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LEARNING MODEL TO IMPROVE THE ABILITY TO UNDERSTAND MATHEMATICAL CONCEPTS

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ABSTRACT

Teaching and learning process to determine student learning outcomes requires the selection of appropriate learning models so that it can provide maximum learning impact. One of the abilities of students that is very important in aspects that can affect learning outcomes is the ability to understand concepts.This study aims to determine the effectiveness of better learning models for the ability to understand mathematical concepts. This type of research is quantitative using the Quasi-experimental design method. Data collection in this study uses a description test with the type of questions based on indicators of mathematical concept understanding ability. Hypothesis testing uses a non-correlated 2-sample t test with decisions taken through the left-side test. Based on the results of the analysis obtained the ability of students who are given Flipped Classroom learning has an average value of the ability to understand concepts better than students who are given the Auditory Intellectually Repetition learning model.This shows that the Flipped Classroom learning model is more effective than the Auditory Intellectually Repetition learning model in influencing students' mathematical concepts.

Keywords : Auditory Intellectually Repetition, Flipped Classroom, Understanding Mathematical Concepts.

INTRODUCTION

Indonesia is a democratic nation, where every individual is required to understand every problem in every way. However, based on TIMSS 2011 research shows that the ability to understand the concept of the Indonesian nation is quite far compared to other countries (TIMSS 2011). Understanding the concept can be improved through the use of appropriate learning models, one of them is the Auditory Intellectually Repetition learning model and the Flipped Classroom learning model.

Various studies on Auditory Intellectually Repetition have demonstrated its superiority, such as the results of previous studies which state that the application of auditory intellectually repetition learning models has an effect on mathematics learning

outcomes, student motivation, representation abilities, mathematical problem solving abilities, ability to understand mathematical concepts and on the development of interactive multimedia to improve learning outcomes (Elisa, Hadiyanto, and Fitria 2019; Winarti and Suharto 2017; Mukcram 2018; Soenarto and R 2016; Budiarti, Agustini, and Widyaningrum 2019; Agustiana, Putra, and Farida 2018; Risdianti, Kartono, and Masrukan 2019; Elinawati, Duda, and Julung 2018; Mustamin and Kusumayanti 2019; Isna and Masykuri 2018).

Based on previous researchers also have used many flipped classroom models in their research. This is because the application of the flipped classroom model influences the teaching of foreign languages, increasing the ability to master the geometry transformation formula(Ramadhani, Umam, Abdurrahman, & Syazali, 2019), help explore teacher and student responses, effectiveness in students 'mathematical reasoning abilities, influence in various fields of study, student learning outcomes, conceptual understanding, students' creative thinking abilities, motivation and cognitive load in order to improve student learning to obtain maximum results.(Basal 2015; Abidin 2019; Dewi and Harahap 2019; Zainuddin and Halili 2016; Vermana and Zuzano 2018; Juniantari 2018; Suswandi 2018; Oakes et al. 2018; Abeysekera and Dawson 2015; Evseeva and Solozhenko 2015).

One of the most important things in achieving the goals of mathematics learning outcomes in students is understanding a concept based on learning experiences. This is in accordance according (Dahlan, 2004) that almost all learning theories make conceptual understanding the goal of the learning process. The ability to understand concepts has been extensively studied in previous research, such as the ability to understand mathematical understanding of the fighting abilities of students through trajectory learning strategies(Habibi et al., 2019)**,** realistic mathematic education models helped by a bongpas teaching aids to improve understanding of mathematical concepts in student learning outcomes.(Putra et al. 2018; Saragih 2018; Pujiastuti and Suparsih 2018; Ananggih 2017; Unaenah, Een . Sumantri 2019; Andamon and Tan 2018; Fahrudhin and Zuliana 2018; Tanjung 2019; Huda and Erman 2018).

Based on previous studies, the authors' renewal in his research will compare the effectiveness of the Auditory Intellectually Repetition model and the Flipped Classroom Model to understanding mathematical concepts. The purpose of this study is to find the best model that can provide the best impact in influencing the ability to understand mathematical concepts.

RESEARCH METHODS

This research methods used a quasi-design experiment with a quantitative method which will compare AIR and FC models in terms of influencing the ability to understand mathematical concepts. The design of the research is shown in Figure 1.

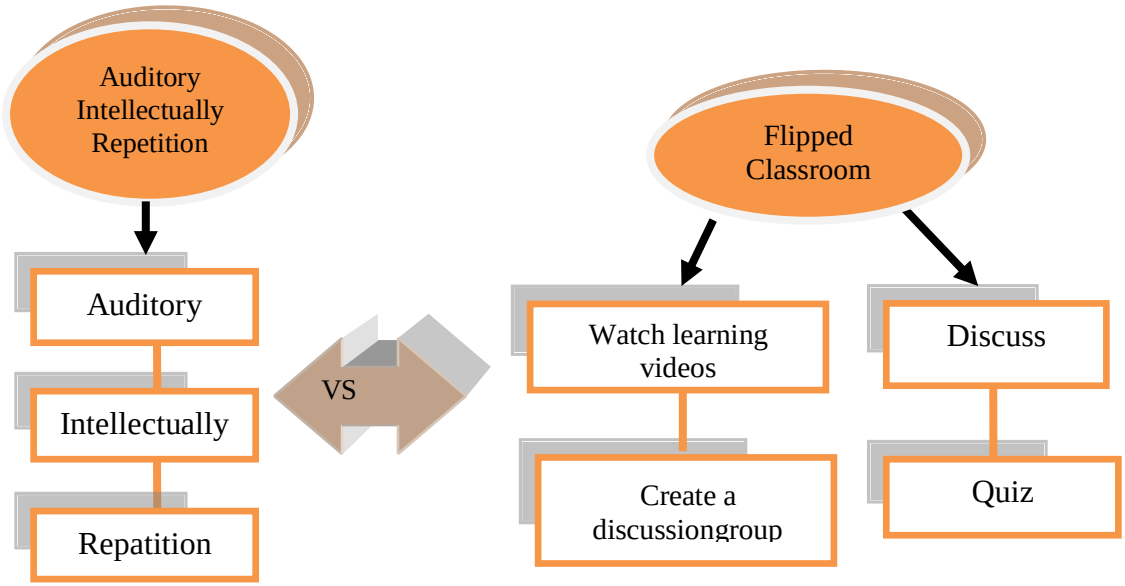

Figure 1. Research Design

Based on Figure 1, the steps of the AIR model are the first Auditory ie students go to their respective groups that have been formed by the teacher, students receive worksheets given by the teacher to be worked in groups, and students ask questions about the worksheet questions that are less understood to the teacher. Intellectually is working on LKS questions in groups by examining the examples of questions that have been given, presenting their work in groups that they have finished working on, students from other groups ask questions and express their opinions. Repetition iework on the practice questions given by the teacher individually, as well as verbally conclude about the material that has been discussed.

Flipped Classroom learning model that is before face to face, students are asked to study independently at home about the material for the next meeting, by watching the teacher's own learning video or learning video from the uploads of others. In learning in class, students are divided into several heterogeneous groups. The teacher's role when learning activities take place is to facilitate the discussion with cooperative learning methods. In addition, the teacher will also prepare several questions (questions) from the material. The teacher gives a quiz / test so that students realize that the activities they do

are not just games, but are learning processes, and the teacher acts as a facilitator in helping students in learning and solving questions related to the material.

Data collection methods in this study use a test description with the type of questions based on indicators of students' mathematical concept understanding ability. Data analysis techniques in hypothesis testing using t-test 2 samples are not correlated through the formulation of the left side test hypothesis with the assumption of normality and homogeneity.

RESULT AND DISCUSSION

Based on the research design to measure students' mathematical understanding of the concept that has been formulated, the following is the presentation of the descriptive test results of the mathematical concept understanding data test.

Table 1. Descriptive Results from students 'Mathematical Understanding Ability Data

Concept Understanding Ability	Mean	Median	Variance	Std. Deviation	Minimum	Maximum	Range
AIRModel	73.3667	73.00	57.689	7.59529	60.00	85.00	25.00
FCModel	87.8667	90.00	47.775	6.911193	71.00	96.00	25.00

Based on Table 1, the mean, minimum and maximum indicate that the application of the flipped classroom model is more effective than the auditory intellectually repetition model of the ability to understand mathematical concepts.

Strengthen the results of the data description followed by the t test. Before the t test is performed, the prerequisite test is normality test and homogeneity test first. Normality test is used to analyze whether the data is normally distributed or not. With the following hypothesis:

H_o = Data is normally distributed

H_1 = Data is not-normally distributed

Test this normality with a significance level $\alpha = 0.05$. If Asymp.sig,> α then H_o is accepted. Following are the results of the normality test for the ability to understand mathematical concepts.

Table 2. Normality Test Results Mathematical Understanding Ability

Model	Kolmogorov Smirnov[a]		Shapiro Wilk	
	Statistic	Sig.	Statistic	Sig.
AIR	.122	.200*	.945	.126
FC	.221	.001	.901	.009

Based on table 2, it is found that the application of AIR and FC models is normally distributed with significance level α = 0.05. So that it can proceed to the homogeneity test stage to find out whether or not the variances of the two data distributions are the same.The following homogeneity test results.

Tabel 3. Homogeneity Test Results of Mathematical Concept Understanding

		Levene Statistic	df1	df2	Sig.
Score	Based on Mean	.507	1	58	.479
	Based on Median	.972	1	58	.328
	Based on Median and with adjusted df	.972	1	55.741	.328
	Based on tri-med mean	.605	1	58	.440

Based on table 3, it is concluded that the above data conclusions are homogeneous. After the results of the data are normally distributed and homogeneous, then proceed to do the t-test phase of two uncorrelated samples to determine the effectiveness of the AIR and FC models for understanding mathematical concepts. Following are the results of the two sample t-test which is not correlated.

Table 4. T-Test Results about the Ability to Understand Mathematical Concepts

	Levene's Test for Equality of Variances		t-test for Equality of Means					
Ability to Understand Mathematical Concepts of Auditory Intellectually Repetition Learning Model and Flipped classroom Model	F	Sig	T	Sig (2-tailed)	Mean Diference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
	507	.479	7.734	.000	14.50000	1.87495	10.74688	18.25312
			7.734	.000	14.50000	1.87495	10.74617	18.25383

Based on Table 4 shows that the results of the t test 2 samples that do not correlate the ability to understand mathematical concepts in the application of the AIR learning model and the FC model, are obtained. Hypothesis decisions are taken based on the left side test results obtained $p.value < 0{,}05 = .000 < 0{,}05$ then $H_0$is rejected. This means that there are significant differences in the ability to understand mathematical concepts that apply the Flipped Classroom model. So that shows that the application of the Flipped

Classroom model is more effective than the Auditory Intellectually Repetition model on the ability to understand mathematical concepts.

The flipped classroom model is more effective than AIR, This is in line with previous research which states that the application of the Flipped Classroom model affects the mastery of students' mathematical understanding of concepts, motivation, representation abilities, problem-solving abilities, and the development of interactive multimedia in order to improve student learning outcomes.(Elisa, Hadiyanto, and Fitria 2019; Winarti and Suharto 2017; Mukcram 2018; Soenarto and R 2016; Budiarti, Agustini, and Widyaningrum 2019; Agustiana, Putra, and Farida 2018; Risdianti, Kartono, and Masrukan 2019; Elinawati, Duda, and Julung 2018; Mustamin and Kusumayanti 2019; Isna and Masykuri 2018)**.** Previous research also states that the application of the auditory intellectually repatition model affects the learning outcomes of mathematics, student motivation, ability of representation, ability to solve mathematical problems, the ability to understand mathematical concepts and to develop interactive multimedia in order to improve learning outcomes (Elisa, Hadiyanto, and Fitria 2019; Winarti and Suharto 2017; Mukcram 2018; Soenarto and R 2016; Budiarti, Agustini, and Widyaningrum 2019; Agustiana, Putra, and Farida 2018; Risdianti, Kartono, and Masrukan 2019; Elinawati, Duda, and Julung 2018; Mustamin and Kusumayanti 2019; Isna and Masykuri 2018). However, based on the data that has been tested it turns out that the flipped classroom model has more influence in understanding mathematical concepts than the Auditory Intellectually Repetition model.

Based on the steps in the AIR learning process, namely: Auditory (expressing an opinion or argument), Intellectually (training in problem-solving), Repetition (repeating the learning for greater understanding). While the flipped classroom learning model in which students are asked to learn independently next meeting before face to face, in the teaching process the teacher gives the object to students to discuss fellow group friends. In addition, the teacher will also prepare several questions (questions) from the material. The teacher gives a quiz/ test so that students realize that the activities they do are not just games but are learning processes, and the teacher acts as a facilitator in helping students in learning and solving questions related to the material. From the different steps, it can be seen that the steps of the flipped classroom learning model that most influence students' understanding of mathematical concepts are that students are asked to study independently at home such as watching a learning video given by the teacher.

CONCLUSION

Based on the test results that have been described, it can be concluded that there are significant differences in the mastery of understanding mathematical concepts using the flipped classroom learning model. So it shows that the flipped classroom learning model is more effective than the auditory intellectually repetition learning model in understanding mathematical concepts. This can be applied to students to improve their mastery of understanding comprehension concepts and motivate student learning to be active in the learning process.

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