



The Effect of Index Card Match Method to The Math Critically Thinking Skill Oriented to Higher Order Thinking Skills (HOTS)

Firda Halawati

Universitas Islam Al Ihya Kuningan, Jalan Mayasih No 11, Cigugur, Kuningan, West Java, Indonesia
email: fbayasut90@yahoo.com

Received: 6th September 2019

Revised: 27th October 2019

Accepted: 30th October 2019

Abstract

This study aims to: (1) find out the use of the Index Card Match method in mathematics; (2) determine the students' ability of mathematics critical thinking with Higher Order Thinking Skills (HOTS); (3) determine whether there is an influence of the use of Index Card Match method to the students' ability of mathematics critical thinking with HOTS. This study uses the pre-experimental method with one group for the pretest-posttest design. The population in this study was all students of Senior High School in Kadugede, Kuningan, West Java, totaling 1008 students. The sampling technique used was purposive sampling. The sample of this study was taken from two classes from class VII D as a control class with 37 students and class VII E as an experimental class with 38 students. The test instruments used were multiple-choice questions. Tests were given at the initial test (pretest) and final test (posttest). The testing data were analyzed using the independent samples t-test which has previously been tested for normality and homogeneity. The results of this study indicate: (1) the use of the Index Card Match method in mathematics learning in the experimental class was positively well and students looked serious and enthusiastic in following the teaching and learning process; (2) The students' ability of mathematics critical thinking by using the Index Card Match method increased both in the experimental and control classes; (3) There was an influence of the use of the Index Card Match method in students' ability of mathematics critical thinking oriented to HOTS.

Keywords: critical thinking ability, HOTS, Index Card Match

INTRODUCTION

Education has an important role in improving the process of increasing the ability and competitiveness of a nation in the eyes of the world and in improving the quality of human resources to be able to compete in the face of the times. RI Law Number 20 of 2013 concerning the National Education System Article 37 states that mathematics is a compulsory subject for students at primary and secondary education. Therefore, the

mathematics learning process needs to be planned and implemented as well as possible. Mathematics subjects need to be given to all students starting from elementary school, to equip students with the ability to think logically, analytically, systematically, critically, innovative and creative, and the ability to work together. To achieve these goals, in mathematics learning it is very important to develop various aspects of skills, one of which is higher order thinking skills.

This is in line with the opinion expressed by Yen & Halili (2015: 42) that higher order thinking skills are skills that are needed by every individual in the educational environment. Higher Order Thinking Skills (HOTS) are skills that involve the ability to think that includes critical thinking processes and creative thinking (Conklin, 2012; Costa, 2001; King, et. al., 2010; Yen & Halili, 2015), problem solving (Costa, 2001; Brookhart, 2010; Yen & Halili, 2015), logical and reflective thinking (King, et. al., 2010), metacognitive thinking (King, et. al., 2010; Yen & Halili, 2015), and decision making (Costa, 2001; Yen & Halili, 2015). From the opinions of the experts, it appears that higher order thinking skills are in line with the objectives of the 2013 curriculum and certainly play an important role in developing students' thinking abilities. Facts on the ground show that higher order thinking skills of students in Indonesia are still low (Susanti, et. al., 2014). The low higher order thinking skills of students in learning mathematics can be seen from the results of the *Trends in International Mathematics and Science Study* (TIMSS) study. TIMSS data shows that Indonesia ranks 38th out of 42 countries.

One of the higher order students' thinking skills is caused by the learning process. The process of learning mathematics is inseparable from a good learning plan from the mathematics teacher. Moon et. al., (2002) state that effective teachers are teachers who have systematic preparation and implementation of learning. The preparation is not only focused on the mastery of the material by the teacher, but also the readiness of the teacher in using effective learning methods and making students enthusiastic in accepting learning and can stimulate students to be more active when learning in class which is the problem at the moment is how can create an effective learning process and can be understood by students well. The learning process is in principle the process of

developing religious morals, activities, and creativity of students through various interactions and learning experiences. However, in its implementation, there are still many learning activities that ignore the activities and creativity of these students. It is caused by method learning that more emphasizes on mastering the ability of intellectual course and the process of learning centered on the teacher in the classroom so that the presence of the participant students just waiting for the description of teachers and then record and memorize it. In summary, the learning is centered on the teacher as the delivery of materials subject and students as recipients of material subjects (Diguna, 2015).

The teacher in conveying learning must be able to choose and apply learning methods that can stimulate students to be more active in learning and improve students' ability to understand the lesson. From the method of learning that exists, the researcher tried using Index Card Match method. This method requires students to cooperate and enhance the sense of responsibility on what is learned actively and pleasantly, mutually working together, helping each other to resolve questions and throw the question to the other couple (Nugraha, 2013).

RESEARCH METHODS

The method of this research used pre-experimental research with one group for the pretest and posttest. The pretest was given to the students firstly. After that, the treatment which was the learning of mathematics by using the method of learning Index Card Match oriented to the Higher Order Thinking Skills (HOTS) was given. In the end, the students were given the posttest.

Research design

The design of this research was carried out in this study namely as follows.

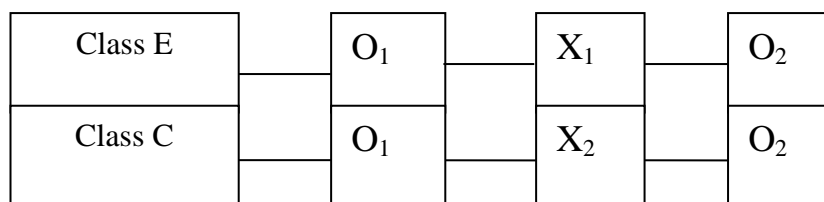


Figure 1. Research Design

Population and sample

The population in this study were 1008 students at SMP Negeri 1 Kadugede, Kuningan, West Java. In taking the sample, the researcher used the sampling purposive, meaning that taking the subject was based on the specified purpose. That specified purpose was the set of material given in class VII. Samples were 75 students consist of two classes, namely class VII D and class VII E. Class VII D consists of 37 students as the control class and class VII E consists of 38 students as the experimental class.

Data Collection Instrument

The instrument used in this study was a test. The test is a tool to measure student learning outcomes. The type of test was the mastery test consisting of pretest and posttest. A pretest is a test that is given before students are given treatment to determine the extent to which the understanding of students on the material that will be delivered, while posttest is a test which is given after the process of learning takes place, to determine the extent to which absorption material that has been taught to the students. The research instrument must meet the criteria of validity, reliability, level of difficulty and distinguishing problem that was used in the research to produce accurate and objective data.

Data Analysis Technique

In this study, the data analysis technique used an independent sample t-test. The data collection tool in this study was a test, which would then be analyzed by using the prerequisite test consisting of normality and homogeneity tests which then continued by independent sample t-test.

RESULTS AND DISCUSSION

This research was conducted on 75 students of SMP Negeri 1 Kadugede, Kuningan, consisting of 37 students of class VII D as the control class and 38 students of class VII E as the experimental class. After the question instruments were made, the analysis of the research instrument trials was carried out in the form of tests of validity, reliability, the level of difficulty of the questions test, and the test of distinguishing problems. In the next step, the researchers conducted a learning process in class VII D as the control class to be the sample class by using the discussion method and in the experimental class that was class V II E by using the Index Card Match method. Before delivering the learning material, the researcher first gave the pretest to the two classes to know the students' initial abilities. The learning process in the experimental class using the Index Card Match

method and the control class using discussion, in general, can be well received and followed by students.

After the end of the meeting, the final test (posttest) was given which aimed to find out the mastery of the material that had been delivered in both the experimental class and

the control class. After obtaining the pretest and posttest values for the experimental class and the control class, it was continued with the normality test and homogeneity test, and the independent sample t-test. To measure HOTS questions with 20 items consisting of aspects C3-C6, the results can be seen as follows.

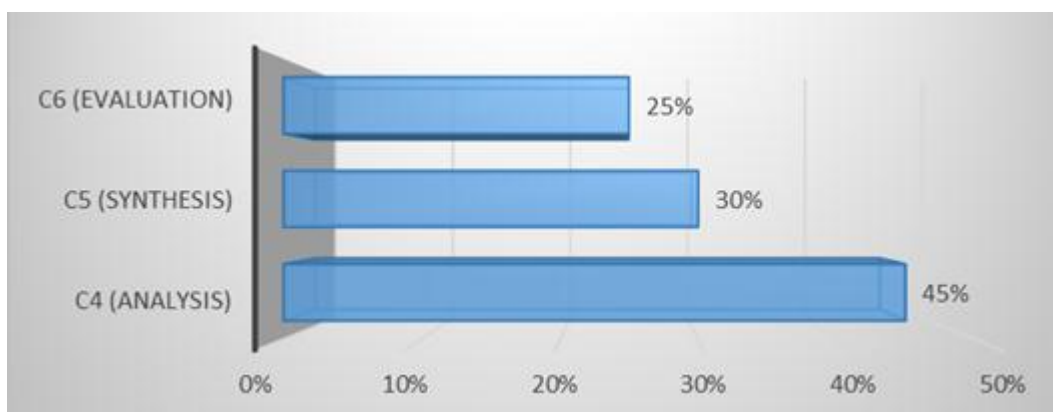


Figure 2. The Aspects of HOTS

From the graph above, it can be seen from 75 respondents after being given HOTS test questions which consist of 20 items, for aspects of C4 (analysis) is 45%, C5 (synthesis) aspect is 30%, and for C6 (evaluation) aspect is 25%. From the graph above, it can be seen the average ability of students working on

HOTS questions is in the C4 aspect, namely in the analysis aspect.

Description of the research results of the pretest value of the control class and the experimental class of students is presented in the following table.

	Pretest of Control Class	Pretest of Experiment Class
N	Valid	37
	Missing	1
The mean	47.70	46.32
Median	50.00	45.00
Std. Deviation	11,761	11,009
Minimum	30	30
Maximum	75	70

From the table above, it can be seen that the average pretest value for the control class and the experimental class is not too much different. The average control class has a value of 47.70 and the experimental class has an

average of 46.32. After knowing the pretest values for the control class and the experimental class, the result of the independent sample t-test showed as follows.

Table 2. Pretest Results of Independent Sample T-Test

		Levene's Test for Equality of Variances		T-Test for Equality of Means						
Value		F	Sig.	t	Df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Equal variances assumed	Equal variances assumed	,183	,670	,527	73	,600	1,387	2,630	-3,854	6,628
	Equal variances not assumed			,527	72,374	,600	1,387	2,632	-3,860	6,633

Based on the output above, the obtained value of Sig. (2-tailed) at 0,600 > 0.05, then the corresponding basic decision making in the test independent sample t-test, it can be concluded that Ho is accepted and Ha is rejected, which means there is no difference in the average critical thinking skills between the control class and the experimental class. Thus,

the ability of the class is the same. The description of the research results of the posttest values for the experimental class that has been given treatment using an Index Card Match and a control class that uses the discussion method can be presented in the following table.

Table 3. Posttest Value of Control Class and Experiment Class

		Posttest Control Class	Posttest Experiment Class
N	Valid	37	38
	Missing	1	0
The mean		79.59	84.87
Median		80.00	85.00
Std. Deviation		6,166	7,212
Minimum		70	75
Maximum		90	100

From the table above, it can be seen that the average test scores for the control class and the experimental class are different. The average control class has a value of 79.57 and the experimental class has an average of 84.87.

After knowing the posttest values for the control class and the experimental class, an independent sample t-test was conducted as follows.

Table 4. Posttest Results of Independent Sample T-test

		Levene's Test for Equality of Variances		T-Test for Equality of Means						
		F	Sig.	T	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Posttest score	Equal variances assumed	1,007	,319	3,400	73	,001	5,274	1,551	8,366	2,182
	Equal variances not assumed			3,407	71,813	,001	5,274	1,548	8,360	2,188

Based on the above output, the Sig value (2-tailed) is obtained as 0.001 < 0.05. According to the basis of decision making in the independent sample t-test test, it can be concluded that Ho is rejected and Ha is accepted, which means that there are differences of the average critical thinking skills between the control class and the experimental class. So, it can be concluded that there are differences in the post-test scores between the control class and the experimental class.

Description of N-gain increase

Values of *N-gain* derived from the difference in score pretest and posttest, to determine the increase in critical thinking math students between the experimental class and control class, the researchers used the calculation of test *N-gain*. Here is presented a table of the gain of the experimental and control class.

Table 5. Experiment and Control Class Gain Data

Class	Pretest	Posttest	N-gain	Criteria
Experiment	46.32	84.87	0.72	High
Control	47.70	79.59	0,60	Middle

Based on the value of the pretest and posttest, it is obtained *N-gain* of 0,72 in the experimental class and 0,60 in the control class. After interpreting the obtained value of *N-gain* class experiment relatively high, and the grade control value of *N-gain* classified is on.

The results of this study indicate that the implementation of mathematics learning using Index Card Match is going well and students look serious and enthusiastic in following the teaching and learning process. The process of

learning to teach lasted more active, creative, recreational, and fun.

The learning method that is used is active and fun. It is associated with ways to remember back what that was they learn and test the knowledge and abilities they currently have with the technique of looking for partner card that is the answer or matter while learning about a concept or topic in the atmosphere fun with the hope students can build meaning or impression in the memory or memory. It is demonstrated that the method of Index Card

Match can be a stimulus or trigger the spirit of the self in learning that can improve the critical thinking skills of mathematics students. The ability to think critically by using the method of Index Card Match achieves an average value of 84,87. Whereas, the control class reached an average value of 79,59. It shows the acquisition value of a class that uses the methods Index Card Match is large compared to the class that uses the discussion.

There is an influence both by using Index Card Match and discussion. It is can be seen from the results of testing the hypothesis that gain value t-count more substantial than t table is $3.400 > 1.666$ and the significance value is below 0.05 which is $0.001 < 0.05$ for the experimental class. Whereas for grade control of the acquisition value of t-counted is $3.407 > 1.666$ and the acquisition of a significant value of $0.001 < 0,05$. It is showing the increase in the critical thinking skills of mathematics students both experiment and control classes.

Based on the test, the value of *N-gain* in the experimental class is 0,72 which is in the high criteria, while the control class is at 0,60 with middle criteria. Based on the acquisition of *N-gain*, the increase in critical thinking skills math class that uses the methods Index Card Match is higher than the class that uses the discussion. So, the use of methods of Index Card Match can effectively improve the ability of students' critical thinking of students compared with discussion.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that: (1) the use of the Index Card Match method in mathematics learning in the experimental class is going well and students look serious and enthusiastic in following the teaching and learning process; (2) The students' ability of mathematics critical thinking by using the

Index Card Match method increase in both the experimental and control classes; (3) There is an influence of the use of the Index Card Match method on students' ability of mathematics critical thinking oriented to HOTS.

REFERENCES

- Brookhart, S.M. (2010). *How to assess higher order thinking skills in your classroom*. USA: ASCD.
- Conklin, W. (2012). *Higher order thinking skills to develop 21st century learners*. Huntington Beach, CA: Shell Education Publishing.
- Costa, A.L. (2001). *Developing minds: A resource book for teaching thinking* (pp. 43-48). Alexandria, VA: ASCD.
- Diguna, B.R. (2015). Peningkatan aktivitas dan hasil belajar siswa melalui strategi pembelajaran aktif tipe index card match. *Jurnal Pendidikan UNILA*, (1), 32-42.
- King, F.J., Goodson, L., & Rohani, F. (2010). *Higher order thinking skills: Definition, teaching strategies, assessment*. Retrieved on October 20th, 2017 from <http://goo.gl/su233T>.
- Moon, B., Mayes, A.S., & Hutchinson, S. (2002). *Teaching, learning, and the curriculum in secondary school*. New York: Routledge.
- Nugraha, D.A., VH, E.S., & Masykuri, M. (2013). Efektifitas metode index card match terhadap prestasi belajar siswa pada materi kimia semester gasal SMAN 2 Karanganyar. *Jurnal Pendidikan Kimia*, 2(4), 174-181.
- Susanti, E., Kusumah, Y.S., Sabandar, J., & Darhim. (2014). Computer-assisted realistic mathematics education for enhancing students' higher order thinking skills. *Journal of Education and Practice*, 5(18), 51-58.

Yen, T.S., & Halili, S.H. (2015). Effective teaching of higher-order thinking (HOT) in education. *The Online Journal of Distance Education and e-Learning*, 3(2), 41-47.