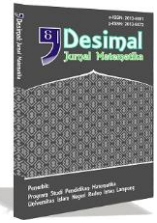




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## Learning Models to Improved Mathematical Communication Skills

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### ABSTRACT

The problem faced by students in slow learning is in terms of communication. The use of Auditory, Intellectually, Repetition (AIR) and Cooperative Think Pair Share (TPS) types is needed to help students communicate mathematically in expressing mathematical ideas. This study aims to determine whether or not there are differences in mathematical communication skills of students using the Auditory, Intellectually, Repetition (AIR) learning model with students who use Think Pair Share (TPS) Cooperative learning models. This research uses a quantitative approach using the Quasi Experiment method. The research design is in the form of posttest only, non-equivalent group design. Testing data using the T test with Independent Samples T-Test. Based on the results of hypothesis testing obtained  $p\text{-value} > \alpha 0.05$ . So it was concluded that there were indications of differences between Auditory, Intellectually, Repetition (AIR) learning models with (TPS) Cooperative learning models and superior (AIR) learning models compared to Cooperative learning models of (TPS) Type in influencing students' mathematical communication skills.

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### INTRODUCTION

Mathematical communication skills are one of the abilities students must have (Aminah, Wijaya, & Yuspriyati, 2018). One aspect that needs to be taught to students is how they are able to express their thoughts both in writing and in words, so that they are able to interact with the

community (Hodiyanto, 2017). There have been several previous studies regarding mathematical communication skills (Lusiawati, 2013; Wulandari, 2016).

Mathematical communication skills are very important because with mathematical communication, students can communicate mathematical ideas with

symbols, tables, graphs, or diagrams (Dharma, Pujiastuti, & Harianja, 2019; Junaedi, 2010; Ningrum, 2016; Nuraeni & Luritawaty, 2016; Prihastuti & Riyadi, 2014; Purwati, Sessu, & Jursa, 2018; Sakti, Rahardjo, & As'ari, 2017; N. Wahyuni, Mirza, & BS, 2018). One way to further develop mathematical communication skills is to apply an appropriate learning model.

There are various kinds of learning models that are considered to be able to influence mathematical communication skills, one of which is the Auditory Intellectually Repetition (AIR) learning method, (listening) (S. Huda, Anggraini, et al., 2019), Intellectually (thinking), and Repetition (repetition). Based on previous research, there have been studies that discuss AIR learning models for students' reasoning abilities (Rahmawati, Lestari, & Umam, 2019), mathematics learning achievement (Habibi et al., 2019), speaking skills, mathematical problem solving abilities (S. Huda, Sholikhakh, et al., 2019), student understanding (Prastowo et al., 2019), activeness and learning achievement (Agustiana, Putra, & Farida, 2018; Ainia, Kurniasih, & Sapti, 2012; I.M, 2014; Linuwih & Sukwati, 2014; Mustika & Kinanti, 2018; Purnamasari, 2014; Puspitawedana, Sujadi, & Harini, 2014; Sulistyaningsih & Istiqomah, 2014; Widiastuti, Suniasih, & Kristiantari, 2014).

Another learning model that is using cooperative type Think Pair Share. In this method there are three stages, namely Thinking, Pairing and Sharing (Ayukmartina, Sudjadi, & Purnami, 2014; Isari, Sanusi, & Krisdiana, 2014; Sugiharti,

2013; R. S. Wahyuni & Harini, 2017). The Think Pair Share (TPS) method is a type of cooperative learning that is designed to influence learners' interaction patterns and provide an opportunity for each student to show their participation to others (Hanadayani & Sujadi, 2014). Think Pair Share is also one model of learning with small groups (Kasimuddin, 2016). The number of group members consisting of only 2 people (in pairs) can optimize the active role of each student in the group and make it easier for students to cooperate with each other in expressing and discussing mathematical ideas they have both in oral and written form (Susanti, 2014; Wijayanto, 2015). This learning method prioritizes student learning activities together in groups so as to develop social relationships in problem solving learning (Wulan Sari, Kusmanto, & Sujadi, 2014). So the purpose of the writer to make this article is to compare the two learning models of Auditory Intellectually Repetition (AIR) and cooperative Think Think Share (TPS) types whether there are differences in the two models and the more superior between the two (S. Huda, Tsani, Syazali, Umam, & Jermsittiparsert, 2020).

## **METHOD**

This type of research is quantitative research. The research method used in this study is experimental research (experimental research). The research design used in quasi-experimental (quasi-experimental design) with the research design is posttest only, non-equivalent group design.



## RESULTS AND DISCUSSION

Based on the results of the posttest conducted in this study, the data

obtained were then analyzed using the centralization rules shown in Table 1.

Table 1. Data Mathematical Communication Skills

Model	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
AIR	30	29.00	71.00	100.00	81.6333	8.19791	67.206
TPS	23	41.67	50.00	91.67	70.21	11.17787	124.945

Based on Table 1 for mathematical communication skills data using two types of learning models, namely the AIR model and the TPS model, the number of members or respondents in each group are 30 and 23 members with a mean number of 81.6333 and 70.21. From these data also obtained Std. Deviation for the AIR model of 8,19791 and the TPS model of 11,17787, from the results of the research above, there was a significant

difference in the mean value and also the Std.Deviation of each learning model. The smaller the standard deviation indicates that the data does not spread and the better the data shows. It can be concluded that the AIR learning model is better than the TPS learning model.

To strengthen the results of the above research, a T test was then performed using the Independent Samples T-Test. The recapitulation results of the T test results in Table 2.

Table 2. Independent Samples Test

		Levene's Test for Equality of Variances		T-Test for Equality of Mean			
		F	Sig.	t	df	p-value	Mean Differences
Learning Model	Equal variances assumed	1.594	0.213	4.295	51	0.000	11.42333
	Equal variances not assumed			4.124	38.871	0.000	11.42333

Meanwhile, for Table 2 based on the same data for the T Test using the Independent Samples Test with IBM SPSS on the AIR learning model and the TPS learning model as a sample, the output results obtained are in the Levene's Test of Equality of Variances F value of 1.594 and sig. or significance of 0.213. Because the significance value of  $0.213 > \text{significance level } \alpha 0.05$  indicates that the data variance is assumed to be the same. Because the variance test obtained the same data, the p-value in the T-Test for Equality Mean column

used is in the first row Equal variances assumed with a p-value of 0,000. The results obtained p-value of  $0,000 < \alpha 0.05$  then  $H_0$  is rejected. So it was concluded that at a significance level of  $\alpha$  of 5% learning models using the AIR model and the TPS model on mathematical communication there were differences. Seen in Table 1 on the Mean line that the AIR learning model and the TPS learning model have different Mean with the average difference in the Mean Differences column in the Independent Sample Test table of 11.42333 which

statistically assumes that the AIR learning model and the TPS learning model have differences and the AIR learning model is more superior than the TPS learning model.

This happens because the Auditory learning model, Intellectually, Repetition (AIR) contains several steps in its implementation that are superior to Cooperative Think Pair Share (TPS) types, where the teacher explains the discussion material first before then being analyzed by students, after which group representatives are required to dare to present the results of group discussions in front of the class. In addition to being given questions to be solved together with the group students individually get repetition of material by being given a quiz at the final stage after the discussion is over.

Next to strengthen the conclusions, researchers review from each stage of the learning model that researchers use. In the first stage all learning models do the preparation including preparing a discussion group, the TPS model after students are divided into their groups and then divided again in pairs. Then in the second stage in the TPS learning model the teacher directly gives questions to the students, then the questions are first done individually to train students' thinking power, then in the third stage the work results of each student are discussed in pairs. At the last stage students rejoin their groups to discuss in groups.

The stages of preparation in the AIR learning model after group formation, the second stage is the teacher explaining to students the material to be used for discussion. Furthermore, in the third stage students are asked to listen and pay attention and understand the material conveyed by the teacher. The fourth stage, each group is welcome to conduct discussions. The results of the discussion are then written to be

presented in front of the class. Then, at the fifth and sixth stages each group is given questions by the teacher which is then discussed again in groups to solve the problem. The last stage is, the teacher gives a repetition of material in the form of a quiz. The teacher gives quizzes to students which are then done individually. The purpose of this repetition is that students repeat or review the discussion material earlier and also become one of the differentiators from other learning models (Purnomo, 2018).

Strengthened by the results of previous studies, that the TPS learning model can also improve mathematical communication skills and confidence, learning achievement, mathematics learning activities and results, learning motivation (Ayukmartina, Fibriana, 2014; Dharma,I.D.P.P, 2019; Isari, Sri, 2014; Kasimuddin, Drs.H., 2016; Lusiawati, Eni, 2013; Sugiharti, Eka Handayani, 2013; Wahyuni, RR Sri, and Esti Harini, 2017; Wulandari, Wulan Sri, 2016; Wulan Sari, Arin Dwi, 2014). Likewise the AIR model has an impact on mathematical communication skills. This is in line with the results of previous studies which stated the AIR learning model also impacts and influences and enhances students' reasoning abilities, mathematics learning achievement, speaking skills, mathematical problem solving abilities, student understanding, activeness and learning achievement (Agustiana et al., 2018; Ainia et al., 2012; I.M, 2014; Linuwih & Sukwati, 2014; Mustika & Kinanti, 2018; Purnamasari, 2014; Puspitawedana et al., 2014; Sulistyaningsih & Istiqomah, 2014; Widiastuti et al., 2014).

TPS learning model can also improve mathematical communication skills and confidence, learning achievement, activities and learning outcomes in mathematics, learning motivation (Ayukmartina, Fibriana,

2014; Dharma, I.D.P.P, 2019; Isari, Sri, 2014; Kasimuddin, Drs.H., 2016; Lusiawati, Eni, 2013; Sugiharti, Eka Handayani, 2013; Wahyuni, RR Sri, and Esti Harini, 2017; Wulandari, Wulan Sri, 2016; Wulan Sari, Arin Dwi, 2014). However, the results of the study of the authors of the two models turned out to have significant differences, the Auditory Intellectually Repetition (AIR) learning model was superior to the Think Pair Share (TPS) cooperative type because of the different steps in implementing the two methods (M. Huda, 2015; Khadijah & Sukmawati, 2013). The AIR learning model has a greater impact on mathematical communication skills compared to the TPS learning model.

#### CONCLUSIONS AND SUGGESTIONS

Based on the results of data analysis and discussion, it is found that there is a difference between the influence of students' mathematical communication using the Auditory, Intellectually, Repetition (AIR) learning model using the Cooperative learning model Type Think Pair Share (TPS). The results of hypothesis testing using IBM SPSS with the T test through the Independent Sample Test test obtained a p-value of 0,000. Because the p-value is  $0,000 < \alpha 0.05$  so based on the decision making criteria in the hypothesis test it can be concluded that  $H_0$  is rejected. With this mathematical communication, students use the Auditory learning model, Intellectually, Repetition (AIR), there is a difference with the mathematical communication of students using the Think Pair Share (TPS) Cooperative learning model. From the results of the discussion it can also be seen that students' mathematical communication using Auditory, Intellectually, Repetition (AIR) is better than those using Think Pair Share Type Cooperative learning models (TPS) with a difference in the amount of 11.42333.

The advice that researchers can give based on the results of these studies, teachers should be more creative and innovative in using and developing a learning model. The more learning models, then we can analyze which learning models have more impact to improve students' mathematical communication skills, one of which is the Auditory, Intellectually, Repetition (AIR) learning model.

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