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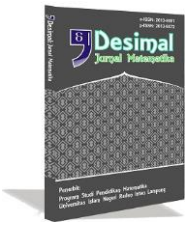

The Effectiveness of Somatic, Auditory, Visualization, and Intellectually and Numbered Head Together Learning Models Against Students' Mathematical Problem Solving Capabilities

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ABSTRACT

This study aims to examine the effectiveness of the Somatic, Auditory, Visualization and Intellectualy (SAVI) and Numbered Head Together (NHT) learning models on students' mathematical problem solving abilities. This research is included in the type of quantitative research. The research sampling technique uses the random sample method. Using the T-Test as a data processing analysis technique with a significance level α = 0,05. Obtained research results indicate that there are very significant differences in students' mathematical problem solving abilities. Students who use the NHT learning model have problem-solving abilities that are superior to students who use the SAVI learning model. This is evident from the mean value of descriptive data that is 80.88 for the NHT learning model and the SAVI learning model obtained a mean value of 68.24, in addition from the T test also concluded that there are significant values for both models.

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INTRODUCTION

The rapid development of science and technology requires each individual to be able to adjust. Along with that education must be really quality so that students can have various abilities to keep up with the times, one of which is the ability to solve mathematical problems.

Mathematical problem solving ability is an ability to measure high level skills possessed by students. So that students are better able to find a variety of concepts in a holistic, meaningful, authentic and applicable manner (Hariawan, Kamalludin, & Wahyono, 2014). In addition according to (Ruseffendi, 2006) problem solving ability is very important in mathematics, not only those who will explore mathematics, but also for those who will apply it in other fields of study and in everyday life, so that

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problem solving ability has a very important role. As stated by (Suherman, E, 2003) problem solving skills are very important, students gain experience using knowledge and skills possessed in solving problems that are not routine. The ability to solve has many roles so a lot of research on it, for example in learning mathematics to train emotional intelligence, train students' ability to analyze problems, solve mathematical problems, train critical thinking while also helping to make decisions that are very useful in everyday life. (Amir, 2015; Basri, Nursalam, & Suharti, 2018; Gunawan et al., 2019; Hapsyah, Permana, & Zanthy, 2019; Jiaoyu, Gulo, & Fadillah, 2009; Palapasari, Kadir, & Anggo, 2017; I. J. Sugesti, Simamora, & Yarmayani, 2018; Sundayana & Williams, 2019). Various ways to improve mathematical problem solving skills with learning models, including the learning model Auditory, Visualization and Intellectualy (SAVI) and Numbered Head Togheter (NHT).

The Savi Learning Model is naturally designed to match learning activities with specific instructions based on the needs when implementing the learning process without compromising the aspects of learner privacy (Kusumaningsih, Hidayah, & Sutrisno, 2019). Many research has been done on SAVI learning models in various objects, namely to improve learning outcomes, learning motivation, learning interest, learning achievement, problem solving skills, critical thinking skills, mathematical communication skills, student creativity, learning independence and confidence in learning mathematics. (Anas & Syafitri, 2019; Arif, 2018; Dewi, Murda, & Pudjawan, 2019; Hendrawan, Suarjana, & Arini, 2018; Kusumaningsih et al., 2019; Murti, Negara, & Nasir, 2019; Nio, 2016; Rosalina & Pertiwi, 2018; indri jati Sugesti, Simamora, & Yarmayani, 2018; Ulvah & Afriansyah, 2016).

Various studies have also been carried out using learning models including to improve learning achievement, science process skills, learning outcomes, learning activities, problem solving skills, motivation to learn, thinking abilities, attitudes of student responsibility, active learning mathematics, character improvement, and improving mathematical connection (Atiyah, Usodo, & C, 2018; Fajriyati, Supandi, & Rahmawati, 2019; Halim, Boleng, & Labulan, 2019; Herbawa, Adi, & Wijaya, 2018; Khasanah, Wahyuni, & Astuti, 2013; Muchlis et al., 2018; Nur, Salam, & Hasnawati, 2016; Permatasari, 2017; Rahayu, Wibowo, & Purwoko, 2017; Rahmawati, Nugroho, & Putra, 2014; Rosdianawati, Dra. Yuliati, & Sabar Nurohman, S.Pd.Si., 2017; Wati & Fatimah, 2016). The NHT learning model is a group learning model that completes tasks by sharing ideas from each individual (ErminaSari & Maryam, 2017).

Based on what has been described above, no one has done research on the comparison of Somatic, Auditory, Visualization and Intellectualy (SAVI) and Numbered Head Togheter (NHT) learning models, the researcher wants to conduct research to find out their effectiveness considering that both models have been proven to have an influence both of the objects under study, with the ability to solve mathematical problems as research parameters.

METHOD

Research using quantitative methods. quasi type of experiment. Sampling is done by random sampling or random technique. Using the T test as an analysis of hypothesis testing data that will compare the results of comparison of SAVI and NHT learning models.

Figure 1 shows the steps of the SAVI learning model starting with explaining the learning objectives, dividing the class into several groups, delivering material by giving real examples and explained in

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detail, students are given questions to be in groups then ask students to display the results and other students respond, the teacher assess the results of student work, provide evaluation and conclude the material.

The NHT learning model starts from the preparation stage where the teacher makes a lesson plan and worksheets in accordance with the learning model, then divides students into groups using the initial test as the basis for forming and giving numbers and names for each group, each group is required to have a guidebook to help in solve problems, each student is given a worksheet containing teaching material and then students discuss with the group to understand and answer questions, the teacher calls a number and the name of the student in each group to answer, finally the teacher and the student conclude the answer in the material presented.

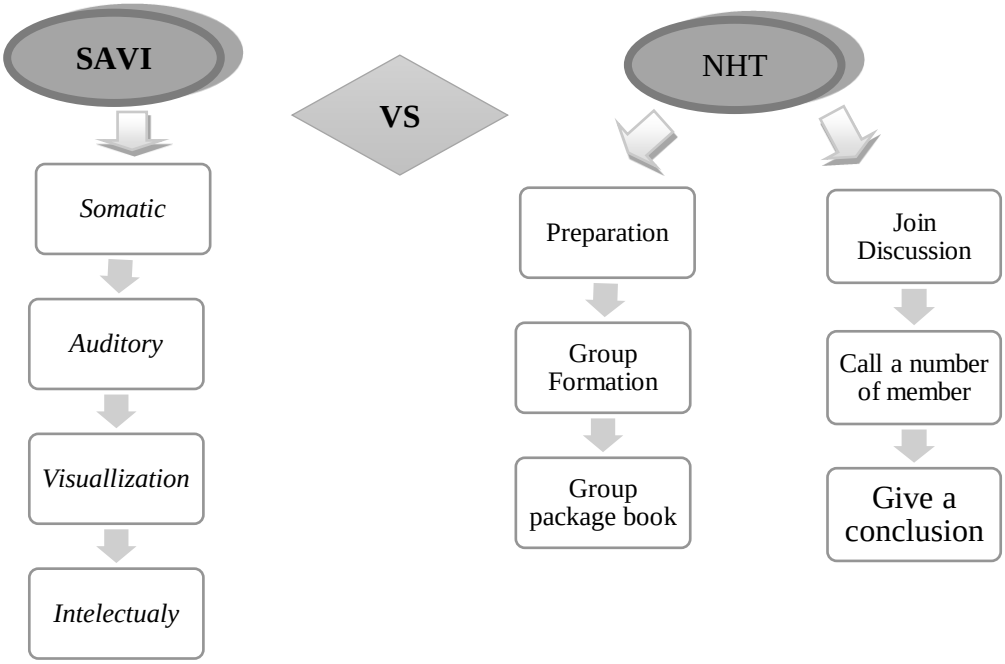

Figure 1. Research design

RESULTS AND DISCUSSION

Based on the research design that will be used to measure students' mathematical problem solving abilities that have been formulated, the following is the presentation of the results of descriptive tests of mathematical problem solving ability data tests :

Table 1. Descriptive Data of Mathematical Problem Solving Ability

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Model SAVI	25	30	57	87	68.24	8.686	75.440
Model NHT	25	27	65	92	80.88	7.178	51.527

Based on the data obtained from the table above, the mean, maximum and minimum results of the two models show that the NHT learning model is greater than the results of the SAVI learning model so that it can be concluded that the NHT learning model has a higher level of effectiveness than the SAVI learning

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model. in mathematical problem solving abilities.

To strengthen the data it will proceed to test the data with the T test, before the test will be carried out pre-requisite tests including the normality test and homogeneity test. Normality test is used to analyze whether the data is normally distributed or not. Namely on the condition that:

H_0 = normally distributed data
H_1 = data not normally distributed

The normality test has a significance level of $\alpha = 0.05$ if Asymp.sig> α then H_0 is accepted but conversely if Asymp.sig <α then H_0 is rejected, it means the data is not normally distributed. Here are the data from the results of the normality test for mathematical problem solving ability:

Table 2. Normality Test data results mathematical problem solving abilities

model	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
SAVI	.167	25	.069	.928	25	.078
NHT	.096	25	.200*	.959	25	.403

Based on table 2, the results of the normality test data show that the application of the SAVI and NHT learning models is normally distributed because both of their significance levels are more than $\alpha = 0.05$, so they can proceed for further testing, namely homogeneity tests. Homogeneity test is used to see whether or not the variance of the two distribution data is the same. Then the homogeneity test results are obtained as follows :

Table 3. Homogeneity test results for mathematical problem solving abilities

		Levene Statistic	df1	df2	Sig.
Score	Based on Mean	2.411	1	48	.127
	Based on Median	2.132	1	48	.151
	Based on Median and with adjusted df	2.132	1	47.993	.151
	Based on trimmed mean	2.359	1	48	.131

Based on data from table 3 above, the homogeneity test results for the SAVI and NHT learning models are homogeneous. After finding that the data is normal and homogeneous, then proceed to the T Test for two uncorrelated samples to find out which is more effective than the SAVI and NHT models in mathematical problem solving abilities. Following are the results of the T test for the two uncorrelated samples:

Table 4. T test results for mathematical problem solving abilities

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Sig. (2-tailed)
SAVI and NHT problem solving skills	Equal variances assumed	2.411	0.127	-5.609	000
	Equal variances not assumed			-5.609	000

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Based on the results of the T test in table 4 shows that for two samples that do not correlate to the mathematical problem solving ability in the learning model SAVI and NHT get the results of the decision of the hypothesis based on the left side test, the value of p.value is obtained < 0.05 = .000 < 0.05 then H_0 rejected. Which means that it has a very significant difference in the ability to solve mathematical problems using the SAVI and NHT learning models. Therefore, the application of the NHT learning model is more effective than the SAVI learning model in mathematical problem solving abilities. This is caused by differences in several steps in the SAVI and NHT learning model, in the SAVI learning model the learning steps begin from the teacher explaining the learning objectives, dividing students into groups, delivering material by giving real examples and explained in detail, students are given problems in groups then ask students to display the results and students respond to these results, the teacher assesses the results of student work, provide evaluations and conclude the material. Whereas in the NHT learning model the learning steps begin with the preparation stage of the teacher making lesson plans and worksheets, then dividing students into groups using the initial test as a basis for forming and giving numbers and names for each group, each group is required to have a guidebook to help in solving problems, each student is given a worksheet that contains teaching material and students discuss with the group to understand and answer questions, the teacher calls one number and the name of the student in each group to answer, finally the teacher concludes with the answer to the material presented.

From the second step of the learning model, it can be seen that there are some differences that make the NHT learning model more effective, including in the beginning of learning, the teacher makes a lesson plan and worksheet so that the implementation of learning is more conceptual, however, in the SAVI model the teacher only explains the learning objectives. Then the second step in the NHT learning model the teacher divides the groups using the initial test scores as a basis for grouping, but in the SAVI model the teacher only divides students into groups randomly.

The NHT learning model is more effective than the SAVI learning model, this is in accordance with previous research which states that the NHT learning model is influential to improve learning achievement, science process skills, learning outcomes, learning activities, problem solving abilities „ learning motivation, thinking ability, attitude of student responsibility, active learning of mathematics, improvement of character, and improve mathematical connections ((Atiyah, Usodo, & C, 2018; Fajriyati, Supandi, & Rahmawati, 2019; Halim, Boleng, & Labulan, 2019; Herbawa, Adi, & Wijaya, 2018; Khasanah, Wahyuni, & Astuti, 2013; Muchlis et al., 2018; Nur, Salam, & Hasnawati, 2016; Permatasari, 2017; Rahayu, Wibowo, & Purwoko, 2017; Rahmawati, Nugroho, & Putra, 2014; Rosdianawati, Dra. Yuliati, & Sabar Nurohman, S.Pd.Si., 2017; Wati & Fatimah, 2016).

CONCLUSIONS AND SUGGESTIONS

From the results of tests conducted by researchers who refer to the research objectives. It can be concluded that there is a very significant difference in the ability to solve mathematical problems using the SAVI and NHT learning models. From these data it shows that the NHT learning model is more effective than using the SAVI learning model in students' ability to solve mathematical problems. Therefore, the NHT learning model is more appropriate to be used to support students to further improve their mathematical problem solving abilities in

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the learning process carried out in the classroom.

Hopefully in this case the research we do can add to the teacher's knowledge to help students improve their problem solving abilities and for further research to be able to further develop the SAVI learning model and the NHT learning model to be even better.

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