# CHAPTER 1
# INTRODUCTION

## 1.1 Background

Mathematics, among other subjects taught in every class from elementary school to higher education, is a foundation and framework of sciences and technologies to achieve the aim of education in our state. According to National Ministry of Education No. 20 Year 2006, as noticed on May 23, 2006 for content standard, mathematics should be taught for students through elementary school to prepare them with thinking logically, analytically, systematically, critically, and creatively, as well as able to work cooperatively. These competencies are crucial to help someone inquiring, managing, analyzing, and implementing a bulk of information to survive in a competitive era.

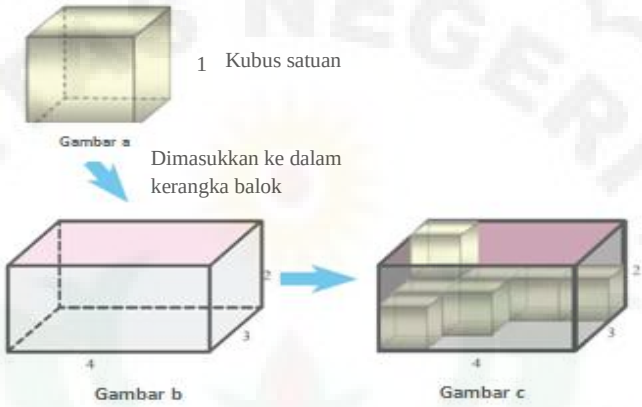
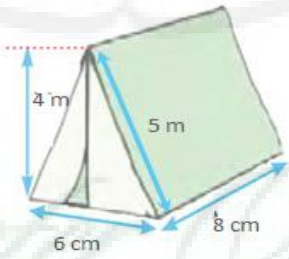
Indeed, Mathematics is a special and unique language. Its uniqueness makes it called to be *symbolic language* (Usiski, in Hendiana and Soemarmo, 2014:12); Baron quoted that "A mathematician, like a painter or a poet, is a maker of patterns. If his more permanent than theirs, it is because they are made of ideas". This means that mathematics is an efficient language; consistent; a beautiful pattern and quantitatively analytic; universal and able to be understand by every people whenever and wherever, which helps mathematics modeling to solve daily problems and other branch of sciences.

According to Schoenfeld (Hendiana and Soemarmo, 2014: 3), Mathematics, as a developing discipline, creates something to be logic, loads a sequence of symbols and reasoning types related each other where the truth can be achieved individually and collectively (mathematical society). This is explaining that Mathematics is not solely a discipline, but also consisting of society interaction in it. To Mathematics be growing and developing, mathematical communication ability required; the aim is to communicate mathematical ideas to other people especially to students who learn mathematics.

According to Baroody (Hendiana and Soemarmo, 2014: 30), there are two reasons why Mathematics should be developed under the circumstance of students: (1) *mathematics as a language*, not only a tool to aid thinking in problem solving and drawing conclusion, but also as a priceless tool to communicate ideas clearly, precisely and accurately, (2) *mathematics learning as social activity*, as a social activity in class, interaction media among students and communication between teacher and students. Communication is required by students to express their selves, create social interaction – network, and reform their personalities. It also helps educators to understand student's ability in interpreting their understanding about what they learn in mathematics.

Mathematical communication ability is an essential mathematical ability in high school unit education level curriculum, KTSP 2006. Hendriana and Soemarmo (2014: 29) express that the aims of learning mathematics are: to communicate ideas through symbols, tables, diagrams, or mathematical expression to make a problem clear; to appreciate mathematics in its use daily; to achieve curiosity, focus, and interest on learning mathematic as well as to achieve hard work and confidence in problem solving. Along with school curriculum, development of mathematical communication ability is also suitable to mathematics core as an efficient language; consistent; a beautiful pattern and quantitatively analytic; universal and able to be understand by every people whenever and wherever, which helps mathematics modeling to solve daily problems and other branch of sciences.

Over observation to this crucial ability, students are insisted to achieve it. In fact, students in SMP N 2 Panai Tengah, especially in class VIII – 1, had low achievement. This observation was conducted in January 2016, to the explanation of how students feel difficult to solve the test of mathematical communication ability, consists of two problems about topic of three dimensions in the school.

| Indonesian Version | English Version |
|---|---|
| (1) Perhatikan gambar berikut ini. | (1) See this figure carefully. |
|  | |
| a. Berdasarkan gambar tersebut informasi yang dapat kamu peroleh?<br>b. Susunlah kalimat matematika untuk menghitung banyak kubus satuan yang dibutuhkan untuk mengisi balok hingga penuh ?<br>c. Berapa banyak sisi - sisi kubus yang kelihatan setelah disusun memenuhi balok? | a. Based on the figure above, what information can you get?<br>b. Formulate a mathematical model to compute unit cubes needed to full the beam up.<br>c. How many sides of cube can be seen after the beam is full up by cubes? |
| (2) Bila tenda yang kamu lihat seperti gambar berikut, | (2) If you see a tent like this following picture, |
|  | |
| a. Berdasarkan gambar tersebut informasi yang diperoleh?<br>d. Coba kamu susun kalimat matematika untuk hitung luas kain terkecil yang di perlukan!<br>e. Coba kamu susun kalimat matematika untuk hitung volume ruang tenda itu! | a. Based on the picture, what information can you get?<br>b. Try to formulate a mathematical model to calculate the smallest area of cloth to create that tent!<br>c. Try to formulate a mathematical model to calculate the volume of the tent! |

The answers were analyzed and at the time a result of some errors found made by students. After checking problem (1), only 43.33% of the class was able to connect the figure into mathematical ideas correctly, 60% of the class was able in the indicator of formulating a mathematical model, and the rest of 3.33% of the class could conclude with right but incomplete answer, 76.67% of the class had wrong answer of conclusion and 6.66% was not answering. This picture is a sample of student's answer.

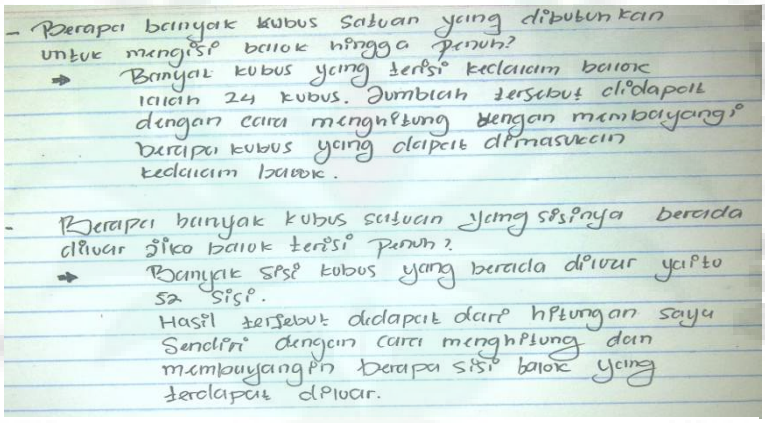



**Figure 1.1 Student's answer for problem 1**

The answer shows that the student was not able to formulate mathematical ideas into a correct model so he possessed wrong answer as he tried communicating the idea through narrative explanation. This shows the ability of the student is still low.

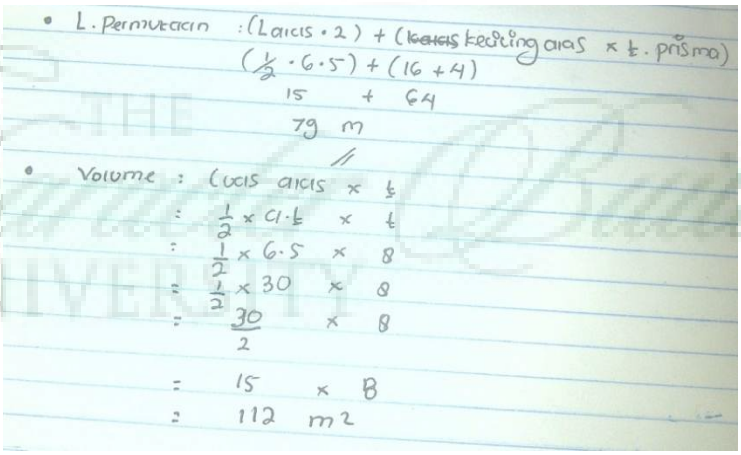



**Figure 1.2 Student's answer for problem 2**

Observing the problem (2), 66% of the class had been able to connect figure into mathematical idea correctly, but in mathematical modeling, they tended to struggle with difficulty: only 46% of the class mastered this indicator although it was incomplete, and 76.67% of the class could conclude with their own words (but still wrong), and 23.33% was not answering. This is a sample of student's answer.

After checking the Figure 1.2, it is seen that the student was obviously wrong to identify the triangle's height of prism base and the height of the prism itself. Misunderstanding occurred when read figures and connect them into mathematical ideas, so that they were not able to solve the problem, causing them not able to create any argumentative solution. It shows what level of mathematical communication they had, especially reading the figure and formulating a mathematical model from a mathematical idea, which led them to some mistakes to respond a problem argumentatively.

Tracking down the result of preliminary test of mathematical communication, only 66.67% (20 students) of 30 students passed the minimum score of 65 in SMP N 2 Panai Tengah. Meanwhile, the expected classical mastery is 85%. In mathematical communication ability test, none of them in very good level (score $\geq$ 90); 16.67% in good level, score $\geq$ 75; half of them in enough level, score $\geq$ 65; and 33.33% is in low level. This fact shows the mathematical communication ability of students in class 8 – 1 in SMP Negeri 2 Panai Tengah A.Y. 2015/ 2016 is low in common.

A solution for urgent, therefore, is needed to overcome the mathematical communication ability of students in SMP N 2 Panai Tengah class 8 – 1 A. Y. 2015/2016. In order to improve that ability, there is a need of efforts through classroom action research collaborating with teacher to implement an innovative learning model to create a conducive activity sequel and applicable in topic of three dimensions.

Suryanto (Handayani, Pujiastuti, and Suhito, 2014) emphasized that *Auditory Intellectually Repetition* (AIR) is an alternative of mathematics learning

method. This model is actually very similar to SAVI method, but the repetition makes them two be different each other.

Maulana (Handayani, Pujiastuti, and Suhito, 2014) expressed that the AIR model considered effective if applying three crucial points: *Auditory*, *Intellectually* and *Repetition*. *Auditory* means that the ears are to learn by understanding, speaking, presentation, argumentation or arguing, and responding. *Intellectually* means that thinking ability must need some exercises of reasoning, creating, solving problem, constructing, and applying. *Repetition* is needed to learn deeper and wider; students are given some quizzes or other forms of exercises. Those three points should motivate students to solve daily problems through formulating into mathematical forms and of representing the result as well as to construct mathematical communication ability of students.

The AIR model is expected being fit to apply in learning mathematics (especially for three dimension flat faces) because this model uses all perceptions of body; that it eases students to learn the topic abstractly. The implementation of AIR model usually comes with teaching aids to support learning mathematics. The teaching aids are suitable to apply on topic of three dimensions since they are intertwined.

As have been written above, the researcher takes an interest to conduct a class action research to reveal if the AIR model enhances student's mathematical communication ability to achieve the expected result of repairing student's achievements in learning mathematics, as an academic contribution to enhance Indonesia's education quality. Therefore, this research entitled "Enhancing Student's Mathematical Communication Ability using Auditory Intellectually Repetition (AIR) Model in Class 8 SMP N 2 Panai Tengah Academic Year 2015/2016".

**1.2 Problem Identification**

Based on the problem identification above, there are some identified problems. They are:

1. Low level student's mathematical communication ability in SMP N 2 Panai Tengah. This fact is shown by their difficulty to solve mathematical communication problem in representing assertion of verbal, non verbal, figure and graphic, proposing mathematical guessing, manipulating mathematically, and drawing a conclusion from a mathematical assertion to make the solution clear.
2. The focus of students when solving mathematical problems is on mathematical formulas.
3. Disability of students to retrieve knowledge from teacher.
4. Less active students to solve the mathematical communication.

**1.3 Problem Limitation**

Conscious of self – ability, research background and the problem, this research is limited in enhancing student's mathematical communication ability using Auditory Intellectually Repetition (AIR) model on topic of Solid Polyhedron in Class 8 – 1 in the second semester of academic year 2015/2016.

**1.4 Problem Formulation**

Based on the above problem, the problem formulation in this research are:

1. Is student's mathematical communication ability enhanced after AIR model?
2. How is the mathematics learning activity using AIR model?

**1.5 Research Objective**

The objectives of this research are:

1. to achieve enhancement of mathematical communication ability after Auditory Intellectually Repetition (AIR) model.
2. to enhance mathematics learning activity in the classroom using AIR model.

## 1.6 Research Advantages

This research gives advantages for:

1. The researcher himself, as a partial fulfillment of achieving degree in UNIMED and as a medium to retrieve information and expand knowledge about the implementation of Auditory Intellectually Repetition (AIR) model as well as a preparation of a professional teacher.
2. Teacher, as a recommendation to use this AIR model in learning mathematics.
3. Students; this research is to enhance their mathematical communication ability, developing a mutual cooperative work, appreciating each other and trusting each other in solving problems.
4. School; this research is to share a result of thinking and material for school in order to enhance learning in schools.

## 1.7 Operational Definition

To avoid misunderstanding on some key terms in the problem formulation, this operational definition is as follows:

1. Mathematical communication ability, especially written, is student's ability to connect pictures, tables, diagrams, and daily events in to mathematical ideas, formulate mathematical ideas into mathematical model, of using vocabulary, notions and structures of Mathematics to express the relationships and ideas, and understand them to solve mathematics problems.

   Student's mathematical communication ability, especially written, occurs if student is able to:

   a. Connecting some the picture, chart, daily event, etc in a mathematical idea.
   b. Formulate a mathematical idea in mathematical model.

c. Determine mathematical model by using mathematical language to solve mathematics problems.

2. Auditory Intellectually Repetition (AIR) model is a learning model considering learning is effective if involving three components:

b. Auditory

Auditory is a learning stage using tools, so students listen to understand and memorize, learn to speak and listen, present, argue, submit an opinion and respond.

c. Intellectually

Intellectually is learn to think, solving problem using minds on, concentrating and training to use it through reasoning, investigating, identifying, inventing, creating, constructing, solving problem and applying.

d. Repetition

Repetition means to repeat, analyze, and improve by training students through assignments and quizzes.