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Analysis of Mathematical Communication of Students through AIR Model at SMAN 1 Driyorejo Gresik

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ABSTRACT

The learning model during the Covid-19 pandemic has reduced students' mathematical communication because students are very dependent on *gadget* facilities. In this study, researchers used a learning model, namely *Cooperative Auditory Intellectually Repetition (AIR)*. This study aims to determine the effect of *Cooperative AIR* learning model on students' mathematical communication on the material of System of Linear Equations of Three Variables (SPLTV) at SMAN 1 Driyorejo Gresik. This research method is quantitative research with data collection techniques that apply the test process using normality test, homogeneity test, and continued with hypothesis testing. The test instrument used was a *post-test* on students' mathematical communication as many as two questions. Based on the calculation result of students' mathematical communication test, it was found that students' mathematical communication using *Cooperative AIR* learning model was better than students' mathematical communication using *Cooperative Jigsaw* learning model with $t_{count} > t_{table}$ or H_0 rejected, so it can be concluded that there is an effect of Cooperative *AIR* learning model on mathematical communication of class X students at SMAN 1 Driyorejo Gresik on SPLTV material.

Keywords: AIR Learning Model, quantitative research, mathematical communication

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1. INTRODUCTION

Based on Law Number 20 Year 2003 article 31 paragraph 2, learning from home through digital *platforms* has the function of providing educational facilities for citizens who do not receive face-to-face lessons. In addition, the school used for research, SMAN 1 Driyorejo Gresik, is located in Java, so in accordance with Inmandegri Regulation Number 35 of 2021, it states that Face-to-Face Learning for areas that are at level 3 PPKM is limited with a maximum capacity of 50%. Based on (Kemdikbud RI 2020), SMAN 1 Driyorejo Gresik conducts face-to-face meeting activities by dividing learning time into two sessions. To achieve the desired mathematics learning at level 3 of PPKM, mathematical communication is needed.

On the *National Council of Teachers of Mathematics* (in Ritonga, 2017) explained, mathematical communication is a way for students to discover mathematical concepts and strategies, solve mathematical problems through various learning models, and become a place to interact in expressing their opinions. Mathematical communication according to Kendal (2015) is a place for students to express something they know through interaction in the classroom environment, with the transfer of messages such as formulas, concepts, and ways to solve problems.

To assess the mathematical communication test, it is based on mathematical communication indicators which will be formed in scoring the mathematical communication test. Indicators of mathematical communication include the way students express mathematical ideas orally, in writing, or visually, students' skills in learning, channeling, and arguing mathematical ideas orally, in writing, or in other visual forms, and students' skills in applying mathematical notations to be presented in various models. Mathematical communication will be achieved when using an effective learning model.

Before the *Covid-19 pandemic*, SMAN 1 Driyorejo Gresik had used the *Cooperative Jigsaw* learning model. According to (Handayani et al. 2022), the disadvantages of the *Cooperative Jigsaw* learning

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model include students getting bored quickly, especially for students who have higher abilities. They lack respect for other students' opinions. In addition, they also look more prominent, resulting in a lack of equal distribution of information. The learning model that is expected to be effective is *Cooperative AIR*. Wahyudin in Akmalia (2019) *Cooperative AIR* learning model is a learning style whose effectiveness is through three situations, namely *Auditory (*hearing), *Intellectually* (thinking), and *Repetition*. As a result, students get deeper abilities regarding creativity, activeness, problem solving, and strong memory. The *Cooperative Auditory Intellectually Repetition* learning model can be explained according to its meaning. *Auditory* means related to hearing, such as listening to the information obtained. *Intellectually* means learning to overcome problems by trying or creating something new. *Repetition* means repeating what has been learnt.

From all the responses above, the researcher interprets the *Cooperative Auditory Intellectually Repetition* learning model as a learning style that links three points of view, namely *auditory, intellectually, repetition*, which means exploring the material, mastering the material, and stabilising the material by repetition in the form of tasks. The following are the stages in conducting the *Cooperative Auditory Intellectually* Repetition learning model, among others: (1) *Auditory* Stages; (2) *Intellectually* Stages; (3) *Repetition* Stages.

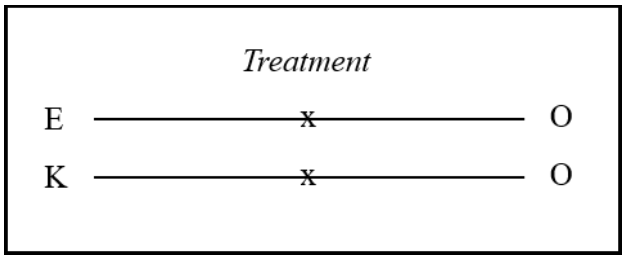
Agustiana (2017) argues that the *Cooperative AIR* learning model has some advantages and disadvantages. The first advantage, which is familiarising the function of hearing and creating the courage of students when sharing their opinions. Second, it provides opportunities for learners to solve problems in creative and innovative ways. Third, it familiarises learners to re-memorise the material that has been listened to at school. Fourth, the *Cooperative AIR* learning model forms students as individuals who are more enthusiastic in learning. As for the shortcomings, when implementing learning, it is done with a long time because it involves three aspects contained in the learning model, *Auditory, Intellectually, and Repetition*. In addition, with the learning model listed above, many of the learners cannot understand the material and commands directly, so it requires repetition of delivery until the learners understand.

Based on the above description, the researcher conducted a study on the analysis of mathematical communication of grade X students through *Cooperative Auditory Intellectually Repetition (AIR)* learning model at SMAN 1 Driyorejo Gresik. This research is expected to be applied in other learning and international-based schools. Research on the *Cooperative Auditory Intellectually Repetitiom (AIR)* learning model was also conducted by (Ain and Kamaluddin 2020; Alan and Afriansyah 2017; Apriliani 2020; Bonatua, Mulyono, and Febriandi 2021; Hidayati and Darmuki 2021; Kamsurya and Saputri 2020; Nisarohmah, Rochmad, and Rosyida 2021; Permatasari and Sulistyaningtyas 2023; Rohayati 2018; Sarniah, Anwar, and Putra 2019; Zulherman, Arifudin, and Pratiwi 2020)

2. RESEARCH METHOD

This research is a form of quantitative research using the *Quasi Experimental Design* method with *Post-test Only Control Group Design* classification. This study uses two classes, namely the experimental class and the control class. According to Sugiyono (2016, p. 76), the effect of treatment is tested with different methods using *t-test* statistics, with a picture as below:

Fig 1. Research implementation design



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Description:

E : Experimental class through *Cooperative AIR* learning model
K : Control class through *Cooperative Jigsaw* learning model
O : Post-test

The population determined in the study was all students of class X SMAN 1 Driyorejo Gresik. Samples were taken in two classes including class X IPS 3 as the experimental class and class X IPS 4 as the control class. Before the research, both classes were given different learning models. The operation of realized the test was that the experimental class is delivered with the *AIR Cooperative* learning model, while the control class is delivered through the application of the *Cooperative Jigsaw* type. Data collection was obtained by conducting a mathematical communication test of two description questions in both classes with the same number and questions. The scoring of mathematical communication test is presented in the form of the following table:

Table 1. Assessment of Mathematical Communication Test

Indicators	Student Response about the Problem	Value
Writing down everything known in the problem	Did not write everything known in the problem	0
	Write down everything known in the question but many are incomplete	1
	Writing down everything known in the question but a little incomplete	2
	Write everything known in the question accordingly and completely	3
Write down everything that is asked	Did not write everything that was asked in the question	0
	Write down everything that is questioned in the question, but many are incomplete	1
	Write down everything that is questioned in the question, but a little incomplete	2
	Write everything that is asked in the question appropriately and completely	3
Write down the answers to the questions distributed	Did not write down the answer	0
	Writing inappropriate answers to the questions distributed	1
	Writing answers according to the questions distributed but less precise	2
	Write the answer according to the question that was distributed correctly	3
Write down the conclusions obtained from the answers to the questions distributed	Did not write the conclusion	0
	Writing conclusions does not match the answers to the questions shared	1
	Writing conclusions according to the answers to the questions shared but not quite right	2
	Write conclusions according to the answers to the questions distributed	3

Source: (Siti Fitriani 2015)

The descriptive question test was initially run using a validity test and reliability test and then distributed to students. Validity and reliability testing was carried out with other classes, not experimental or control classes. Regarding the calculation results obtained $r_{count} > r_{table}$, so that both questions are valid. The results of the reliability calculation with the two-split technique are r_{11}= 0.608 which can be classified in high reliability. Furthermore, to test the data, it used normality test, homogeneity test, and

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finally hypothesis testing. The normality test required the *Chi Kuadrat* table in both classes to determine normally distributed data. The homogeneity test used the F table to find out homogeneous or inhomogeneous data. Hypothesis testing required t-test in order to find whether there is a difference in mathematical communication in the class with the *AIR Cooperative* learning model, as well as the class through the application of the *Cooperative Jigsaw* type.

3. RESULTS AND DISCUSSION

Based on the results of the assessment of students' mathematical communication tests in experimental and control classes, different calculation results were obtained. The results of the normality test calculation in both classes are compared with the following table.

Table 2. Mathematical Communication Test Results and Data Normality Test

Data	*Cooperative AIR Model*	*Jigsaw Cooperative* Model
Minimum Value	53	46
Maximum Value	98	98
Mean	84,58	78,61
Standard Deviation	12,22	13,13
χ^2_{hitung}	1,23	-7,32
χ^2_{tabel}	12,591	14,067
Number of students	36	36

According to Table 2 above, it is found that both classes are normally distributed. The class with *AIR Cooperative* model has a minimum value of 53 while the class with *Jigsaw Cooperative* model is 46. For the maximum value, it has the same value of 98. The class with *AIR Cooperative model* had a mean value of 84.58, while the class with *Jigsaw Cooperative* model was 78.61. The mathematical communication score of the class with *Cooperative AIR* learning model is higher than the class through the application of *Cooperative Jigsaw* type.

After the tested data is normally distributed, proceed with testing homogeneity to check whether the experimental class and control class have homogeneous conditions. The calculation is evidenced in the following table.

Table 3. Data Homogeneity Test

Class	Total	Variance	F_{hitung}	F_{tabel}
Experiment	36	149,45	1,15	1,76
Control	36	172,44		

From the calculation of table 3, it has been obtained F_{count}=1.15 and F_{table}=1.75 which means $F_{count} \leq F_{table}$, so the data is homogeneous.

Hypothesis testing was done utilising t-test with the formulation that: $H_0: \mu_1 = \mu_2$ (there is no difference in mathematical communication between the class with *Cooperative AIR* learning model and the class through the application of *Cooperative Jigsaw* type). While, $H_0: \mu_1 \neq \mu_2$ (there is a difference in mathematical communication between classes with *AIR Cooperative* learning model and classes through the application of Cooperative *Jigsaw* type). The following is a table of t-test data analysis results:

Table 4. Hypothesis Testing with t-Test

Class	Total	S_G	t_{hitung}	t_{tabel}
Experiment	36	12,68	2,147	1,994
Control	36			

Based on Table 4, we found that $t_{hitung} > t_{tabel}$ or H_0 is rejected. This is because there are differences in students' mathematical communication in the experimental and control classes. In the data collection, this study used a sample of X IPS 3 class as an experimental class of 36 students and X IPS 4 class as a control class of 36 students with SPLTV material. To prove the effect of *Cooperative AIR* learning model, different treatments were given to the two classes. Furthermore, the data was tested using data normality test, homogeneity test, and hypothesis test. The experimental class used *Cooperative AIR* model, while the control class used *Cooperative Jigsaw* model. Furthermore, a *post-test* was conducted with questions that had been tested for validity and reliability.

Based on Table 1, it is found that the average experimental class is 84.58 and the control class is 78.61. So, it can be concluded that students in the experimental class have more maximum mathematical communication test scores. After the implementation of the data normality test and homogeneity test with the results of normal distribution and homogeneous data. According to the t-test data analysis obtained t_{hitung}= 2.147 and with a classification of 0.05 obtained t_{tabel}= 1.994, because $t_{hitung} > t_{tabel}$ then H_0 rejected, so there is a difference in mathematical communication between the class with the *AIR Cooperative* learning model and the *Cooperative Jigsaw* learning model class.

CONCLUSION

Based on the explanation above, students' mathematical communication with *Cooperative AIR* learning model is better than students' mathematical communication with *Cooperative Jigsaw* learning model. This is because the average value in the *post-test of the* experimental class, the class that applied the *AIR Cooperative* learning model, was more optimal than the control class, the class that applied the *Jigsaw Cooperative* learning model, namely the experimental class was 84.58, more optimal than the control class which was 78.61. According to the t-test data analysis, obtained t_{hitung}= 2.147 and t_{tabel}= 1.994, or $t_{hitung} > t_{tabel}$, then H_0 rejected. So, it can be concluded that there is an effect of *Auditory Intellectually Repetition (AIR) Cooperative* Learning Model on mathematical communication of class X students at SMAN 1 Driyorejo Gresik. Suggestions that can be given by the author for further research are the need to conduct research with other Cooperative Models, so that more learning models can be found or applied that can help students to think creatively and innovatively, with more efficient time.

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