Effect of CORE (Connecting, Organizing, Reflecting, Extending) Learning Models on Student's Mathematical Connections Ability

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Abstract: This research is based on the ability of high school students' math connection. The purpose of this research is to analyze the influence of CORE learning model on students' mathematical connection ability. This research was conducted at senior high school 87 Jakarta school year 2013/2014. The method used in this research is quasi experimental method with research design Randomized Subjects Post-test Only Control Group Design, which involves 79 students as sample by using cluster random sampling technique. Data collection after treatment was done by using the students' mathematical connection ability test. The results revealed that the mathematical connection ability of students taught by CORE learning model is higher than the students taught by conventional learning model, with the indicator of mathematical connection ability used are: a) linking mathematics between one topic with another mathematical topic; b) linking mathematical concepts with other disciplines; c) associate mathematical concepts with real life. The conclusion of this research is that mathematics learning on trigonometric subject by using CORE learning model has significant effect on students' mathematical connection ability compared to using conventional learning model.

1 INTRODUCTION

Mathematics is a science that deals with ideas, structured structures that are arranged according to logical rules (Ekana, 2011). Mathematics is taught from students entering elementary to university, because mathematics is one of the most important branches of science. According to Van de Walle, the mathematical competencies students need to have include problem solving ability, argumentation ability, communication ability, connections ability, and representation ability (Van de Walle, 2010). The general lesson of mathematics, formulated by the National Council of Teachers of Mathematics or NCTM, requires students to study mathematics through understanding and actively building new knowledge from prior experience and knowledge (Ekana, 2011). For the student to experience the benefits of mathematics, he must attain a deep and meaningful understanding of mathematics by connecting several mathematical ideas. Research Tout indicates that students learn best when they make connections with ideas and transfer these ideas into long term memory (Corovic, 2017). The ability of mathematical connections is the ability of students to demonstrate internal and external relationships of mathematics, which include connections between mathematical topics, connections with other disciplines, and connections with daily life so that students can connect between mathematical concepts, students can be more successful in learning mathematics because with students can link between mathematical concepts the ability of any understanding can increase. According to NCTM, in grades 9-12, students, (Baki et al., 2009)

- should be able to use their knowledge of data analysis and mathematical modeling to understand societal issues and workplace problems in reasonable depth;
- should be confidently using mathematics to explain complex applications in the outside world;
- not only learn to expect connections but they learn to take advantage of them, using insights gained in one context to solve problems in another.

According to Hirdjan, "mathematics is not taught separately between topics. Each topic can be involved or involved with other topics ", so students' understanding of a topic will help to understand other topics, but this can happen if students are able to connect the topics (Puspitasari, 2011).

Mathematics learning activities in schools, which occur so far is to use conventional learning model.

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One-way learning, the teacher as the center of learning with the delivery of materials using lecture methods. This condition causes learners resulting from school education lack the ability of understanding caused by the lack of achievement of mathematical connection ability. An educator who teaches mathematics can stimulate or cultivate students' mathematical connection skills using an effective learning model and emphasize the process of linking between old concepts and new concepts.

Based on data from the 2011 Trends in Mathematics and Science Study (TIMSS) 2011 study for grade VIII students, putting Indonesian students in 38th out of 42 countries with an average score for general mathematics ability is 386. Indonesia scored 11 points from the assessment of 2007. The value is still far from the minimum standard score of average mathematics ability set by TIMSS that is 500. In the TIMSS mathematics class VIII, the first rank achieved by Korean students (613), followed by Singapore. This shows that the low mathematics learning achievement (Lince, 2012).

Ruspiani also revealed that the average value of high school students' mathematical connection ability is still low, the average score is less than 600 at a score of 100, which is about 22.2% for mathematical connections with other subjects, 44.9% for mathematical connections with other fields of study, and 67.3% for math connection with daily life (Lestari, 2011).

Learning model used by educator or teacher in improving or growing the ability of connection of mathematics that is by using cooperative learning model. According to Slavin, cooperative learning encourages students to interact actively and positively in groups (Rusman, 2012). A cooperative learning model that can improve the ability of mathematical connections is the CORE learning model (Connecting, Organizing, Reflecting, Extending). CORE learning model is a discussion model that includes four processes, namely: (1) connecting, connect language means come or bring together, meaning students connect between old concepts with new concepts, (2) organizing, organize language means arrange in a system (3) reflecting, reflect language means think deeply about something and express, meaning students think deeply about the concepts they are learning, (4) extending, extending language means make longer and larger, meaning that through discussion can help students expand their knowledge (Yuniarti, 2013). In mathematics learning connecting old concepts with new concepts is one of the most important elements, therefore a good connection is needed in connecting that knowledge.

This research is done with problem formulation: (1) how mathematical connection ability between students who follow mathematical learning by using CORE conventional learning model, (2) is there any influence of CORE model on students' mathematical connection ability.

2 RESEARCH METHODS

This research was conducted at senior high school 87 Jakarta, located in Jalan Awareness Ulujami Raya Pesanggrahan South Jakarta. The sample in this research is 39 students of the third eleventh grade science and 40 students of the second eleventh grade science. The research method used is quasi experimental method. The sample groups were divided into two groups, namely the experimental group and the control group. The research design used was two groups of randomized subject posttest only.

The test instrument used in this research is the test instrument of mathematical connection of students in the form of a description test of 9 questions. The tests were administered in post-test to experimental groups and control groups on trigonometric subjects.

3 RESULTS AND DISCUSSION

Differences in the value of students' mathematical connection ability between the experimental group and the control group can be seen in the following table.

Table 1: Comparison of Test Results of Student Mathematics Connection.

Statistics	Class	
	Experiments	Control
N	39	40
Xmax	81	71
Xmin	38	24
$\bar{x}$	62.00	48.90
S^2	177.95	168.66
S	13.34	12.99

In Table 1 the value of the mathematical connection ability of the experimental group is better than the control group. The ability of the connections studied is to connect the concept of trigonometry with other mathematical topics, connecting the concept of trigonometry with other disciplines (physics), connecting the concept of trigonometry with everyday life.

Judging from the connection capability indicator, the connection ability score in the experimental group and the control group based on each indicator is presented in the following table.

Table 2: Percentage of Mathematical Connection Ability of Students of Experiment Group and Control Group Based on Mathematical Connection Indicators.

No	Indicators	Scores Max	Experiment		Control	
			$\bar{x}$	%	$\bar{x}$	%
1	Connects the concept of trigonometry with other mathematical topics	28	15.69	56.04	13.00	46.43
2	Connects the concept of trigonometry with other disciplines	8	6.26	78.25	3.03	37.81
3	Connects the concept of trigonometry with everyday life	6	3.64	60.67	4.13	68.75
$\sum$		50	25.59	51.18	21.91	43.82

Table 2 shows that in the experimental group, students who can connect trigonometry with other mathematical topics are 56.04%, connecting trigonometric concepts with other disciplines (physics) as much as 78.25%, connecting trigonometric concepts with daily life of 60.67%. While in the control group, students who can connect the concept of trigonometry with other mathematical topics as much as 46.43%, connecting the concept of trigonometry with other disciplines (physics) as much as 37.81%, connecting the concept of trigonometry with daily life as much as 68.75 %. Overall the mathematical connection ability of the experimental group was higher than the control group, with the difference of 9.61%, 40.44%, 8.08% respectively.

Based on the hypothesis testing done shows that the student's ability of mathematical connection by using conventional learning strategies. To test it the hypothesis as follows. $H_0 : \mu_1 \leq \mu_2$ and $H_1 : \mu_1 > \mu_2$.

Meanwhile the result of the calculations shows that $t_{obs} > t_{table}$ (4.32 > 1.66). Thus, H_0 reject, in other words the average of mathematical connections ability in the experimental group is higher than the control group. In summary, the result of the t-test can be seen in the following table.

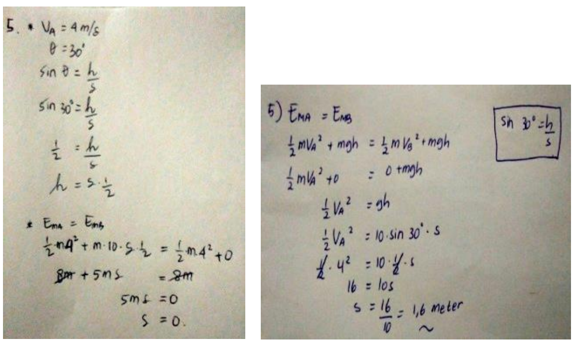
Table 3: Hypothesis Test Results with T-Test.

Groups	N	$\bar{x}$	S	t_{obs}	t_{table}	Conclusion
Experimental	39	62.00	13.34	4.32	1.66	Reject H_0
Control	40	48.90	12.99			

In Table 3 the CORE learning model affects the student's mathematical connection ability. This is in line with the research conducted Santi Yuniarti (Yuniarti, 2013) which states that contextual-based learning model CORE can improve student's mathematical understanding ability. Ellisia's research also states that the learning model CORE can improve student's mathematical problem-solving abilities (Kumalasari, 2011).

The learning model CORE can make students actively building new ideas based on the knowledge they have in the past or present. In line with the above statement Calfee, et al suggests that the learning model CORE is a learning model that expects students to be able to build their own knowledge by connecting and organizing new knowledge with old knowledge then thinking about the concept being studied and expected students can expand their knowledge during the learning process takes place (Kumalasari, 2011).

Here is an answer to the number 5 with indicators Connects the concept of trigonometry with everyday life on the experimental and control learner with the following question: "An object glides on a flat surface with v = 4 m/s and then the object rises on an incline with a 30° slope. If there is no friction between the object and the glide, then the length of the object's path on the incline is ..."



(A) (B)

Figure 1: Answer post-test from experiment and control group.

Problem in Figure 1 is used to quantify indicator to connect trigonometric concepts with other disciplines (physics). Figure 1 (A) is the student's answer to the control group. The student's answer is not correct. Students less able to connect the concept of trigonometry with other disciplinary science and less mastering the material of mechanical energy. Figure 1 (B) is the student's answer to the experimental group. In the student's answer, students can see the concept of trigonometry with other discipline science in mechanical energy material properly and correctly. Indicator connects trigonometric concepts with other discipline disciplines has a total score of 8, the students in the experimental group have an average of 6.26, while the average value in the control group is smaller at 3.03.

4 CONCLUSIONS

The achievement of the mean value of mathematical connection indicator of students whose learning process using CORE learning model from the highest is 1) Connecting the concept of trigonometry with other mathematical topics, 2) Connecting the concept of trigonometry with other disciplines, 3) Connecting the concept of trigonometry with life daily. The achievement of the average value of mathematical connection indicator of the students whose learning process using conventional learning model from the highest is 1) Connecting the concept of trigonometry with other mathematical topics, 2) Connecting the concept of trigonometry with daily life, 3) Connecting the concept of trigonometry with the field other disciplines. Mathematical connection ability of students using CORE learning is higher than students' mathematical connection ability taught using conventional learning with expository method. This can be seen from the average ability of students' mathematical connections taught using CORE learning for 62.00 while the average mathematical connection ability of students taught using conventional learning of 48.90. Thus, the CORE learning model has more effective effect on mathematical connection ability compared with conventional learning model.

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