CHAPTER I

INTRODUCTION

1.1 Background

The progress of a nation is determined by the quality of human resources, while the quality of human resources depends on the quality of education. Therefore, the renewal of education should always be done to improve the quality of education of a nation. Education is an important thing in human life because it can improve the value life of human being. Education is a process to help people improve their knowledge, ability, and, creativity.

School as an educational institution that organizes the learning process has an important role in transferring knowledge and skill to students. The role is expected to produce qualified human in science department. In other words, school implements teaching–learning activity as the realization of the established educational objective. According to Sukmadinata (in Sirait, 2017) that education in schools is created through the interaction between educators with students that aims to help the development of all the potential, skills, and characteristics of learners, to the intellectual, social, affective, and physical.

As according to Noviani, Syahputra, and Murad (2017) state that: "Mathematics is one of the basic science that has very important influence in life, because it can prepare and develop students' ability to think logically, sociably, and appropriately to solve a problem that occurs in their daily lives". Mathematics is also an important subject in education system in the world. A country that neglects mathematics education as a top priority will be left behind from the progress of all fields especially science and technology. Given the importance of mathematics in daily life, mathematics needs to be understood and controlled by all levels of society is no exception of school students as the next generation. Based on Hudojo (in Sirait, 2017) that mathematics is a tool to develop a way of thinking. Therefore, mathematics is

indispensable both for everyday life as well as in dealing with the advancement of science and technology so that the mathematics must be procured to every student since elementary classes, however, there are essentially mathematical science is a way of thinking deductive formal and abstract. Mathematics not only related to numbers and operations but also the element of space as a target. Clear that the object of study of mathematics is not just the quantity, but more focused on the relationship, patterns, shapes, and structures. Students have difficulty in learning mathematics because mathematics is abstract things so it is difficult to understand and boring.

Mathematics education materials in schools include arithmetic, algebra, statistics, and geometry. These materials are used, both for mathematics alone and for utilization outside mathematics. These materials aim to improve the 5 capabilities described by NCTM (in Subroto 2012): reasoning ability, connection ability, communication ability, problem-solving ability, representational ability. In addition to these 5 abilities, mathematics material can develop other abilities beyond the NCTM stated that is spatial ability.

According to Putra (2011) stated that: The distribution of competency standards for SMP, which get the largest share is geometry (41%) compared to other materials such as algebra (29%), numbers (18%), and statistics and opportunities (12%)". Based on the above data geometry has a larger study for students compared with other branches of mathematics. Therefore, geometry that should be more attention to the lesson. Geometry is one of the most difficult and boring subject matter for students. According to Putri (2017) state that: From a psychological point of view, geometry is the presentation of abstractions from visual and spatial experiences, whereas from a mathematical point of view geometry provides approaches to problem-solving". The National Council of Teachers of Mathematics or NCTM (2000: 232) describes four geometric capabilities students must possess in studying geometry:

> 1) capable of analyzing the characters and properties of two and three dimensional geometric shapes and develop mathematical arguments about geometric relationships, (2) capable of specifying location and

describe spatial relationships using coordinate geometry and other representational systems, (3) capable of applying transformations and use symmetry to analyze mathematical situations, (4) capable of using visualization spatial reasoning, and geometric modeling to solve problem.

In learning mathematics, especially the good spatial geometry ability is needed by students. Because in learning geometry, the actual object in the form of 3D is often visualized as a 2D. This three dimensional visualization into two-dimensional shape that needed the good spatial ability so that it doesn't cause any difficulties for students to understand geometry material (Sayekti, 2017).

For that NCTM suggested that in the learning of geometry students can visualize, describe, and compare wake-up geometry in various positions, so that students can understand it. Therefore, the spatial ability is required.

Kurniyawati (2013) state that:

Spatial ability in learning mathematics is one of the factors that influence student achievement. Spatial power itself is an individual's ability to see and re-assimilate space objects by simply making pictures of the space objects on paper. Spatial ability in mathematics is very important, as many students find it difficult to understand objects or geometry drawings, so that teachers are required to give more than enough attention to fit spatially with the willingness-indeed according to the curriculum's mandate. To solve the problems in dimension three, one must have spatial power. Because in the three dimensional matter many matters can't be realized in actual form or build, only visualized or ways in the form of dimension two. Visualizing the three dimensions into a two dimensional dimension that requires the imagination and abstraction of learners, so that often make them was confused.

The importance of spatial abilities for students as well it becomes a challenge for teachers to plan a lesson which is creative, effective, and efficient so that the material of geometry which was initially considered difficult by students can be easily understood and of course through a fun but meaningful learning process.

Sayekti (2017) also says that: "Spatial ability is the ability to see colors, lines, shape, and understanding the figure visualization and spatial properties".

According to (Susilawati, Suryadi, and Dahlan, 2017) stated that:

The spatial visualization ability can be developed through the use of various learning media which serve as the main tasks assigned to students, including origami, geoboard, pop-up book, and geogebra. These media can help students to use their motoric ability as well as to develop spatial visualization process on their mental image. Exercises in mental transformation relate to metacognitive knowledge so that students can answer questions more easily. This also indicates that spatial visualization ability is required by the curriculum and should therefore be accommodated in geometry learning in the classroom.

In fact, based on researcher's preliminary study of students in grade VIII-3 at SMP Negeri 3 Kisaran, students have difficulty visualizing in solving geometry problems. This is supported by interviews with one of the mathematics teachers in the class, who said that students are still having difficulty in understanding issues related to geometry. Students are still weak in understanding space and shape. One of the factors causing low mathematical spatial abilities of students is abstract mathematical characteristics so that students have difficulty in visualizing and constructing the geometry. Based on the observation that researcher do, the researcher can conclude that there is less response that given by students in mathematics class and from the observation test, the students that has mark more than KKM are 5 students with percentage is 14,29%, and the students has mark less than <KKM are 30 students with percentage is 85,71%. This shown that the students' mathematical spatial ability is very low. The lesson plan is the teacher was teaching with discovery learning model, but in fact that only one class can be taught with discovery, and the other is conventional learning.

Based on the student answers on observation tests is given by the researcher's in grade VIII-3 at SMP Negeri 3 Kisaran, the students are not

able to make explanation to solve the problem (not complete). For example, one of the problem is:
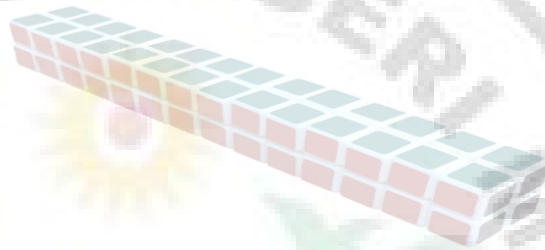
The problem number two is:

Figure 1.1 The Second Problem of Observation Test

A long beam in the paint. The long beam is then cut in the direction of the line and produces many small pieces of cube like the picture on the side. How many small cubes are produced? Explain mathematically!
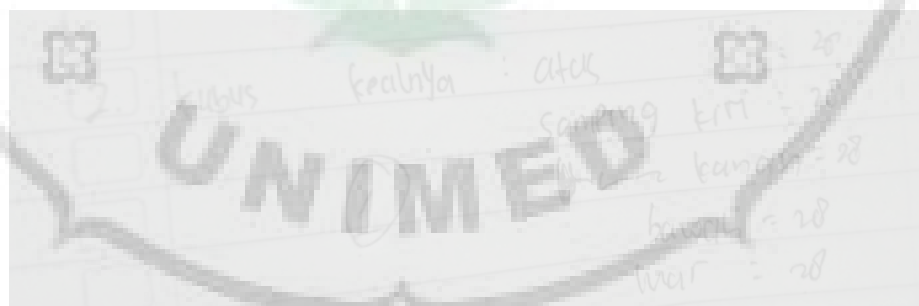
And the answer is:

Figure 1.2 Student's Answer for the Second Problem

From the figure 1.2 can be known that the student difficult to imagine and visualize the figure, even only three students can answer mathematically with the beam volume formula. The problem above is indicator of perception, that is the ability to recognize that the size and shape of the object is fixed despite the different stimuli based on their perspective. It means the student's ability in perception the figure in question then operates the numbers into the formula is low.

And the other problem is:

From the figures below, which one is the nets of cube and not nets of cube, if it is a nets of cube, determine the lid and base!

a.   b.   c.

Figure 1.3 The Third Problem of Observation Test
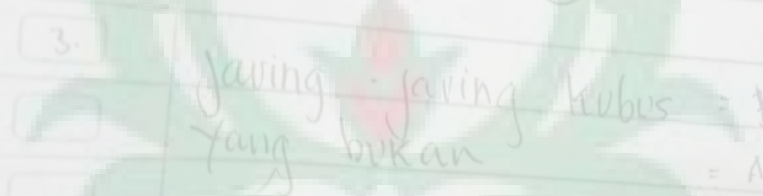
And the answer is:

Figure 1.4 Student's Answer for the Third Problem

From the above figure 1.2 can be known that the student can't indicate the nets of cube and not nets of cube. This is show that the student doesn't meet the indicator of spatial visualization, that is the ability to visualize a configuration in which there is movement or displacement among (internal) parts of the configuration. And also many of them also can not indicate the nets of cube and not nets of cube and can't indicate the lid and base. It means the student's ability in visualization was low.

From the fact that researcher's get, then researcher's need to improve the student's mathematical spatial ability. According to constructiyist learning theory, knowledge can't simply be transferred from the teacher to the mind of students. This means that students must be mentally active build knowledge based student's cognitive structure. An activity which expected able to apply for increase the student's mathematical spatial ability are applying cooperative learning models type Numbered Heads Together (NHT) and Student Teams Achievement Division (STAD).

According to Cohen (in Pedersen and Digby 2014: 251) state that cooperative learning is a generic name that refers to methods for the organization and conduct of classroom instruction. These methods include Complex Instruction, Group Investigation, Jigsaw, Learning together, STAD, and others.

According to Istarani (in Nestia, 2017) refers to the virtues taught by using Numbered Heads Together (NHT) are as follows:

1. Enhance the cooperation between the students
2. To increase the responsibility of students together
3. Train students to unite their mind.
4. To train students to respect the opinions of others.

According to Anas (2014: 57) stated that:

Student Teams Achievement Division (STAD) is one of the method or approach in simple cooperative learning. And good for teachers who are just starting to use cooperative learning in the class. STAD is also an effective cooperative learning method. STAD approach describes learner centered principle in discussion group, among others showing the students how to try and be individually responsible in the group to do the best as a result of learning the group.

Based on above background, the researchers intend to conduct a research entitled: **"The Differences of Students Mathematical Spatial Ability Taught Cooperative Learning *Numbered Heads Together* (NHT) and *Student Teams Achievement Division* (STAD) Types at SMP Negeri 3 Kisaran Academic Year 2017/2018".**

1.2 Problem Identification

Based on analyzing in the background, problem identification in this research are:

1. Student's mathematical spatial ability at SMP Negeri 3 Kisaran is still low.
2. Students activity at SMP Negeri 3 Kisaran is passive during the learning goes on.
3. Students give low attention to the learning goes on.

4. Teachers Learning model is discovery learning.

5. Cooperative Learning NHT types is required to be more active in teaching and learning activities.

6. Cooperative Learning STAD types is the most researched and highly adaptable learning method.

7. The process to get the answer is still less complete.

1.3 Problem Limitation

This research needs to bound the problem to get precise target of expectation. The limitation of this research are:

1. The model used were cooperative learning model Number Heads Together and Student Team Achievement Divisions.

2. The student's mathematical spatial ability in this research is bounced in student's mathematical spatial ability at Cube and Rectangular Prism matter in grade VIII.

3. This research was conducted at SMP Negeri 3 Kisaran.

1.4 Problem Formulation

The problem formulation in this research are:

1. Is there any difference in mathematical spatial ability by cooperative learning *number heads together* and *student team achievement divisions* types?

2. Which is better, the student's mathematical spatial ability by cooperative learning *number heads together* or student's mathematical spatial ability by *student team achievement divisions* types?

1.5 Research Objectives

The objectives in this research is:

To know any difference student's mathematical spatial ability in cooperative learning *number heads together* and *student team achievement divisions* types.

1.6 Benefits of Research

1. For teacher, this can be as consideration in selecting one of alternative model or approach in mathematics learning.
2. For students, this can make the students have enthusiasm to improve mathematical spatial ability.
3. For School, this can be consideration and suggestion to improve the quality of teacher and learning system at class.
4. For The Authors, this study is expected to be a positive feedback in preparing themselves as prospective educators.

1.7 Operational Definition

Operational definition is point to things which will be standard or indicator of variable. The standard or indicator is not abstract but easy to be measured. So operational definition in this research are:

1. Mathematical Spatial Ability is the ability to ability to imagine, compare, guess, define, construct, present, and find information from stimulus visual in the context of space in geometry. Mathematical spatial ability also to see color, line, shape and space, and can understand the visualization and spatial properties. spatial abilities as abstract concepts which include spatial relationships (the ability to observe the relationship of the position of objects in space), the frame of reference (the sign used as a benchmark to determine the position objects in space), projective relationships (the ability to see objects from different points of view), distance conversions (the ability to estimate the distance between two points), spatial representation (the ability to represent spatial relations by cognitive manipulation), and mental rotation (imagine rotation of objects).

2. Cooperative Learning Model *Number Heads Together* (NHT) Type is a model of cooperative learning that holds each student accountable for learning the material by having students work together in a group. This is an excellent strategy for teaching accountability in the classroom. This strategy is beneficial for reviewing and integrating subject matter.

3. Student Team Achievement Divisions (STAD) Type is a collaborative learning strategy in which small groups of learners with different levels of ability work together to accomplish a shared learning goal. STAD is good interaction among students, improve positive attitude towards subject, better self-esteem, increased interpersonal skills. STAD also add an extra source of learning with in the groups because some high achievers act as a role of tutor, which result in high achievements.