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MODEL OF JIGSAW TYPE COOPERATIVE LEARNING INFLUENCE ON MATHEMATICAL REASONING ABILITY

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Abstract

The purpose of this study was to determine: students' responses to the jigsaw type cooperative learning model, the ability of mathematical reasoning with the application of a jigsaw type cooperative learning model, the effect of applying the jigsaw type cooperative learning model to mathematical reasoning abilities. Data collection techniques used were questionnaires and tests. The population is all students of MTs Al-Munawwir. The research sample is class VII with the sampling technique using cluster random sampling. The results of this study are obtained a positive response to the use of the jigsaw cooperative learning model of 77.10% and the average value of mathematical reasoning ability is 76.54. After testing the hypothesis, it is obtained that t_{count} (2,375) > t_{table} (1,708), then Ho is rejected and Ha is accepted, meaning that there is an effect of the application of the Jigsaw type cooperative learning model to the ability of mathematical reasoning. Regression equation $\hat{Y}$=33.127+0.447 X.

Keywords: *cooperative learning, jigsaw, mathematical reasoning,*

Abstrak

Tujuan dari penelitian ini adalah untuk mengetahui: respon siswa terhadap model pembelajaran kooperatif tipe *jigsaw*, kemampuan penalaran matematika dengan penerapan model pembelajaran kooperatif tipe *jigsaw*, dan pengaruh penerapan model pembelajaran kooperatif tipe *jigsaw* terhadap kemampuan penalaran matematika. Teknik pengumpulan data yang digunakan adalah kuesioner dan tes. Populasinya adalah semua siswa MTs Al-Munawwir. Sampel penelitian adalah kelas VII dengan teknik pengambilan sampel menggunakan *cluster random sampling*. Hasil penelitian ini yaitu diperoleh respon positif terhadap penggunaan model pembelajaran kooperatif tipe *jigsaw* sebesar 77,10% dan nilai rata-rata kemampuan penalaran matematika adalah sebesar 76,54. Setelah melakukan pengujian hipotesis diperoleh bahwa t_{hitung} (2,375) > t_{tabel} (1,708), maka Ho ditolak dan Ha diterima, artinya ada pengaruh penerapan model pembelajaran kooperatif tipe *jigsaw* terhadap kemampuan penalaran matematika. Persamaan regresi $\hat{Y}$ = 33,127 + 0,447 X.

Kata Kunci: pembelajaran kooperatif, *jigsaw*, penalaran matematika

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INTRODUCTION

Education is all learning experiences that take place in all environments and throughout life. The statement indicates that education is a case that can not be separated from human life during his life. Approximately 600 BC, the Greeks believed that education was an effort to help humans become human (Tafsir, 2010). This means that education is useful as a tool in forming a human being.

In essence, education is a learning process. Learning from the ignorant to knowing, learning from the wrong to be right, and learning from everything that aims to build a human being into a complete human being. Learning is a characteristic of humans (Hamdani, 2010). By learning will make humans educated so that humans can be distinguished from animals.

In line with this, the objectives of education in Indonesia are as stated in the Preamble to the 1945 Constitution of the Republic of Indonesia and the National Education System Law No. 02 of 1989 is to educate the life of the nation and develop a whole person, namely Indonesian people who believe in and fear God Almighty and virtuous character, have knowledge and skills, be healthy physically and spiritually, have a steady and independent personality and sense of responsibility to society and nation.

The educational objectives can be realized if the educational institution can optimize its students through a variety of learning activities, both learning in the classroom and learning outside the classroom. In addition, other factors that support the above objectives are students, teachers / teachers, facilities and infrastructure, and many other factors.

In every educational institution will teach many disciplines in order to achieve the objectives of education. Of the many disciplines studied in each educational institution, mathematics is included in the mandatory scientific discipline. The purpose of learning mathematics in schools is that students are able to: (1) understand mathematical concepts, (2) use reasoning, (3) solve problems, (4) communicate ideas, (5) have an attitude of appreciating the usefulness of mathematics in life (Wardhani, 2008). Mathematics arises because of human thought related to ideas, processes and reasoning.

Reasoning ability is one of the things students must have in learning mathematics. Besides because mathematics is a knowledge gained by reasoning, but also because one of the goals of learning mathematics is that students are able to use reasoning on patterns and traits, do mathematical manipulation in making generalizations, compiling evidence, or explaining mathematical ideas and statements.

Mathematical reasoning abilities possessed by students are very important in the success of these students. In fact for middle school students the mathematical reasoning abilities possessed by students are still unsatisfactory. Mathematical reasoning abilities possessed by students in secondary schools are still low (Nurdalilah, 2010). This can be seen when students try to solve a comparison problem, many students have difficulty determining the position of the value of a comparison whether the problem is a comparison of value or turn around value. Examples such as the following problem: A farmer has a supply of food for 80 animals for one month. If the farmer adds 20 more livestock, how many days the food supply runs out. The results show that of the 35 students who answered the question, 10 of them did not answer the question, 17 students answered the question incorrectly, and 8 students answered correctly.

The low ability of mathematical reasoning possessed by students that is due to learning in schools so far has not made mathematical reasoning as a learning goal (Sugianto, 2014). Whereas in the 2013 curriculum as the latest curriculum at this time, emphasizing the modern pedagogic dimension in learning that is using a scientific approach. The scientific approach to learning involves five things: observing, asking, reasoning, trying, and forming clearly emphasizes that reasoning is one of the basic abilities expected to be achieved through learning in school.

The low ability of students' mathematical reasoning cannot be separated from the learning activities carried out by the teacher in the classroom. Mathematics learning process that is

usually done does not provide opportunities for students to explore and discover their own mathematical concepts.

The best way to improve learning in order to achieve the objectives of learning is to sort and choose models, strategies, approaches, methods and learning techniques that are appropriate to the learning material (Hamzah, 2014). In learning mathematics itself, so that the objectives of learning mathematics can be achieved can use the application of cooperative learning models. Because the cooperative learning model allows the involvement of all students actively in the learning process so that it gives a positive impact on interaction, communication, reasoning, connection and problem solving (Nurhayati, 2014).

Among the various learning learning models that exist. Cooperative learning type jigsaw is one of the learning models that can improve mathematical reasoning abilities in students. The reasons why choosing jigsaw cooperative learning include jigsaw cooperative learning, can make students learn to be responsible for learning activities, not just to be passive recipients of information but must actively search for information needed in accordance with their capacity as experts in a material. Cooperative setting type of jigsaw students are required to skillfully ask and express opinions, find relevant information from existing sources, find various alternative ways to get solutions, and determine the most effective ways to solve mathematical problems. One of the advantages of implementing a jigsaw cooperative learning model is that it can improve children's reasoning abilities (Rusman, 2012).

Based on the results of an interview with a mathematics teacher at MTs Al-Munawwir, Ambulu Village, Losari District, Cirebon Regency, it is known that the reasoning abilities possessed by students at the MTs are still low. This can be seen from the small number of students who are able to determine formulas, submit allegations, do mathematical manipulation, give reasons for their answers, or draw conclusions from a given mathematical problem. So that researchers are interested in researching about efforts to improve the mathematical reasoning ability of students of Al-munawwir MTs Ambulu Village, Losari District, Cirebon Regency through the use of a jigsaw type cooperative learning model.

After knowing the problems faced by students in learning mathematics as explained above, it is certainly interesting to study further about whether there is an increase in students' mathematical reasoning abilities through a jigsaw type cooperative learning model in MTs Al-munawwir Ambulu, Losari, Cirebon.

METHOD

The experimental research method is a research method used to look for the effect of certain treatments on others both in situations and conditions that are controlled by researchers to obtain data with specific purposes and uses (Sugiyono, 2007). In line with the purpose of the study, is to determine the effect of the application of the Jigsaw type of cooperative learning model to the mathematical reasoning ability of grade VII of Al-munawwir MTs, Ambulu Village, Losari District, Cirebon Regency. then the type of research conducted is a quantitative research method using the design of "One Shot Case Study".

$X \quad O$

Information :

X = Jigsaw Type Cooperative Learning Model

O = Observation of Mathematical Reasoning Ability

RESULTS AND DISCUSSION

Results

This study aims to determine the effect of jigsaw type cooperative learning models on the ability of mathematical reasoning on the subject lines and angles in class VII MTs Al-Munawwir Ambulu Village Losari District Cirebon District. In this study only used one class, namely as an experimental class.

Obtaining results from this study among other things: The results of the questionnaire responses of students on indicators motivating learning by 76.30% so this indicator is included in the strong category. Then the results of the questionnaire responses of students on the indicator of delivering learning objectives of 77.04% so that this indicator is included in the strong category. Then the results of the questionnaire responses of students on indicators formulating mathematics learning problems by 80.00% so that this indicator is included in the strong category. Then the results of the questionnaire responses of students on the indicators of mental formation of students through the process of thinking by 80.74% so that this indicator is included in the category of very strong. Then the results of the questionnaire responses of students on indicators understanding contextual problems by 81.85% so that this indicator is included in the category of very strong. Then the results of the questionnaire responses of students on indicators applying the concept in accordance with the experience and level of student knowledge of 75.19% so that this indicator is included in the strong category. Then the results of the questionnaire responses of students on indicators lead students to think rationally and logically by 79.26% so that this indicator is included in the strong category. Then the results of the questionnaire responses of students on indicators interpreting the problem into mathematical symbols by 77.78% so that this indicator is included in the strong category. Then the results of the questionnaire responses of students on the indicators discussing the material in groups of 80.74% so that this indicator is included in the category of very strong. Then the results of the questionnaire responses of students on the indicator of solving problems with a discussion of 71.85% so that this indicator is included in the strong category. Then the results of the questionnaire responses of students on indicators of solving problems related to daily life by 74.07% so that this indicator is included in the strong category. Then the results of the student questionnaire responses to the indicators form the ability of students to use knowledge in solving mathematical problems by 80.00% so that this indicator is included in the strong category. Then the results of the student response questionnaire on the indicator presented the results of problem solving by 75.93% so that this indicator is included in the strong category. Then the results of the questionnaire responses of students on indicators concluded learning outcomes of 73.33% so that this indicator is included in the strong category.

In general, based on the percentage score obtained from all statements is 77.10% which is included in the strong category. This shows that the majority of students respond positively to the use of Jigsaw type cooperative learning models in learning mathematics.

The summary recapitulation (rounding up) resulting from the distribution of student responses to the application of the jigsaw cooperative learning model, can also be illustrated by the diagram in figure 1 as follows:

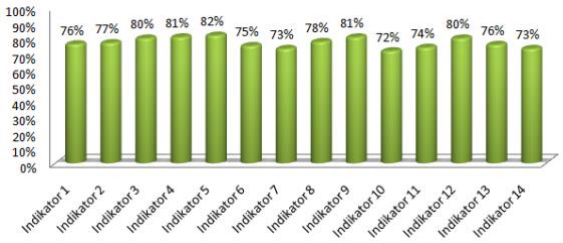

Figure 1. Percentage of Questionnaire Results on the Implementation of Jigsaw Cooperative Learning Models

Tabel 1. Test of Homogeneity of Variances

Kemampuan Penalaran Matematika

Levene Statistic	df1	df2	Sig.
2.082	6	12	.132

Based on table 1 of the results of homogeneity test can be seen that the value of sig. sample of 0.132 is above 0.05, then H0 is accepted and Ha is rejected. Thus it can be concluded that the data come from populations of the same variance (homogeneous distribution).

Table 2. ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	165.595	1	165.595	5.641	.026[a]
	Residual	733.903	25	29.356		
	Total	899.498	26			

a. Predictors: (Constant), Model Pembelajaran Kooperatif Tipe Jigsaw

b. Dependent Variable: Kemampuan Penalaran Matematika

In the Anova table 2 above, the value of F = 5.641 with a sig value of 0.026. Because the significant value is smaller than 0.05, regression can be used to determine the effect of the use of Jigsaw type cooperative learning models on the results of mathematical reasoning abilities.

Tabel 3. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	33.127	18.310		1.809	.082
Model Pembelajaran Kooperatif Tipe Jigsaw	.447	.188	.429	2.375	.026

a. Dependent Variable: Kemampuan Penalaran Matematika

Based on table 3, the regression equation that is formed is $\hat{Y}$ = 33.127 + 0.447 X. From the equation, the constant value of 33.127 with sig is known. 0.082 is above 0.05, which means it is not significant, while the linear regression coefficient is 0.447 with sig. 0.026 is below 0.05. Therefore the regression equation is $\hat{Y}$ = 0.447 X. The regression coefficient of 0.447 states that each addition (increase) in the use of the Jigsaw type cooperative learning model will affect the ability of mathematical reasoning by 0.447. The positive value coefficient means that there is a positive relationship between the jigsaw type cooperative learning model and the mathematical reasoning ability, the higher the jigsaw type cooperative learning model, the more mathematical reasoning ability increases.

Tabel 4. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.429[a]	.184	.151	5.41813

a. Predictors: (Constant), Model Pembelajaran Kooperatif Tipe Jigsaw

Based on the table 4, shows the results of the calculation of the data using the type of jigsaw cooperative learning model and student test results obtained rxy = 0.429. Based on the interpretation of the value of r, the correlation between variable X (jigsaw type cooperative learning model) with Y value (student test) is strong. From the correlation coefficient of 0.429 obtained a determination index of 0.184, which means that 18.4% of learning outcomes are determined by the use of a jigsaw cooperative learning model and the remaining 81.6% is influenced by other factors and it appears that the adjusted R square value is 0.151 or 15 , 1% influence of jigsaw type cooperative learning models on students' mathematical reasoning abilities.

Tabel 5. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	33.127	18.310		1.809	.082
Model Pembelajaran Kooperatif Tipe Jigsaw	.447	.188	.429	2.375	.026

a. Dependent Variable: Kemampuan Penalaran Matematika

Based on the table 5, the results of the analysis of IBM SPSS Statistics software version 19.00 in the Coefficients table show a t value of 2.375 and a significance of 0.026. For t tables sought at a significant level of 5% with degrees of freedom (df) n - 2 or 27 - 2 = 25 obtained t table of 1.70814. Because tcount (2,375)> ttable (1,70814) then Ho is rejected and Ha is accepted, meaning that there is an effect of the application of the Jigsaw type cooperative learning model to the ability of mathematical reasoning.

Discussion

When learning in class it is best to use innovative learning, both when explaining the material and when evaluating. This is intended so that the learning process can be well developed, effective, efficient, and learning objectives can be achieved. As is the case in this study, researchers used a learning model that is arguably rarely used in their daily mathematics learning, namely group-based learning (cooperative). Although there are many other external factors that ultimately affect student learning outcomes, it is expected that the application of cooperative learning models (with jigsaw type) can improve learning outcomes (specifically on the reasoning ability) of student mathematics as discussed below.

Although at the beginning of the study the researchers had a little difficulty in teaching and learning the mathematics subject by using a jigsaw cooperative learning model (due to lack of interest and students' understanding of the cooperative learning model) to improve reasoning ability, the influence of the jigsaw cooperative learning model for students can be known from Correlation test calculation and hypothesis test (t test) where the value of rxy = 0.429. This means that there is a very strong relationship between variable X (jigsaw type cooperative learning model) with Y variable (Mathematical reasoning ability). Likewise the results of the acquisition of regression, with t = 2.375 and t table = 1.70814. Because t-count 2,375> t-table 1,70814, Ho was rejected and Ha was accepted. It means that there is a significant influence of variable X (jigsaw type cooperative learning model) on Y variable (mathematical reasoning ability).

The regression equation for the two variables is $\hat{Y} = 33.127 + 0.447$ X, sig. for a constant value of 0.082> 0.05, which means not significant, while the value of sig. for the linear regression coefficient of 0.026 <0.05 which means significant. Positive coefficient means that there is a positive relationship between the type of jigsaw cooperative learning model with the ability of mathematical reasoning. then the regression coefficient of 0.447 states that the more frequent application of the Jigsaw cooperative learning model is used, the more it will affect the ability of mathematical reasoning, where each addition (increase) of one unit of use of the Jigsaw type cooperative learning model will affect the ability of mathematical reasoning by 0.447. As well as the type of jigsaw cooperative learning model and mathematical reasoning ability are positively correlated which means that if the jigsaw type cooperative learning model is getting better the mathematical reasoning ability will be better too.

Based on the test results that have been described in descriptive data and data analysis, it is known that there is a significant effect between the type of jigsaw cooperative learning model on mathematical reasoning abilities, this can be seen from the calculation results using IBM SPSS Statistics version 19.0, the results of the test of the goodness of the model has the coefficient of determination (R Square) of 0.184. It means that 18.4% of the dependent variable is mathematical reasoning ability explained by the independent variable using the Jigsaw type cooperative learning model and the remaining 81.6% is explained by other variables outside the variable used. As for other variables that can affect the ability of mathematical reasoning, namely the physical condition of students, the school environment, facilities and infrastructure of the school, and others.

Based on the results of tests of mathematical reasoning ability of the experimental class by using a jigsaw cooperative learning model the average value of students' mathematical communication skills is 76.54. The average value of 76.54 shows the average student in the good / complete category because it is greater than the minimum completeness criteria (KKM) that has been determined from the school which is 65.00. The indicator of this reasoning ability

test is relevant to the mathematical reasoning ability indicator of the Directorate General of Primary and Secondary Education of the Ministry of National Education Number 506 / C / Kep / PP / 2004 dated November 11, 2004 on report cards so that it is suitable for measuring mathematical reasoning ability in this study. The indicators of mathematical reasoning ability expressed by the Directorate General of Elementary Education of the Ministry of National Education Number 506 / C / Kep / PP / 2004 dated November 11, 2004 on report cards are as follows: (1) Submitting allegations, (2) Conducting mathematical manipulation, (3) Drawing conclusions , compiling evidence, giving reasons or proof of the truth of the solution, (4) Drawing conclusions from statements, (5) Checking the validity of an argument, and (6) Finding patterns or properties of mathematical symptoms to make generalizations.

Based on the distribution of questionnaires obtained data on student responses to the use of the type of jigsaw cooperative learning model, the percentage score obtained from the overall statement is 77.10% which is included in the strong category. This shows that the majority of students respond positively to the use of Jigsaw type cooperative learning models in learning mathematics.

Because of the reasons described above, the writer can draw the conclusion that the use of a jigsaw cooperative learning model affects the ability of mathematical reasoning on the principal lines and angles of class VII MTs Al-munawwir Ambulu Village, Losari District, Cirebon Regency.

CONCLUSION

Based on the distribution of questionnaires obtained by students' responses to the application of the jigsaw cooperative learning model, the percentage score obtained from the whole statement is 77.10% which is included in the strong category. This shows that the majority of students respond positively to the use of Jigsaw type cooperative learning models in learning mathematics.

Mathematical reasoning ability test results of the experimental class using a jigsaw cooperative learning model, obtained an average value of students' mathematical reasoning ability of 76.55 which is included in the good category because it exceeds the predetermined KKM value of 65.00. This shows that the application of the jigsaw cooperative learning model affects the ability of mathematical reasoning.

The effect of the jigsaw cooperative learning model on mathematical reasoning ability can be seen from the results of the hypothesis test which shows that tcount (2.375) is greater than ttable (1.70814) then Ho is rejected and Ha is accepted, meaning that there is an influence of mathematics learning using cooperative learning models jigsaw type towards mathematical reasoning abilities. In addition, the regression equation for the two variables is $\hat{Y} = 33.127 + 0.447\ X$, the regression coefficient of 0.447 states that the more frequent application of the Jigsaw cooperative learning model is used, it will increasingly affect the ability of mathematical reasoning where each addition (increase) one unit of model use Jigsaw type cooperative learning will affect the ability of mathematical reasoning by 0.447. As well as the type of jigsaw cooperative learning model and mathematical reasoning ability are positively correlated which means that if the jigsaw type cooperative learning model is getting better the mathematical reasoning ability will be better too. In addition, the results of the test of the goodness of the model has a coefficient of determination (R Square) of 0.184. It means that 18.4% of the dependent variable is mathematical reasoning ability explained by the independent variable using the jigsaaw type cooperative learning model and the remaining 81.6% is explained by other variables outside the variable used.

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