

CHAPTER I

INTRODUCTION

1.1. The Background Of The Problems

The development of science and technology today has increased rapidly. The development of science and technology makes us easier to communicate and obtain information quickly from various parts of the world. Along with the development of science and technology must be balanced with the development of a qualified education.

Education is a very important sector in promoting the advance of a country because an education can create qualified human resources and able to compete in the era of globalization. Education is influenced and contribute directly to the development of all aspects of human life especially in the development of science and technology. We can say a country already developed if the education and human resources quality of the country are better. This is supported by Eni A and Tri H statement (in [http://indikator negara maju dan berkembang ss belajar.htm](http://indikatornegara maju dan berkembang ss belajar.htm), 2014) that: “The rate of advancement of a nation can be seen from the six indicators, namely the economic conditions, the condition of the population, the unemployment rate, the level of education, the condition of socio-cultural and the progress of technological”.

Education can be obtained from formal or informal. Good education should also be able to prepare students become qualified and reliable human resources, and able to compete globally. Therefore, in education must have requires high order thinking to realize this fact. The high order thinking can be obtained through study of mathematics because mathematics can train someone to think logically, creatively and skillfully. Trianto, 2011:1 stated that: “Education that can support the future development is education that can develops students' potentials, so they are able to face and solve the problems”.

Mathematics is one of the basic sciences that have an important role in the mastery of science and technology. Mathematics is important to learn because mathematics is a science that became the basic for understanding other sciences

both exact and non-exact. Mathematics is also one of the subjects that must be followed by students from elementary school until college level.

The objective given in school mathematics courses have been described in the SBC (BSNP, 2006: 388), namely that the student has the following capabilities:

1. Understand the mathematical concepts, explains the relationship between the concept and apply it appropriately in problem solving.
2. Use the pattern and nature of the reasoning, mathematical manipulation, compile evidence or arrange ideas and mathematical statements.
3. Solve the problems that include the ability to understand the problem, devised a mathematical model, solve the model and interpret the obtained solution.
4. Communicate the ideas with symbols, tables, diagrams or other media to clarify the issue.
5. Having a respect for the usefulness of mathematics in life, which has a curiosity, attention and interest in studying mathematics and tenacious attitude and confidence in solving problems.

After studying mathematics, is also expected five ability to be acquired, namely, (1) learn to communicate, (2) learn to think logically, (3) learn to solve problems, (4) learn to associate ideas, and (5) the establishment of positive mathematics attitude. One of the ability that are important in learning mathematics is learn to communicate, where communication is not only used in science but also in the overall of human activity.

In mathematics learning, a student is required not only have the ability in learning concept but also able to communicate, so the knowledge can be understood by others. Mathematic is not just a tool to think but also as a tool to communicate between students and teachers with students. Everyone is expected to use mathematical language to communicate information and ideas that have gained. As Corwin in Bistari (2010: 14) argues that:

“Student’s mathematical communication ability allows students to be able to measure the extent of their understanding of the material, enable students to learn about the mathematical construction of the other students

and provide opportunities for students to reflect their mathematical understanding. Mathematical concepts understanding are very strongly associated with students' ability to communicate mathematically”.

Student must have communication ability in every process of learning, especially in learning mathematics. This is accordance to Lindquist opinion based on the National Council of Teachers of Mathematics (NCTM) revealed that mathematics communication ability needs to be built so that students can:

1. Reflecting and clarifying the thinking about mathematical ideas in a variety of situations,
2. Modeling the situation with verbal, written, graphic images and algebraically,
3. Developing an understanding of mathematical ideas, including the role of definitions in various mathematical situations,
4. Using the ability of reading, listening and writing, interpret and evaluate mathematical ideas,
5. Examining the mathematical ideas through conjecture and convincing reasons,
6. Understanding the value of notation and the role of mathematics in development of mathematical ideas.

Communication should be improved in every student because the communication process will help students to develop their ideas, publish ideas, and can build a good social network in a classroom environment.

One thing that became determinant of qualified education is the success of students in learning mathematics. Because mathematic is one of the subjects that must be learnt. However, until today mathematics has always been considered a difficult subject and creepy by students. In students soul is embedded an assumption that mathematics was shut off and tend to memorize formulas. It causes the interest of students in mathematics is low. One of the characteristics of mathematic is abstract. This characteristic caused students difficulties in learning mathematics, especially in understanding and completing mathematics problems. As a result, students do not appreciate or understand the mathematical concepts

and have difficulties to apply mathematics in daily life. It makes learning achievement also be low.

One of the factors that cause the results of students' mathematics learning becomes less is because of the students' mathematical ability communication that can inhibit the understanding and mastery of concepts in mathematics learning topic. This is supported by the opinion of Ansari (2009: 19) states: the higher student's mathematical communication ability, the higher the required understanding to students.

To remember the important of mathematics role, the school must pay attention to the development of learning mathematics itself and mathematics learning outcomes in education needs to be improved. To be able to improve learning outcomes as expected, it is require the participation from all supporting aspects of the progress of learning, especially teachers and students.

However the reality is happens today, only teachers who play an active role in the learning process. Teachers become a source of knowledge as a conduit material and students to be good listeners who receive any material that is taught by the teacher. To create teaching and learning condition was orderly and calm. Communication happens tend to be one direction, from teacher to student. There is no feedback from student to teacher. Generally, student is less to take the opportunity to initiative and seek their own answer. Students are also not given the opportunity to ask the teacher and to exchange ideas with classmates. Students are accustomed to work individually and when they find a difficult problem, students leave it alone until the lessons passed or hope teachers will solve it. Teachers are too concentrated on procedural matters and mechanistic, mathematical concepts presented in informative, and students are trained resolve many problems without deep understanding.

Many things can cause communication ability in mathematics learning are still low, that finally makes learning outcomes in mathematics are also low. One of the method of teaching that is done by the teacher. The teaching methods are almost applied by teachers is conventional teaching methods, where lectures

become the main choice in this learning method. Generally, students acquire knowledge because “notified” by the teacher, not because of “find themselves”.

In conventional learning, a teacher is considered as a source of knowledge, the teacher acts authoritarian and dominates the class. Teachers tend to be more active and student is passive in receiving learning. Typically, teacher teaches math materials directly, proving all their arguments and give examples, then ask students to work on the problems similar to the problems that have been explained by the teacher. While students just sit neatly, listen calmly and try to imitate the ways of proving the proposition teachers and how teachers working on the problems. Mathematics learning process that is done by the teachers do not involve the activities of the students. So the learning process that occurs is teacher centered.

Such learning process result students always depend on the teacher. Students tend to imitate what the teacher worked. When the teacher gave examples of questions to the students and then give the exact same problem and just change the numbers, the students will tend to follow the way of teachers in solving the problem. Usually the answer students in a class are the same and no variations. And when different and difficult question given by the teacher than the example question, the students will hard to find the answer of the question. This is because of the knowledge that is gained by students do not come from themselves, however came from the science sources that is teachers.

The low students' mathematical communication ability can be seen from the example in the case of students of SMP N 2 Sidikalang class VIII-1. To measure the students' communication ability, given the preliminary tests consist of 3 question about rectangular and Pythagorean theorem as a prerequisite materials to learning cuboid and cube. As for the third questions is as follows:

1. A child raises a kite with the length of yarn is 250 meters. The distance of child with a point just below the kite is 70 meters.
 - a. Draw a sketch of the problems above!
 - b. Calculate the height of the kite!

2. A rectangle with a length = (x) cm and width = $(x - 4)$ cm. If the area of the rectangle is 60 cm^2 , find the length and width of the rectangle!
3. Is a triangle with the third sides consecutive 9 cm, 12 cm, and 18 cm a right triangle? Explain!

After the results of the students' answers were analyzed, there were some errors found were made by students. Communication indicator from the first questions is the ability to write situation or mathematical idea into picture and solve the problem. In question number 1, there are 22 student or only 66,41% of students can answer the question rightly. This is one of incorrect picture from student's answer:

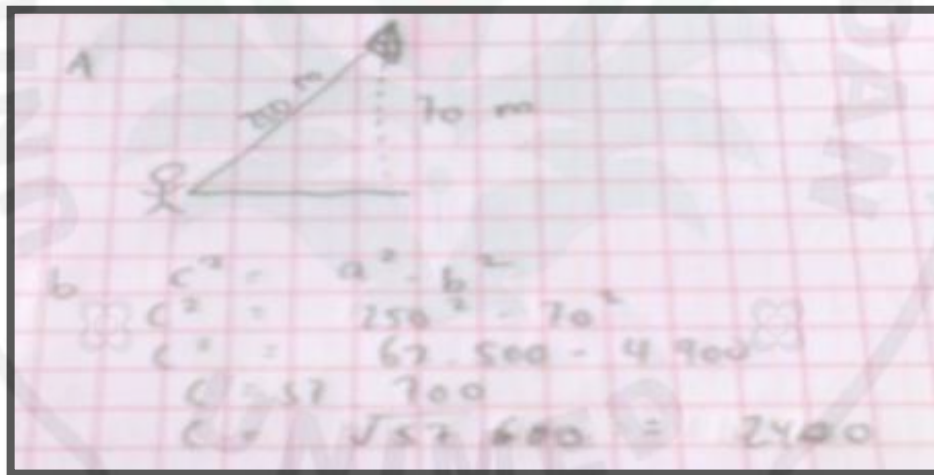


Figure 1.1. Student's answer to the first question

From the pictures of the students' responses indicate that students are still confused in describing a problem into mathematical models or into picture. In question asked kites high, but the picture that the students showed that there has been a height of kites. For the completion of answer part b, students unable to communicate mathematical ideas of the images created. In the picture there is no distance a , b , and c but in answer appear a , b , and c . In addition, students also still failed to complete the final phase solution.

In question number 2 students failed to formulate a mathematical idea into a mathematical model. In question number 2, there are 12 student or only 30.76% of students can answer the question rightly. This is one of incorrect picture from student answer:

$L = 60 \text{ cm}^2$
 x
 $x - 4$
 $Dik P = ?$
 $L = ?$
 $P = L \cdot 2 \cdot (P + L)$
 $60 \text{ cm}^2 = 2 \cdot (x + x - 4)$
 $60 \text{ cm}^2 = 2x + 2x - 8$
 $60 \text{ cm}^2 = 4x - 8$
 $60 + 8 = 4x$
 $68 = 4x$
 $x = \frac{68}{4}$
 $x = 17 \text{ cm}$
 $L = 17 - 4 \text{ cm}$
 $= 13 \text{ cm}$
 $P = 17 \text{ cm}$
 $L = 13 \text{ cm}$

Figure 1.2 Students' answers to the second question

From the pictures of the students' responses indicate that students are able to describe a rectangle with the size of width is x and the size of length is $x - 4$, and has been able to make known and were asked of a problem. However, student failed to connect rectangular image with size into mathematical ideas. Student is incorrect to write the formula of asked. The formula is supposed to area of the rectangular, but that is written the circumference formula of rectangular. It is show that the ability to communicate mathematical ideas of students is low so that when making mathematical models and strategies for the final solution, students still failed.

In question number 3, the indicator communication is responds to a statement in the form of argument. In question number 3, there are only 9 student or only 23.076% of students can answer the question rightly. Here's one of the mistakes of the students' answers:

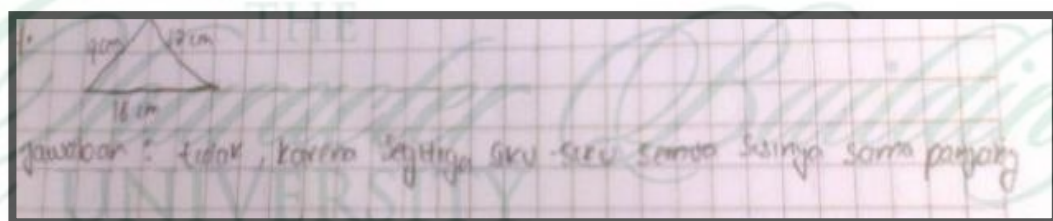


Figure 1.3 The students' answers to the third question

In question number 3, students are asked to provide a statement about right triangles statement. From the picture above, we can see that the student's answered is "the triangle is not a right triangle because the length of all sides right

triangle is same". The argument that given is certainly incorrect. Supposedly students calculate the hypotenuse squared distance equal to the sum of square flat and upright side. If the student finally gets the result is larger or smaller or equal, it certain that it includes the type of acute triangle or obtuse triangle or right triangle. However, these students do not give proof of that statement. This is because understanding the concept of a right triangle that exist on these students is still low, so in communicating their opinions about student right triangle is still incorrect. The third incorrect answer example above can be used as concrete evidence that mathematical communication ability of students is low.

The result of analyze show that from 39 students that follow the initial test, the complete categorized who scored ≥ 65 , only 9 students that complete or about 23.07%, while 76.92% students were not complete (30 students). Next can be seen from the mathematical communication ability category, about 7.69% (3 students) have very high mathematical communication ability and about 2.56% (one student) have high mathematical communication ability, while 12.82% (5 students) were low and 76.92% (30 students) were very low. This show that the communication ability is still low.

The results of the author's observation and interview by one of a math teacher at SMP N 2 Sidikalang, Mrs. R.Sitio note that students are still difficulties in solving mathematical problems, especially problems related to communicate mathematics. It is characterized by the inability student to provide the correct arguments or explanations about the problems they are answer. In addition, student also unable to make the solving strategies steps, and unable to express a mathematical idea in the form of images correctly. In directly learning, the courage of students to submit the ideas and arguments correctly and clearly are still less.

Recognizing that the level of students' mathematical communication ability in the learning process is still low, it is required the participation of students and teachers in the learning process. Students should be actively involved in the learning process, for example in terms of finding information and try to find more information about what will and has been studied in school, from teachers,

friends and other supporting books. Students who are actively involved in the learning process will certainly have a positive impact on learning outcomes, this will make the student will not quickly forget about the provided topic because in the learning process the students also participated.

The role of teacher in the learning process is the most important thing. To improve the communication ability of mathematics students, teachers must be able to create a comfortable learning environment and choose strategies and learning model that corresponds to the student's learning style. Teachers should be able to make the students become actively involved during the learning process, because the activeness in the learning is needed to improve the learning outcomes. Teacher who is one of the main components in the learning process is expected to create conditions that can motivate students to learn more active. One of the learning model that is expected to improve communication ability is cooperative learning model.

Cooperative learning is learning that emphasizes on group collaboration that built in small groups and consist of 4-5 students. The purpose of division's group is to make every student can to collaborate with friends, environment, teachers and all part that involved in the learning process. Cooperative learning model is effective in building the process of communication ability.

In accordance to Slavin (in Rusman, 2010: 201) says: "cooperative learning promote student to interact actively and positively in the group". By using cooperative learning, teachers are expected to facilitate the students to interact with other students, such as asking a problem, so that students are encouraged to exchange information and informal discussion. The process of implementation of cooperative learning can also change the old paradigm of mathematics learning is teacher-centered learning to new learning paradigm of mathematics that is student-centered learning, where the teacher is managers in the classroom learning and manage small group activities, teachers are also conditioned to enable students to actively communicate in learning.

One type of cooperative learning that can be applied to enhance the students' mathematical communication is Number Heads Together (NHT). This

type was developed by Spencer Kagan 1993. NHT Model is a cooperative learning model developed by Spencer Kagan where this learning model gives learners the opportunity to exchange ideas and consider the right answer. This model can be used for solving the problem that the level of difficulty is limited. Kagan (2007) states that: “Cooperative Learning models Numbered Heads Together (NHT) indirectly trains students to share information, listen carefully and speak with the full calculation, so that students are more productive in learning”.

The specific characteristic of Numbered Heads Together (NHT) is teacher just appoint a student to mention a numbers that represent the group to present the group's work without telling who will represent the group first. This is a very good effort to increase the responsibility of individuals in group discussions, as well as the interdependence between individuals in the member of group thus improve students' communication ability in completing the task group.

Herdian (in Ngatini, 2012: 153) suggests three goals to be achieved in a NHT cooperative learning namely:

- 1) The results of structural academic study, which aims to improve the performance of students in academic tasks,
- 2) The recognition of the diversity, aims to enable students can receive friends who have different backgrounds,
- 3) The development of social ability aims to develop students' social ability. Ability among others to share tasks, actively ask, to respect the opinions of others, to explain ideas or opinions and work in groups.

This learning model has been widely studied in order to promote and develop the quality of education. One of the results of studies using this model is done by Jatnika (2012). This research used experimental study to determine the effect of the application of cooperative learning model type NHT on students mathematical communication ability. From the research conducted showed that students' response to NHT learning gained as much as 75% (18 students) who responded positively. The average value of students' mathematical communication

gained 61.29, so it could be said that the level of mathematics communication ability is in medium category.

In addition, the results of the research was conducted by Hadiyanti (2012) to test the ability of understanding concept in three-dimensional topic class X SMA Kesatrian 2 Semarang showed that the students learning outcomes of understanding concept ability who was taught with cooperative learning model NHT provide higher result than students who was taught with expository learning model.

In addition, quasi-experimental study was conducted by Pradnyani (2013) on the mathematics achievement of students in elementary school terms of study habits gained that students who was taught with cooperative learning model type Numbered Head Together on good study habits get the average score was higher (28.18) than students who teach with conventional learning models in good study habits with an average of 19.23. Thus, there is a difference in learning achievement between students who was taught with cooperative learning model type Numbered Head Together with the students who was taught with conventional learning model.

Based on the above, researchers interested in conducting research reveal whether cooperative learning model Number Head Together can improve the students 'mathematical communication ability, which finally will improve the learning outcomes of students as a form of contributing researcher to realize the quality of education in Indonesia. Therefore, this research title is **"The Implementation of Cooperative Learning Model Type Number Head Together to Improve The Student's Mathematical Communication Ability Of Grade Eight SMP N 2 Sidikalang Academic Year 2014/2015"**.

1.2. The Identification Of The Problems

Based on the background described above, we can identify some of the issues as follows:

1. Students difficult to solve the problem of mathematical communication.
2. The students' mathematical communication ability are generally low.
3. The learning model used by teachers in teaching tends to be monotonous and still teacher centered.
4. The process of answer in solving mathematical communication problems in class is not varied.

1.3. The Limitation of The Problems

From the problems above, the researcher limited this problem as follows:

1. The implementation of cooperative learning model type Numbered Head Together to improve the students' mathematical communication ability in cuboid and cube topic at eighth grade SMP N 2 Sidikalang Academic Year 2014/2015.
2. The process of answer is made by the students in solving mathematical communication problems by using cooperative learning model type Number Head Together.

1.4. The Formulation Of The Problems

Based on the limitation of the problem above, the formulation of the problem in this study as follows:

1. How is the improvement of the students' mathematical communication ability with the implementation of cooperative learning model type Number Head Together in cuboid and cube topic at eighth grade SMP N 2 Sidikalang Academic Year 2014/2015?
2. How do the students make the process of answers in solving mathematical communication problems by using cooperative learning model type Number Head Together?

1.5. The Purposes of The Research

The purposes of this study are:

1. To find out how is the improvement of the students' mathematical communication ability with the implementation of cooperative learning model type Number Head Together in cuboid and cube topic at eighth grade SMP N 2 Sidikalang academic year 2014/2015.
2. To describe the process of answer is made by the students in solving mathematical communication problems by using cooperative learning model type Number Head Together.

1.6. The Benefits Of The Research

After the research is conducted, the results of this study are expected to provide benefits such as:

1. For students, can actively build knowledge up, able to develop communication ability, an understanding in dealing with the problems and can improve social relations and mutual responsibility for themselves and their environment.
2. For teachers, in order to improve the quality of mathematics learning outcomes by improving the ability of students in learning mathematics through the creation of mathematical communication and as an alternative learning models that can be used in the learning of mathematics.
3. For the researchers, to be a comparative material on the topic of the role of mathematical communication, learning motivation, achievement motivation on the acquisition of learning outcomes in mathematics, and add the experience and insight into the thinking of the authors of scientific research.
4. For schools and quality of education, is expected to be considered to apply learning with learning model Number Head Together and is expected to improve the quality of education in Indonesia.

1.7. The Definitions of Operational

To avoid differences in interpretation of the terms contained in the formulation of the problem in this study, it should be noted the following operational definition

1. The mathematical communication ability is the ability of the student (1) to connect the images, tables, diagrams and daily events into mathematical ideas, (2) to declare a situation in the form of images or graphics (drawing), and (3) to formulate a mathematical idea into a mathematical model (mathematical expression) and do calculation.
2. Learning Model of Number Head Together type is a learning model more forward to the activities of students in searching, processing, and reporting of information from various sources that finally presented to the class. This learning model consists of four phases, they are: (1) Numbering, (2) Asking questions, (3) Thinking together, and (4) Answering.
3. The process of answer is how the form or the composition of the students' answers performance in solving mathematical communication problems to see the variation process of the answer or solution resulted by the students.