THE COMPARATIVE BETWEEN JIGSAW COOPERATIVE LEARNING MODEL AND QUANTUM LEARNING ON MATHEMATICS LEARNING OUTCOMES

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ABSTRACT

Mastery and understanding the mathematical concept is one thing that is very important to achieve learning outcomes. However, this cannot be achieved the maximum. Therefore requires learning alternatives include using Cooperative Jigsaw and Quantum Learning for mathematics. This type of research is a comparative study. The study population all seventh-grade students of State Junior High School (SMPN) 01 Kretek Academic Year 2015/2016. The research sample is student's class VIIC and VIID. The sampling technique used random sampling of classes. Methods of data collection using the test. The research instrument includes validity, reliability, level of difficulty, and distinguishing matter. Analysis of the data used t-test. The results showed significant differences between student learning mathematics learning using Jigsaw Cooperative models with student learning to use Quantum Learning. Based on data analysis, $t_{count} = 2{,}34 > t_{table} = 1{,}67$, which means the Cooperative Jigsaw learning model is more effective than the learning model Quantum Learning on students mathematics learning outcomes.

Keywords: Cooperative Jigsaw, Quantum Learning, Learning Outcomes.

INTRODUCTION

Life is inseparable from the education process. In everyday life, education helps people make the process of forming an identity. The function of national education according to article 1 of the National Education System Law Number 20 of 2003, namely national education functions to develop capabilities and shape the character and civilization of a dignified nation to educate the life of the nation, aiming at developing the potential of students to become human beings who believe and be devoted to God Almighty, noble, healthy, knowledgeable, capable, creative, independent and become citizens of a democratic and responsible (Mulyasana: 2012).

Considering that the teacher is dealing with a variety of interests, motivations, learning styles, and speeds, as well as the diverse abilities of students in understanding and interpreting learning material, the teacher must be good at concocting teaching methods that can answer the diversity of different interests, motivations, abilities, characteristics, and learning styles students (Mulyasana, 2012), one of them is in the process of learning mathematics. In learning mathematics, students are accustomed to gaining understanding through experience. With observations are expected to capture the understanding and concepts of mathematics (Suherman: 2003).

Mastery and understanding of mathematical concepts is one thing that is very important to achieve learning outcomes. However, so far, in the SMP Negeri 1 Kretek has not been achieved optimally. Based on the results of interviews with mathematics subject teachers, it is known that there are still obstacles in the learning process that takes place, including requiring the right direction because given there are still some students who are less active in finding solutions to problems, usually at the time of discussion requires more preparation and adaptation so that time which is needed quite a long time, students tend to be afraid of the questions given by the teacher to create a classroom atmosphere that is less comfortable and pleasant. In learning, the teacher applies a monotonous learning model. Therefore requires alternative learning, including using the Jigsaw Cooperative learning model and Quantum Learning.

The jigsaw learning model is a cooperative learning model using students learning in small groups consisting of four to six people heterogeneously (Shoimin, 2014). Teamwork is another word from Jigsaw. The way students learn is divided into small groups of four heterogeneous people. The groups formed are called home groups. Each original group is given a problem, and each student in each group is responsible for studying the teacher's topic.

Furthermore, the teacher groups students with the same problem and conducts learning together; this group is called the expert group. The teacher observes and guides students in understanding the concepts. Students discuss and plan for ways to convey to their friends in the expert group when returning to the original group. After that, students return to the original group, explain the expert group's results, and then reflect on the understanding obtained. According to Shoimin (2014: 93), the Jigsaw learning model has several advantages: it allows students to develop creativity, abilities, and problem-solving power according to their own volition. In Dwi Ambar Amargawati's research (2014) entitled Application of Jigsaw learning models to improve mathematics learning outcomes of Grade VII students of SMP Negeri 1, Karangploso said that the increase in learning outcomes was evident in the results of the average grade starting from the average pretest of 62.88 and increased in cycle 1 with an average value of 71.41 and an increase in cycle 2 with an average value of 78.45.

In addition to the Jigsaw learning model, the Quantum Learning learning model also prioritizes students' active role in understanding a mathematical concept. Every lesson that will be learned is implanted with the mission; what is the benefit. Classes are divided into groups, and each group consists of 4 people. At the beginning of learning, students try to remember and express experiences related to the material to be learned through what has been experienced and by accustoming students to find out experiences by reading books. What is known is accustomed to taking notes. Students, with the help of teachers, try to find concepts of experiences that have been passed. Then each group is given a problem. Each group member exchanges ideas and knowledge in preparing assignments. The teacher always reminds us to look back at each group's work then concludes the material that has been learned. The teacher gives positive feedback to students for their success. Students together celebrate the success that has been achieved. The application of this model is expected to increase student interest in learning. Ultimately, students can improve overall learning outcomes (Huda, 2014). This is by the findings of Dini Wahyuni, Masjudin, and Puji Lestari (2014) in a study entitled The Application of Quantum Learning Model in increasing motivation and mathematics learning outcomes of students in Class VIIC of SMPN 02 Kediri on the subject matter of the 2013/2014 Academic Year set revealed that the application of Quantum Learning model can increase motivation and student learning outcomes Class VIIC SMPN 02 Kediri Academic Year 2013/2014.

Jigsaw and Quantum Learning's advantages are expected to be a solution or alternative to solve existing problems. Therefore researchers are interested in testing the type of Jigsaw Cooperative and Quantum Learning to find out which is more effective than the two models. The objectives of this study are 1) To find out the difference between students' mathematics learning outcomes in which learning uses the Jigsaw Cooperative model and students whose learning uses the Quantum Learning model? 2) To find out which learning model is more effective between Jigsaw Cooperative learning models and Quantum Learning models on student mathematics learning outcomes.

METHODS

This research is a comparative study with a Pretest-Posttest design. Pretest value (initial data) is taken from the UTS value. Post-test scores (learning outcomes) are taken from the results of mathematical ability tests after treatment. This study compares learning outcomes between VIID classes given Jigsaw Cooperative learning and VIIC classes given Quantum Learning models. The study was conducted at 01 Kretek Middle School. The study population was all grade VII students of SMP Kretek 01/2016 Academic Year 2015/2016 with basic competencies performing arithmetic operations in algebraic form. The research sample is VIIC class students as Jigsaw class and VIID class as Quantum Learning class. The sampling technique used was a random sampling of classes. The data collection

method uses a test. The research instrument was an objective test of 25 questions. The question was given in class VIIA as a trial class. Instrument testing includes tests of validity, reliability, level of difficulty, and distinguishing features of the questions. Instrument test calculations are done manually using Microsoft Excel. The calculation results obtained 11 valid questions from 25 objective items; the reliability calculation results obtained $r_{11} = 0.82$. At a significant level α = 5% and n = 11 obtained $r_{table} = 0{,}602$ so $r_{11} = 0{,}82 > r_{table} = 0{,}602$ which means the question is reliable. In calculating the difficulty of valid questions, there are two items with an easy difficulty level, four items in the medium category, and five items with a difficult level. The calculation of different power problems obtained six items has sufficient distinguishing power, three items with good difference power, and two questions that have very good differentiating power. The prerequisite test used was the normality test with the χ^2 test and the homogeneity test with the F test. The data analysis technique used was the t-test.

RESULTS AND DISCUSSION

The learning models used in this study are the Jigsaw and Quantum Learning models. Before being given treatment, the initial conditions of students did not show any difference in learning outcomes. In other words, the students' initial data are typically distributed and homogeneous. The preliminary data, normality test results, and homogeneity test results of the initial data are presented in Table 1, Table 2, and Table 3.

Table 1. Description of preliminary data

	Jigsaw	Quantum Learning
Total students	27	28
Highest Score	82,5	77,5
Lowest Score	32,5	27,5
Average	52,5	54
Standard deviation	12,81	11,62

Table 2. Initial data normality test

Class	${\chi^2}_{count}$	${\chi^2}_{table}$	Info.
Jigsaw	3,56	11,07	Normal
Quantum Learning	0,32	11,07	Normal

With a significant level of 5% and df = 5 obtained ${\chi^2}_{table}$ = 11.07. Based on Table 2 obtained ${\chi^2}_{count} < {\chi^2}_{table}$. This means that Jigsaw class data and Quantum Learning classes are both normally distributed.

Table 3. Initial data homogeneity test

Class	F_{count}	F_{table}	Info
Jigsaw	1,22	1,88	Homogeneous
Quantum Learning			

Based on Table 3 above, it can be seen that $F_{count} < F_{table}$. This means that the two classes, the Jigsaw class and the Quantum Learning class, are homogeneous or have the same variance. Then the similarity of the two tests is tested to find out whether the average ability of the two classes has differences or not. Based on Table 4 obtained $-t_{table} < t_{count} < t_{table}$. This means that the average ability of students before being treated is the same.

Table 4. Initial t-test data

Class	t_{count}	t_{table}	**Info**
Jigsaw	-0,46	2,00	There is no difference between the two classes.
Quantum Learning			

After obtaining preliminary data, it appeared to show the same ability. The researchers conducted a math ability test for both classes after the treatment. Descriptions of learning outcomes can be seen in Table 5. Learning outcomes after further treatment are used to test normality, homogeneity, and hypothesis testing.

The normality test of learning outcomes used is the χ^2 test, with a significant level of 5% and df = 5 obtained $\chi^2{}_{table}$ = 11.07. Based on Table 1.5 obtained $\chi^2{}_{count} < \chi^2{}_{table}$. This means that Jigsaw class data and Quantum Learning classes are both normally distributed. Furthermore, the F Test is used on learning outcomes, based on Table 1.7 obtained $F_{count} < F_{table}$. This means that the two classes, namely the Jigsaw class and Quantum Learning class, are homogeneous or have the same variance. The t-test is done to test the research hypothesis. Based on Table 8 obtained $t_{count} > t_{table}$ $(2{,}34 > 1{,}67)$, which means that H_0 is rejected, or it can be said that the average learning outcomes of the Jigsaw class are more significant than that of the Quantum Learning class. This means that the Jigsaw learning model is more effective than the Quantum Learning learning model on mathematics learning outcomes.

Table 5. Description of learning outcomes

	Jigsaw	**Quantum Learning**
Total students	27	28
Highest Score	100	90,91
Lowest Score	27,27	27,27
Average	71,04	58,61
Standard deviation	21,00	18,33

Table 6. Test the normality of learning outcomes

Class	$\chi^2{}_{count}$	$\chi^2{}_{table}$	**Info.**
Jigsaw	0,37	11,07	Normal
Quantum Learning	0,72	11,07	Normal

Table 7. Test homogeneity of learning outcomes

Class	F_{count}	F_{table}	**Info**
Jigsaw	1.31	1,88	Homogeneous
Quantum Learning			

Table 8. T-test of learning outcomes

Class	t_{count}	t_{table}	**Info**
Jigsaw	2.34	1.67	The Jigsaw learning model is more effective than Quantum Learning
Quantum Learning			

Based on the final analysis, it turns out that the average learning outcomes of the Jigsaw class are more significant than that of the Quantum Learning class. This is consistent with Dwi Ambar Ambar Amargawati (2014) findings that there is an increase in the learning outcomes of students whose learning uses the Jigsaw model. One of the causes of the average difference is the difference in treatment. VIID classes are given Jigsaw learning, and VIIC classes are given Quantum Learning learning.

The application of the Jigsaw learning model was carried out in VIID class for seven meetings. Learning activities in the Jigsaw class run smoothly, and students look active in understanding the material. This is by Shoimin (2014) theory that Jigsaw has several advantages, one of which is to be able to develop creativity, ability, and problem-solving according to one's own will. In the Quantum Learning class, an average of 58.61 is obtained. If seen from the average Jigsaw class of 71.04, it shows

lower results than the Jigsaw class. Even so, the Quantum Learning model is a learning model that makes learning fun.

If seen from the average initial data, Quantum Learning classes have increased after being given treatment. It is just statistically. When compared to Jigsaw, the results are not better. This shows that Quantum Learning can improve student learning outcomes. This is by the findings of Dini Wahyuni, Masjudin, and Puji Lestari (2014) that Quantum Learning can improve motivation and learning outcomes of mathematics on set material. While in this study, the material used was a fraction of the algebraic form. It is possible that the material with Quantum Learning is not suitable.

CONCLUSION

Based on the results of the study, the conclusions that can be drawn are:

1. There is a significant difference between students' learning outcomes using the Jigsaw Cooperative model with students learning using the Quantum Learning model.
2. The Jigsaw Cooperative learning model is more effective than the Quantum Learning learning model on student mathematics learning outcomes.

REFERENCES

Huda, Miftahul. 2014. *Model-model Pengajaran dan Pembelajaran.* Yogyakarta: Pustaka Pelajar.

Mulyasana, Dedi. 2012. *Pendidikan Bermutu dan Berdaya Saing*. Bandung: PT Remaja Rosdakarya.

Shoimin, Aris. 2014. *68 Model Pembelajaran INOVATIF dalam Kurikulum 2013.*Yogyakarta: Ar-Ruzz Media.

Suherman, Erman, et al. 2003. *Strategi Pembelajaran Matematika Kontemporer*. Bandung: UPI.

TapPDF. 2014. Penerapan model pembelajaran *Jigsaw* untuk meningkatkan hasil belajar matematika siswa Kelas VII SMPN 01 Karangploso. http://www.tappdf.com/read/319466-penerapan-model-pembelajaran-jigsaw-cendekia. diunduh pada tanggal 01 September 2017.

. 2014. Penerapan model *Quantum Learning* dalam meningkatkan motivasi dan hasil belajar matematika siswa Kelas VIIC SMPN 02 Kediri pada materi pokok himpunan Tahun Ajaran 2013/2014. http://www.tappdf.com/read/318839-penerapan-metode-quantum-learning-dalam-meningkatkan-motivasi. diunduh pada tanggal 31 Agustus 2017.