CHAPTER 1

INTRODUCTION

A. Rationale

Mathematic is a fundamental human activity – a way of making sense of the world. Children possess a natural curiosity and interest in mathematics, and come to school with an understanding of mathematical concepts and problem solving strategies that they have discovered through explorations of the world around them (Ginsburg, 2002)

Stodolsky (1985) stated that mathematics is an area in which ability, in the sense of a stable trait is believed to play a dominant role in performance, either one has the ability or one does not. And if one lacks ability in mathematics, nothing can be done about it. By contrast, people generally believ that performance in in other subjects, like raeding or social studies, can be improved with practice and effort, they hold an incremental theory of ability

But actually mathematics is generally considered as a most difficult subject, boring and scarry subject indeed. This opinion may not too redundancy, beside its abstract properties, mathematics should needs a good conceptual understanding. So that, no wonder if students don't like to learn mathematics. It may just because they hard to understand the Mathematics. Another reason why Mathematics called as difficult subject can be observed from the mastery of Mathematics of students in Indonesia that still low. As Balitbang Depdiknas proposed that just look to the test results of Trends in International Mathematics and Science Study (TIMSS) 2003 which are coordinated by International for Evaluation of Education Achievement (IEA), the test results put Indonesia students in 36^{th} rank of Science mastery. Compare to neighboring countries of Indonesia, like Singapore and Malaysia, this position still far behind their position. Singapore is in first rank in both of

Mathematics and Science and Malaysian is in 10th rank in Mathematics and 20th rank in Science.

Another opinion proposed by Rahim (2012) that Indonesia students' achievement in Mathematics still under standard average scores of TIMSS (500). Indonesia only gets 307 points. As for other countries like Singapore, Malaysia, and Thailand respectively get 593, 474, 444 with minimal standard score is 500.

In mathematics learning, mathematics conceptual understanding is important for students, because one mathematics concept related with another concept, so that, to learn mathematics should continuously. If students already understanding about mathematics concept ease them to understand the more complex concept.

Hiebert and Carpenter (1992) specifically defined mathematical understanding as involving the building up of the conceptual 'context' or 'structure' mentioned above

> The mathematics is understood if its mental representation is part of a network of representations. The degree of understanding is determined by the number and strength of its connections. A mathematical idea, procedure, or fact is understood thoroughly if it is linked to existing network with stronger or more numerous connections (Andreas, 2007).

According to Bruner, Goodnow, and Austin (1956) a concept is learned by testing hypotheses about the correct solution. If the first hypothesis formed is correct, the individual has learned the concept. However, if the hypothesis is incorrect, another hypothesis will be generated and tested. Hypothesis testing will continue until a correct solution is discovered (Klein, 1991)

Many things that considered makes students lack of math conceptual understanding are (1) students relying on rote memorized without understanding the material. That will cause the lack of student's creativity to find the concept so that they will easily forget the material; (2) the material which are taught has float concept, so that students hard to find the keywords to understand the material and;(3) educator (teacher) may not too success to explain the keywords of material concept of existing subjects so that student

not attract to study and causes the low conceptual understanding (Lynch and Waters, 1980, Nakhleh, 1992, 1994).

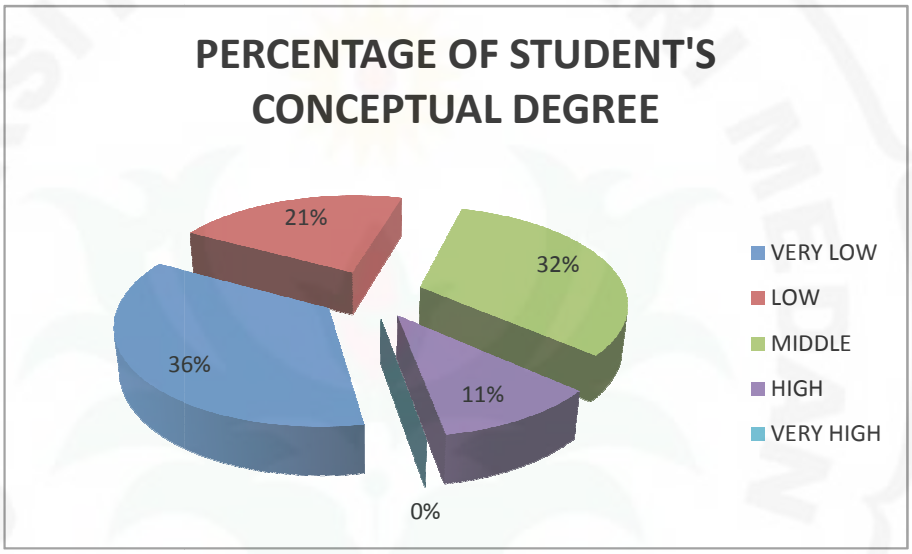
According to Debora Stipek (Johnson & Johnson, 1985b) students tend to find cooperative learning groups more enjoyable than working independently. Some studies suggest that girls respond particularly well to math and science instruction when it is taught in a cooperative manner (Eccles & Roesser, 1999). Debora Stipek proposed that individual accountability is important, and cooperative learning activities need to be planned and implemented thoughfully to ensure that all students are actively participating in substantive intelectual work. Students can collaborate in pairs for a few minutes to solve a single math problem during whole-class instruction (Stigler & Stevenson, 1991)

Based on observation result which conducted in SMP Negeri 5 Percut Sei Tuan on July 15th 2013 in class VIII-5 year academic 2013/2014, linear equation system of two variables considered as difficult subject matter. Actually, linear equation system of two variables is basic knowledge that should be mastered because too often to use in daily life problems and relate to the next subject matter. Students have low prosperity in understanding the concepts that inflict students not able to create mathematic model and solving the problems.

Conceptual understanding of mathematic may observed from 3 aspects. The first aspect is define the concept by own words, second is give the example and counter example of concepts, and third is apply the concept to solve the problem. Observer gave the preliminary test about linear equation system of two variables which test the students' conceptual understanding. The conceptual understanding score after preliminary test was given, the lowest score is 14 and the highest score is 76, with average score is 48.14. For 36% or 10 students have very low degree of conceptual understanding in math, 21% or 6 students have low degree of math conceptual understanding, 9 students or 32% have enough score conceptual understanding degree in math, 3 students

or 11% have high degree of conceptual understanding and no student has very high degree of conceptual understanding. The graphic will be shown as below:

Figure 1.1. Graphic of degree of conceptual understanding in math

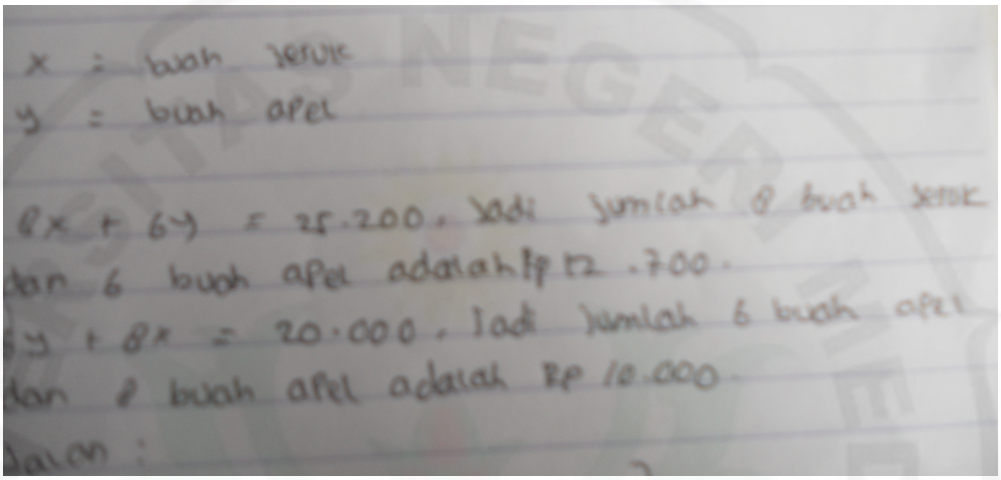


From above results obviously observed that the score of preliminaary test of linear equation of two variables system not too satisfy. Based on above result can concluded that student's conceptual understanding especially in linear equation of two variables system still low and need any action to solve this problem.

When the problem as follow given:

The total price for 8 oranges and 6 apples is Rp 25.000, while the price for 6 oranges and 5 apples is Rp 20.000,-. Make this problem into mathematic model and find the price for one orange!

And one of the students' answers is:



The above answer shows that student disable to define the concept of linear equation system of two variables and also disable to apply the concept to solve the mathematics problem. This case shows that the conceptual understanding of students in linear equation system of two variables still low.

Based on interview with mathematics teacher in class VIII-5 SMP Negeri 5 Percut Sei Tuan, Mr. Amril, learning model which often used is teacher-centered learning which learning process mostly focuses only to the teacher. Teacher most often to explain and to give the information about the concepts of learned material. One of asked question in interview is "What do you think about the conceptual understanding in mathematics?" and teacher answered that the students conceptual understanding is very low. It can observed by their difficulty to solve their problem using concepts, students were soon forgotten with the material that has been taught, and difficult to answer the test with has little different with the explained test before. Based on Mr.Amril, students often waste their chance to ask or to express their mind when teacher prompted. They seems easier to express their idea or ask the question to their friend with their own words and make them understand then help each other. It shows that students need to learn cooperatively.

Cooperative learning is a generic term that is used to describe an instructional arrangement for teaching academic and collaborative skills to small, heterogeneus group of students (Rich, 1993; Sharan, 1980). Cooperative

learning is deemed highly desirable because of its tendency to reduce peer competition and isolation, and to promote academic achievement and positive interrelationship. A benefit of cooperative learning, therefore, is to provide students with learning disabilities (LD), who have math disabilities and social interaction difficulties, an instructional arrangement that fosters the application and practice of mathematics and collaborative skills within a natural setting (i.e., group activity). Thus, cooperative learning has been used extensively to promote mathematics achievement of students both with and without learning disabilities (Slavin, Leavey, &Madden, 1984; Slavin, Madden, &Leavey, 1984)

According to the National Council of Teachers of Mathematics (NCTM; 1991), learning environtments should be created that promote active learning and teaching; classroom discourse; and individual, small group, and whole group learning. Cooperative learning is one example of an instructional arrangement that can be used to foster active student learning, which is an important dimension of mathematics learning and highly endorsed by math educators and researchers. Students can be given tasks to discuss, problem solve, and accomplish.

Numbered Head Together (NHT) is one of cooperative learning type. This model can be used as alternative model of previous learning model. By that condition of underprivileged students in understanding the mathematical concepts, so Numbered Head Together expected to improve the students' spirit in understanding the mathematics concept and to facilitate students to learn mathematics, so that it can improve the students' understanding of mathematical concept.

Numbered Head Together is cooperative learning strategy that holds each students accountable for learning the material. Students are occupied in groups and each person be given a number (from one to the highest number in each group). The teacher poses a question and students "put their heads together" to figure out the answers. The teacher calls a spesific number to respond as spokesperson for the group. By having students work together in a group, this strategy ensures that each member knows the answer of the problems or

questions which asked by teacher. Because no one knows which number will be called, all team members must prepare their selves.

This cooperative learning strategy promotes discussion and both individual and group accountability. This strategy is beneficial for reviewing and integrating subject matter. Students with special needs often benefit when this strategy is used. In learning strategy Numbered Head Together, students not only learn from what teacher teach, but also discuss and share with their friend. Beside of that, students easier to interact to figure out the difficult concept when they discuss that problem to their friend. And also, Numbered Head Together never used before in SMP NEGERI 5 Percut Sei Tuan as learning model for mathematics subject.

By Numbered Head Together model, researcher expected to make a great change for students in SMP Negeri 5 Percut Sei Tuan to learn Linear Equation of Two Variables System until conceptual understanding increase year by year, and help the teacher especially to teach Linear Equation of two variables System in class VIII

Based on above, the researcher attract to did the observation whose entitled "**IMPLEMENTATION OF NUMBERED HEAD TOGETHER MODEL TO IMPROVE THE UNDERSTANDING OF MATHEMATICAL CONCEPTS IN THE TOPIC OF LINEAR EQUATION OF TWO VARIABLES SYSTEM CLASS VIII AT THE ACADEMIC YEAR 2013/2014**"

B. Problems Identification

Based on above rationale, the matter that considered as problem identification are :

1. Students consider that mathematics is the difficult subject
2. Students have low degree of understanding of mathematical concept, so they hard to solve mathematics problem by their own way especially in linear equation of two variables system.

3. Teacher-centered learning makes students tend to be passive in teaching and learning process.
4. Students afraid to ask the teacher about their problem, they feel more enjoy when they share with their friends.
5. Teaching and learning process still dominated by traditional learning strategy.

C. Problem Restriction

Based on above problem identification, the problem must be restricted so that it will be more focus on the restricted problem. The restriction of problems in this research proposal are:

1. Students in class $VIII_5$ SMP Negeri 5 Percut Sei Tuan has low conceptual understanding especially in linear equation of two variables system.
2. Teacher-centered learning makes student's activity along learning process tend to be passive

D. Problems Formulation

According to above problem restriction, the researcher conclude the problem formulation are:

1. Whether the implementation of Numbered Head Together model able to improve the student's understanding of mathematical concept in linear equation system of twoa variables class VIII at academic year 2013/2014
2. How is the level of students activity by implementation of cooperative learning strategy Numbered Head Together Model?

E. Research Goals

The goal of this researh which want to be achieved are:

1. Knowing Whether the implementation of Numbered Head Together model able to improve the student's understanding of mathematical concept in linear equation system of twoa variables class VIII at academic year 2013/2014

2. Describing the level of student's activity in implementation of cooperative learning strategy Numbered Head Together model

F. Research Benefits

The findings which obtained from this class action research about learning strategy of Numbered Head Together model give some benefits as below:

1. For teacher

a. As consideration for teacher about the implementation of cooperative learning strategy Numbered Head Together model

b. Helping to choose and determine the alternative learning model which proper to use in learning process so that the objective of implementation of conceptual understanding in mathematics will be exact and effective

2. For Student

a. Helping and facilitating students in class VIII-5SMP Negeri 5 Percut Sei Tuan to understand the mathematics concept.

b. Helping and training students to familiarizing with group discussion, by discussion students are able to critically thinking, sharing the idea and opinions to solve the problems.

3. For Researcher

a. Increasing the knowledge about educational condition in Indonesia, especially in SMP Negeri 5 Percut Sei Tuan. So that, all associated elements try to improve the quality of education proper to subject matter and learning strategy

b. Knowing what is the proper learning model to be implemented in learning process as prospective teacher

G. Operational Definition

To avoid misinterpretation, there are some special term used in this research, they are:

1. Cooperative learning strategy:
   Method of instruction that has students working together in groups, usually with the goal of completing a specific task. This method can help students develop leadership and the ability to work with others as a team. However gifted students are often placed in groups with non-gifted children, sometimes with the goal of having the gifted student help the others, either directly or by example. In these instances, the gifted students is not likely to learn anything new, while the non-gifted students are not likely to develop any leadership skills.
2. Numbered Head Together
   Cooperative learning strategy that holds each student accountable for learning the material. Students are placed in groups and each person is given number (from one to the maximum number in each group). The teacher poses a question and students "put their heads together" to figure out the answer. The teacher calls a specific number to respond as spokesperson for the group. By having students work together in a group, this strategy ensures that each member knows the answer to problems or questions asked by teacher. Because no one knows which number will be called, all team members must be prepared.
3. Mathematical Concept
   One thing that represent any object in mathematic which has the same characteristic.
4. Student's Understanding Concept
   His or her collection of privately held beliefs about the concept. It satisfies three indicators able define the concepts by own words, able to give the example and counter example of concepts, able to apply the concept to solve the problems.

5. Level of student's activity

   All activities which conducted by students along learning process, observed by observer and measured based on ideal time attainment which are: (1) listening, watching the teacher's explanation, (2) reading/comprehending the problem in worksheet, (3) solving the problem/discovering the way and solution of the problem, (4) writing the problem solution, summarizing and concluding the procedure/concept, (5) presenting the result, (6) discussing/asking to friend/asking to the teacher, (7) writing the relevant things to the learning process, (9) all irrelevant things to the learning process