

The Application of Cooperative Learning Model-Jigsaw Type in Learning Mathematics

Idha Novianti

Mathematics Education, Faculty of Education and Teacher Training
Indonesia Open University

ABSTRACT— *The variety of learning model is able to prevent student from boredom, moreover in learning mathematics. The teacher must be smart in choosing learning model that appropriate with subject matter that will be taught. Cooperative Learning Model-Jigsaw Type puts forward cooperation between student, perhaps it can give better result. This research is quasi experimental research. The sample of this research is 189 students 8th grade of Junior High School in Surakarta. The data analysis technique uses Anava two ways with significance level (α) = 5%, its result of Cooperative Learning Model-Jigsaw Type in learning mathematics gives the same result with the use of conventional learning model in subject matter the system of linear equation in two variables seen from high, medium, and low motivation. But from attitude side, Jigsaw learning model makes student more cheerful and more active in accepting mathematics lesson, student is trained to be brave to deliver opinion. Of course the existence of teacher's role is very important as a guidance for learning process. It is necessary to be seen the appropriateness subject matter that will be taught in the class with learning model that will be used. And also age of student who will be taught.*

Keywords : *The Result of Studying Mathematics, Jigsaw, Conventional, Motivation*

1. INTRODUCTION

The aim of learning mathematics at school is in order that student thinks critical and creative. Mathematics learning in elementary school to senior high school is for preparing student in order to be able to use mathematics correctly in daily life (Wardhani, 2008). Based on the data of UNESCO, the quality of mathematics education in Indonesia is 34th ranking from 38 countries that were observed, and survey from International Statistic Center for Education (National Center for Education in Statistic, 2003) Indonesia got 39th ranking (from 41 countries) after Thailand and Uruguay (Satria, 2012). Those facts must be observed by educators, especially mathematics teacher. What wrong in teaching method is during this time, whereas the allocation time for mathematics gets the most time in a week, it should not get such a bad score. Recently, the Programme for International Student Assesment (PISA) said that the ability of Indonesia's students in mathematics is very low, Indonesia got 61st ranking of 65 countries. The president of Indonesia Mathematics Teacher Association (AGMI) Drs. Firman Syah Noor, M.Pd said that the result of research from International Mathematics and Science (TIMMS) that is done by Frederick K.S. Leung in 2003 said that the main cause of low ranking of mathematics is Indonesia is lack of trained teacher (Okezone, 2013). This is proof that mathematics becomes the thing should be concern for mathematics teachers in Indonesia.

Based on the explanation above, of course there are many factors should be paid attention by the teacher in teaching student in the class. What the things that influence the success of teaching mathematics in the class are. Need a lot of references to handle the problems of mathematics learning in the class, not only references or plan but also action and effort to improve mathematics learning in the class. One of effort to improve mathematics learning is learning model. Learning model that is able to make student more active in learning, perhaps it can make boredom of student disappear and make student interested in studying mathematics. The teacher should be able to choose appropriate and correct teaching model, so that learning process runs well and student gets benefit from learning the subject matter.

According to Slameto (1995:2), studying is a process of effort that is done by someone to get different behaviour. So the success of student is influenced by some factors, the factors come from student and teacher. The teacher as an educator must be creative in managing the learning. The ability in managing the learning has an impact on effective environment and atmosphere of learning, so the result of studying will be optimal. The success or the failure of someone in reaching the best result is caused by many factors, those factors could come from student or from other thing. Those factors have correlation and influence each other. If the physiology of student is not good, it would influence on psychology. And also, if the environment around the student is not good, it would influence learning and its result.

Therefore, teacher and parent should create good condition and good atmosphere that support the success of student at school or at home.

Learning model is being an important thing in order that subject matter can be accepted well by student. In doing learning-teaching process, teacher is able to choose some teaching models, of course each of learning model has excess and flaws, but the shortage of teaching model that one can be closed with the other teaching model. In choosing learning model, should be paid attention to the things that has been explained above such as the aim of learning, time allocation, amount of student, and many others that is dealing with learning process, so that the aim of learning will be reached well.

During this time, learning model that is applied in the class make teacher to be center of studying, but in cooperative learning model the center of studying is student. Cooperative learning model makes student more active in understanding mathematics. Cooperative learning model puts forward cooperation in solving problems and applying knowledge or skill to reach the aim of studying. And the last aim of using the cooperative learning model are the result of studying will increase, student is able to accept the difference of friends, and student is able to develop social skill.

Cooperative learning Jigsaw type is one of cooperative learning that able to trigger student more active, creative, and responsible with the learning process. Cooperative learning model- Jigsaw type is a learning model that consist of some members in a group and they have responsibility for mastery of subject matter and they are able to teach subject matter to another member (Arends, R.I, 1997 : 73). So that, in this learning model every student is given chance to apply their idea and explain subject matter to another member in that group. Discussion is not dominated by a student or a member but all member of the group must be active in their discussion. So, in this cooperative learning Jigsaw type, students are trained to be able to communicate their opinion and the teachers only guide discussion process.

In this model, studying is considered over if member of group has mastered the lesson. According to Zakaria and Iksan (2007:37) said that the use of this model on mathematics and science is very effective. According to Batool (2012) for 9th grade, cooperative learning on mathematics is more excellent than traditional method. In cooperative learning model, student gets benefit in academy side and social side, because process of studying is in a small group (Gillies, 2002). According to Budihartin *et al.*, cooperative learning model-type Jigsaw gives positive impact for increasing result of studying in solving mathematics problems, because Jigsaw type is an expansion of innovative, effective, and flexible learning (Dwi, 2013). Another benefit of using this model is increasing the mastery of totaling and deducting of different fraction in Elementary School Paseh 1 in Sumedang (Mulyanto, 2007).

Based on the data from Education Assessment Center of National Education Department 2009 in Surakarta, percentage value of the lowest absorption capacity is subject matter of determining the set of compilation of linear equation system in two variables, it is 35,71% and result of interview with mathematics teacher is teacher gets difficulty in giving understanding to student about that topic System of Linear Equation in Two Variables.

In learning process, motivation is very necessary. Motivation is reflected through diligence without hopeless to reach success, although there are many difficulties. Motivation is also reflected through intensity of working and doing duties. McClelland showed that motivation to get achievement has contribution up to 64% on studying achievement (Triluqman, 2007). According to Hamzah (2007:27) there are some important roles of motivation in studying, they are (1) determining things that becomes strengthener of studying, (2) clarifying the aim of studying that will be reached, (3) determining kinds of control on studying stimulus, (4) determining diligence of studying. Sardiman (2005:75) said that learning motivation is physicist factor non-intelectual. Its specific role is raising passion, student feels happy and has big spirit to study. Student who has strong motivation will have a lot of energy to study.

The aim of this research is to compare both learning models, they are cooperative learning model Jigsaw type and conventional learning model that able to make better mathematics score seen from learning motivation of student.

The population of this research is students of 27 Junior High Schools in Surakarta. These schools have been arranged first based on ranking of National Examination 2009 in Surakarta. The sampling is done by technique Stratified Cluster Random Sampling. This research is quasi experimental research. This research uses three kind method to collect data, they are test method, questionnaire method and documentation method. Test method is used to collect data about student's achievement in studying mathematics. Questionnaire method is used to know learning motivation in mathematics. Documentation method is used to get first data, they are name and score of middle test in the first semester of 8th grade. The technique of analysis data uses Anava Two Ways in different cell.

Data normality test uses Lilliefors test and data homogeneity test uses Bartlett test with significance level (α) = 5%.

2. RESULT AND DISCUSSION

Before using those samples, the ability of sample is examined by prerequisite test and balance test. Prerequisite test consist of normality test and homogeneity test. Data of beginning ability that will be examined is score of middle semester in the first semester of 8th grade Junior High School with subject matter is mathematics.

Normality test is done on experiment group and control group. Normality test uses Lilliefors test. The result of normality test at the beginning ability is showed on the table below.

Table 1: Result of Normality Test at the Beginning Ability

Normality Test	L_{obs}	$L_{0,05;n}$	decision	conclusion
Jigsaw Experiment	0,0647	0,0914	H_0 accepted	Normal
control	0,0891	0,092878	H_0 accepted	Normal

Based on 1st table above, on each sample gets $L_{obs} < L_{0,05;n}$ so that H_0 is accepted. It means, each sample that will be attached treatment and being control in this research come from population that distribute normal.

Next, doing homogeneity test, to know whether the sample that will be attached treatment and being control in this research has the same variance. Homogeneity test uses Bartlett method with statistic *Chi Quadrate* test. The result of homogeneity test at the beginning ability between experiment group and control group is got value $\chi^2_{obs} = 0,4$ dan $\chi^2_{0,05;1} = 3,841$ with critic area $\{ \chi^2 | \chi^2 > 3,841 \}$; $\chi^2_{obs} = 0,4 \notin DK$ so that H_0 accepted. It means the sample that will be attached treatment and being control in this research has homogen variance.

From the result above, the sample that will be used in this research has distributed normal and has homogen variance. Furthermore the balance test is done to know whether experiment group and control group has the same or balance beginning ability.

The result of balance test of experiment and control group got $t_{value} = 1,8$ and $t_{table} = 1,96$ with critic area $\{ |t| < -1,96$ or $t > 1,96 \}$, so that $t_{value} \notin DK$. The decision of the test is H_0 accepted so both sample group has same and balance beginning ability.

Before doing variance analysis of result data, the first step is doing prerequisite test of variance analysis, they are normality test and homogeneity test. Normality test uses Lilliefors method. Based on normality test on experiment group, control group, and high,medium, and low motivation with significance level (α) = 5% got result as follow:

Table 2: Result of Normality Test

Normality test	L_{maks}	$L_{0,05;n}$	Decision	Conclusion
Experiment group Jigsaw	0,076	0,091384	H_0 accepted	Normal
Control group	0,073	0,092372	H_0 accepted	Normal
Low learning motivation	0,068	0,099058	H_0 accepted	Normal
Medium learning motivation	0,073	0,080545	H_0 accepted	Normal
High learning motivation	0,081	0,097842	H_0 accepted	Normal

Based on normality test (table 2) seems that L_{maks} on each experiment group and learning motivation is smaller than $L_{0,05;n}$. It means on significance level 0,05 hypothesis zero H_0 is accepted. So that, can be concluded that the data in every experiment group and learning motivation come from population that distribute normal.

Furthermore, is doing homogeneity test to know whether group of learning model and learning motivation have the same variance. This test uses Bartlett method with *Chi Square* statistic test. And the result of homogeneity test, between experiment group, control group and learning motivation with significance level (α) = 5% on Jigsaw experiment, control and learning motivation, as below :

Table 3: Result of Homogeneity Test

Sample	k	χ^2_{obs}	$\chi^2_{0,05;n}$	Decision	Conclusion
Learning Model Group	2	1,628	3,841	H ₀ accepted	Homogen
Learning Motivation	3	1,214	5,991	H ₀ accepted	Homogen

From table 3 above, seems χ^2_{obs} at learning model and learning motivation is smaller than $\chi^2_{0,05;n}$, so that the decision test is accepted H₀. It can be concluded that both learning models group and low, medium, and high learning motivation have the same variance (homogen).

The procedure of hypothesis of test in this research uses variance two ways analysis (ANAVA) with different cell. And the result is showed by this table below:

Table 4: Result of Calculation of Variance Two Ways Analysis

Source	JK	dK	RK	F _{count}	F _{table}	Decision
Learning Model (A)	7,821	1	7,821	3,742	3,84	H ₀ accepted
Learning Motivation (B)	1,26	2	0,63	0,301	3	H ₀ accepted
Interaction (AB)	3,126	2	1,563	0,748	3	H ₀ accepted
Galat	386,65	185	2,09	-	-	-
Total	398,857	190	-	-	-	-

From the table 4 above, seems that learning model is got $F_a = 3,742 < F_{table} = 3,84$. It means the decision of the test for learning model is Hypothesis Zero H₀ is accepted, so there is no influence of learning model on mathematics learning achievement of student. While for motivation of learning is got value $F_b = 0,301 < F_{table} = 3,00$, means there is no difference in mathematics learning achievement on student with low, medium or high learning motivation. For interaction between learning model and learning motivation is got value $F_b = 0,748 < F_{table} = 3,00$, means there is no influence between learning model and learning motivation on mathematics learning achievement of student. From result above, can be known that studying by using Jigsaw learning model produce the same score with studying by using conventional learning model. Based on the results of previous research on learning outcomes using the Jigsaw learning model is the result of learning with this learning model gives better results is not entirely true, because the results of the research in this article is the opposite. But from attitude side, Jigsaw learning model makes student more cheerful and more active in accepting mathematics lesson, of course the existence of teacher's role is very important as a guidance for learning process. Based on observation in the field, another benefit of Jigsaw learning model is student is trained to be brave to deliver opinion. In accordance with the Arends (1997 : 73) that cooperative learning Jigsaw type is one of cooperative learning that able to trigger student more active, creative, and responsible with the learning process.

3. CONCLUSION

Based on research, the use of Jigsaw learning model on mathematics produce the same score with Conventional learning model in high, medium, and low learning motivation. But from attitude side, Jigsaw learning model makes student more cheerful and more active in accepting mathematics lesson, of course the existence of teacher's role is very important as a guidance for learning process. Based on observation in the field, another benefit of Jigsaw learning model is student is trained to be brave to deliver opinion.

Jigsaw learning is able to be alternative, but it is necessary to be seen the appropriateness subject matter that will be taught in the class with learning model that will be used. And also age of student who will be taught, because the older their age, the better they understand to cooperate with other member. Many kind of learning models are able to add variety of teaching, so that student does not get bored to accept the lesson, and the process in accepting subject matter will run well so the aim of learning can be reached well.

4. REFERENCES

- Arends, R.I. (1997). *Classroom Instruction and Management*. Central Connecticut State University:the McGraw-Hill Companies.
- Batool, S. (2012). Effect of Cooperative Learning on Achievement of Students in General. *International Education Studies* , 154-158.
- Dwi, B. (2013). THE WAY TO IMPROVE MATHEMATICS RESULT THROUGH. *Jurnal Pendidikan Matematika STKIP PGRI Sidoarjo* , 35-42.
- Gillies, R. (2002). The residual effects of cooperative learning experiences: A two year follow-up. *The Journal of Educational Research*, 96, 1, 15-20.
- Haji, Hamzah, 2007. *Teori Motivasi dan Pengukurannya*. “Analisis di Bidang Pendidikan”. Jakarta: Bumi Aksara.
- Mulyanto, R. (2007). Pendekatan Cooperative Learning Teknik Jigsaw. *Jurnal Pendidikan Dasar* .
- Okezone, R. N. (2013, January 8). *Okezone.com*. Retrieved November 26, 2013, from <http://kampus.okezone.com/read/2013/01/08/373/743021/penyebab-indeks-matematika-siswa-ri-terendah-di-dunia>.
- Sardiman. 2005. *Interaksi dan Motivasi Belajar Mengajar*. Jakarta: Raja Grafindo Persada.
- Satria. (2012, February 24). Retrieved November 26, 2013, from Universitas Gajah Mada: <http://ugm.ac.id/id/post/page?id=4467>.
- Slameto. (1995). *Statistika Dasar*. Surakarta: UNS Press.
- Triluqman. (2007). Retrieved July 6, 2010, from Belajar dan Motivasinya: www.heritl.blogspot.com.
- Wardhani, D. S. (2008). *PAKET FASILITASI PEMBERDAYAAN KKG/MGMP MATEMATIKA*. Retrieved February 23, 2012, from <http://p4tkmatematika.org/fasilitasi/13-SI-SKLSMP-Optimalisasi-Tujuan-wardhani.pdf>.
- Zakaria, E., dan Iksan, Z. (2007). Promoting Cooperative Learning in Science and Mathematics Education: A Malaysian Perspective. *Eurasia Journal of Mathematics, Science & Technology Education*, 3 (1), 35-39.