IMPLEMENTATION OF COGNITIVE CONFLICT STRATEGY IN COOPERATIVE SETTING FOR IMPROVING STUDENTS' MATHEMATICAL UNDERSTANDING ABILITY

By

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Abstract: The purposes of this study are: (1) to describe mathematical understanding ability of Class X students of Vocational High School Negeri 1 Kendari who were taught with cognitive conflict strategy in cooperative setting; (2) to describe mathematical understanding ability of Class X students of Vocational High School Negeri 1 Kendari who were taught with expository strategy; (3) to know the difference of mathematical understanding ability of Class X students of Vocational High School Negeri 1 Kendari who were taught with cognitive conflict strategy in cooperative setting and they who were taught with expository strategy. This type of research is quasi-experimental research, which uses post-test design of group design control. The population in this study is the students of Class X Vocational High School Negeri 1 Kendari, while the samples are students of Class X-C1 and Class X-C2. Sampling technique used is purposive sampling technique, while to determine the experimental class and control class used simple random sampling technique. The results of this research are: (1) description of mathematical understanding ability of Class X students of Vocational High School Negeri 1 Kendari who were taught with cognitive conflict strategy in cooperative setting is: maximum score is 98.00, minimum score is 51.00, average score is 76.39, median is 76.00, mode is 76.00 and standard deviation is 10.68; (2) description of mathematical understanding ability of Class X students of Vocational School of 1 Negeri Kendari who were taught with expository strategy is: maximum score is 93.00, minimum score is 49, average score is 70.76, median is 71.00, mode is 62.00 and standard deviation is 9.82; (3) there is a significant difference of mathematical understanding ability of Vocational High School 1 Negeri Kendari who were taught with cognitive conflict strategy in cooperative setting and they who were taught with expository strategy, where learning with cognitive conflict strategy in cooperative setting is better than learning with expository strategy.

Keywords: *Cognitive Conflict Strategy, Cooperative Setting, Mathematical Understanding.*

INTRODUCTION

Understanding concepts in mathematics is something absolutely essential to master when a student follows the learning process (Brooks & Brooks, 1993). To deal with the problem of understanding the concept in learning mathematics needs to be applied the right strategy. This is because basically the students have brought the initial knowledge gained in the previous education level (Suparno, 2005). The initial knowledge brought by the students is in the form of a scientific conception and some are still misconceptions.

Often students only memorize the concept definition without regard to the relationship between concepts and other concepts. If so, the new concept does not belong to the conceptual network that the student has, but the concept stands alone without any relation to other concepts. The new concept can not be used by students and has no meaning, because the meaning of the concept comes from relationships with other concepts.

The individual interpretation of a concept is called conception. One's interpretation of a concept is often different from the intended concept. A person's misinterpretation of a concept is called misconception and if the student's misconception increases, the student will have difficulty in understanding the next concept (Rahim, et al., 2015). This is because the concept in mathematics is hierarchical. One of the implications of misconceptions in the teaching and learning process is that if misconceptions are not immediately detected and uncorrected, they can lead to a misconception of the students towards the concept (Ulthayakumari, 2005). This suggests that the importance of a learning strategy that can detect and correct students' perceptions.

Students' misconceptions are the main problem facing the world of mathematics education today. Misconception in mathematics occurs universally. Student conceptions and misconceptions allegedly form during childhood in brain interaction with nature (Berg, 1991). Students' misconceptions are indicated by the low of students' understanding of a concept. The problem of low understanding of mathematical concepts is also a phenomenon that occurred in Vocational High School Negeri 1 Kendari. This is indicated by the test results which was done by researchers during the preliminary study in Vocational High School Negeri 1 Kendari. The test results showed that from 80 students who tested only 50 students or 62.5% of students who achieve the minimum completeness criteria (in which it is at least 65). Observations also showed that teachers still use expository or direct learning strategies, which is still teacher-centered.

Studies of misconceptions show that misconceptions are resistant (Sadia et al, 2004) and this occurs because each individual builds his knowledge precisely with his experience. Therefore, a teacher needs to understand the nature and characteristics of students' misconceptions so that teachers can prepare appropriate learning strategies to change students' misconceptions and after that there will be conceptual changes or in other words, students must replace or improve most of the knowledge about conceptual change in cognitive perspective (Kabaca at al, 2011; Limo'n 2001 and Rahim, et al, 2015).

Younger builds new knowledge rather than building misconceptions of knowledge. This is as Suparno (2005) points out that it is easier to build new knowledge from scratch when compared with changing misconceptions of knowledge. Zimrot & Ashkenzi (2007) state that one will be able to change the alternative concept if they begin to doubt their own concepts so that the proposed new concept becomes useful. Suparno (2005) also mentions that conceptual change is very important in the learning process of mathematics. Only with the existence of conceptual change, either expanding the concept or aligning the imprecise concept, a student actually develops in understanding the concepts of math. This can be done by opposing the concepts that the students owned with scientific concepts. Therefore, a strategy is needed to contrast the concepts that the students have with the scientific concept. Berg (1991) reveals that misconceptions of ideas arise from the minds of students which are personal. The ideas are generally less scientific. To change the students' ideas to the right ideas, a strategy called cognitive conflict strategy is needed.

Zulkarnain (2013) defines definition of cognitive conflict as a known state where one sees a mismatch or an imbalance between the cognitive structure he owned and the environment. Cognitive conflict strategy itself is a strategy that utilizes the unbalanced state within the cognitive structure of students that arise due to the conflict between the initial concept that students have with the environment that can be explained by the concept to be studied. Rianto (2009) states that students must go through the process of assimilation and accommodation when they get a cognitive conflict and achieve a new balance. When students have resolved conflicts, they can alter or expand their cognitive structure.

Lee, et. al (2001) describes three stages to create a cognitive conflict process.The first stage is introduction that is done by the teacher with the presentation of cognitive conflict. The second stage is conflict that creates conflict with the help of a problem that involves the process of assimilation and accommodation. The third stage is resolution that is the discussing and concluding the discussion. Based on these stages, the cognitive conflict strategy consists of five learning phases, namely: (1) students' orientation to conflict; (2) organizing students to learn; (3) guiding individual or group investigations; (4) developing and presenting the work; (5) analyzing and evaluating.

Learning by using cognitive conflict strategies has the advantage of being able to generate students' misconceptions (Rahim, et al, 2015). Having known the misconception done by the students, the conceptual changes will be made so that it will produce the correct concept or scientific concept of the students. This way will improve students' mathematical problem solving ability.

Previously it has been described that the learning that is done by the teacher has not improve the activity and creativity of students in learning yet, students are reluctant to ask the teacher if there is something that is not understood by them. To anticipate this, one of the learning models that can be used is cooperative learning model.

Cooperative learning model is a model of learning that involves students actively, because with cooperative learning interaction occurs between students with one another. Students are more brave to express an opinion or ask other students, when compared to ask the teacher. Through cooperative learning

students can train students' mental learning together and side by side, emphasizing individual interests and prioritizing group interests. In cooperative learning, implementing the basic principles of a cooperative learning system correctly will enable teachers to effectively manage classes (Rusman, 2010).

Implementation of cognitive conflict strategy to build students' understanding of a concept in solving mathematical problems, it would be better if the cooperative learning model is used so that students more easily understand the mathematical concepts that will be used to solve mathematical problems. Through a cooperative learning model, students with better conceptual understanding skills will help their misconceptive friends. Therefore, the implementation of cognitive conflict strategy in this study is arranged cooperative. In addition, in this study also applied cooperative learning model, thus in this study compare the ability of mathematical problem solving between group of students who were taught with cognitive conflict strategy in cooperative setting and group of students who were taught with expository strategy.

Because of the importance of conflict strategy in dealing with misconceptions of students in learning mathematics, then learning with cognitive conflict strategy in cooperative setting is applied to improve mathematical understanding abilityof Grade X students of Vocational High School Negeri 1 Kendari.

The purpose of this study is to: (1) to describe mathematical understanding ability of Class X students of Vocational High School Negeri 1 Kendari who were taught with cognitive conflict strategy in cooperative setting; (2) to describe mathematical understanding ability of Class X students of Vocational High School Negeri 1 Kendari who were taught with expository strategy; (3) to know the difference of mathematical understanding ability of Class X students of Vocational High School Negeri 1 Kendari who were taught with cognitive conflict strategy in cooperative setting and they who were taught with expository strategy.

METHOD

The type of study is quasi-experimental research, which uses post-test design of group design control. The population in this study is the students of Class X Vocational High School Negeri 1 Kendari, while the samples are students of Class X-C1 and Class X-C2. Sampling technique used is purposive sampling technique, while to determine the experimental class and control class used simple random sampling technique.

Variable in this study there are two kinds, that is independent variable (X), namely learning strategy and dependent variable (Y), namely the ability of mathematical understanding. The independent variables consist of two types, namely cognitive conflict strategy in cooperative setting and expository strategy, while the dependent variable also there are two kinds of mathematical understanding ability of students who are taught with cognitive conflict strategy in cooperative setting and students' mathematical understanding ability who are taught with expository strategy.

The instrument used in this study is a test of mathematical understanding ability in the form of a description that includes indicators of students' mathematical understanding ability. The test is given to both classes after being given learning treatment with cognitive conflict strategy in cooperative setting and learning with expository strategy.

RESULT AND DISCUSSION

Research Result

The results of this study presented two kinds of research results, namely the results of descriptive analysis and inferential analysis.

Summary of descriptive analysis of post-test data of students' mathematical understanding ability taught with cognitive conflict strategy in cooperative setting is presented in Table 1 below.

Table 1.
Description of Post-test Data of Students' Mathematical Understanding in Experiment Class

N	Valid	31
	Missing	0
Mean		76,3871
Median		76,0000
Mode		76,00
Std. Deviation		10,67919
Variance		114,045
Minimum		51,00
Maximum		98,00
Sum		2368,00

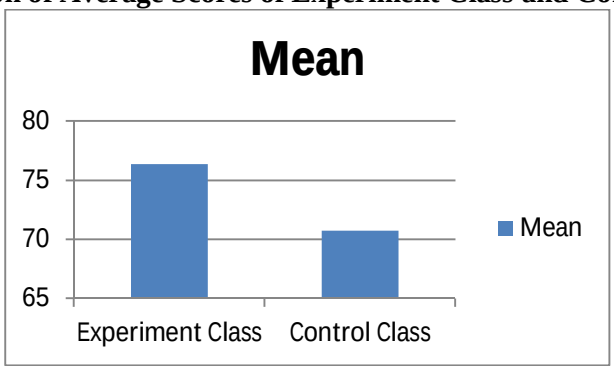
Description of post-test result of students' mathematical understanding in control class is presented in Table 2 below.

Table 2
Description of Posttest Data of Students' Mathematical Understanding in Control Class

N	Valid	33
	Missing	0
Mean		70,7576
Median		71,0000
Mode		62,00
Std. Deviation		9,82354
Variance		96,502
Minimum		49,00
Maximum		93,00
Sum		2335,00

Based on Table 1 and Table 2 obtained the description of post-test average comparison of Mathematical Understanding Competency of the two classes, namely class which is taught with cognitive conflict strategy in cooperative setting and class which is taught with expository strategy as presented in Figure 1.

Figure 1
Comparison of Average Scores of Experiment Class and Control Class



Data hypothesis testing is done to the result of post-test students' mathematical understanding ability, that is by using t-test and test result presented in Table 3 below.

Table 3
Hasil Pengujian Hipotesis

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Nilai	Equal variances assumed	,057	,812	2,197	62	,032	5,62952	2,56287	,50641	10,75263
	Equal variances not assumed			2,191	60,695	,032	5,62952	2,56966	,49064	10,76840

Based on the calculation in Table 3 shows that the significance value obtained 0.032 is smaller than the significance level $\alpha = 0.05$, it can be concluded that there is a difference in the mean score of students' mathematical understanding ability who were taught with cognitive conflict strategy in cooperative setting and who were taught with expository strategy. The result of descriptive analysis shows that the mean score of students' mathematical understanding ability who were taught with cognitive conflict strategy in cooperative setting is higher than the mean score of students' mathematical understanding ability who were taught with expository strategy, it can be said that learning by cognitive conflict strategy is better than expository strategy.

Discussion

Based on the results of descriptive analysis obtained that the mean score of students' mathematical understanding ability who were taught with cognitive conflict strategy in cooperative setting is higher than the mean score of students' mathematical understanding ability who were taught with expository strategy. It also reinforced the results of hypothesis testing that there is a difference in the ability of mathematical understanding between students who were taught by cognitive conflict strategy in cooperative setting and students' mathematical understanding ability who were taught with expository strategy. So, it can be said that learning with cognitive conflict strategy in cooperative setting is better than learning with expository strategy.

There is a difference between students' mathematical understanding ability which applies cognitive conflict strategy in cooperative setting because this strategy gives opportunity to students to contribute dominantly during the learning process. Contribution which is given by students in the form of thinking process and convey the argument about a concept in accordance with the information that have been obtained. The process of cognitive conflict experienced by students can change their own wrong concept into the correct concept. Cognitive conflict strategy is important to do, because if not done then the students' misconception can not be detected immediately. This is in line with the opinion of Ulthayakumari (2005) that one of the implications of misconceptions in the teaching and learning process is that if misconceptions are not detected immediately and not corrected, it can lead to a misconception of the students towards the concept.

Conceptual changes must be made so that students do not bring false concepts when learning the next related concepts (Kabaca at al, 2011). It is also in line with Limon's (2001) opinion that misconceptions need to be converted into the correct concepts in order to learn the next concepts without getting any difficulties.

Implementation of learning with cognitive conflict strategy in cooperative setting will make students become more active, helping each other (Rusman, 2010). Through learning cognitive conflict strategy in cooperative setting, students who have low ability will be better in terms of making conceptual changes, as assisted by friends who have better mathematical understanding ability.

CONCLUSION

Based on the research results and discussion, it can be concluded: (1) description of mathematical understanding ability of Class X students of Vocational High School Negeri 1 Kendari who were taught with cognitive conflict strategy in cooperative setting is: maximum score is 98.00, minimum score is 51.00, average score is 76.39, median is 76.00, mode is 76.00 and standard deviation is 10.68; (2) description of mathematical understanding ability of Class X students of Vocational School of 1 Negeri Kendari who were taught with expository strategy is: maximum score is 93.00, minimum score is 49, average score is 70.76, median is 71.00, mode is 62.00 and standard deviation is 9.82; (3) there is a significant difference of mathematical understanding ability of Vocational High School 1 Negeri Kendari who were taught with cognitive conflict strategy in cooperative setting and they who were taught with expository strategy, where learning with cognitive conflict strategy in cooperative setting is better than learning with expository strategy.

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