NHT and TPS learning models on mathematics learning outcomes in terms of student learning styles.

This study found no interaction between the NHT and TPS learning models on mathematics learning outcomes in terms of student learning styles. We suggest broadening the scope of research beyond student learning styles.

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