CHAPTER I
INTRODUCTION

1.1 Background

Mathematics is a subject taught at every level of education, starting from kindergarten, elementary, junior high school, senior high school, even to the university. One reason why mathematics should be taught at every level of education due to problems in daily life related to mathematical calculations.

Cokroft (in Abdurrahman, 2009: 253) states that

"Mathematics should be taught to students because (1) is always used in every facet of life; (2) all fields of study require the appropriate mathematics; (3) a means of communication that is strong, concise, and clear; (4) can be used to present information in variety of ways; (5) improve the ability of logical thinking, accuracy, and spatial awareness; and (6) give satisfaction to solve business problems challenging."

Mathematics is also a means to foster students' mathematical abilities, such as the ability to think logically, creatively, critically, carefully, effectively, problem solving, representation, connections, communication, and so on. Knowing that the benefit of mathematics for human is very magnitude, it is not surprising that mathematics subject becomes a concern, of course, in this case the concern is the math learning achievement as measured from the mathematical ability of the student *(doing math).*

The purpose of mathematics learning by Depdiknas (2007), namely that students have the ability to: 1) understand the mathematical concepts, explain the relationship between concepts, and apply the concept or algorithm is flexible, accurate, efficient, and precise in solving the problem; 2) communicate ideas with symbols , tables, diagrams or other media to clarify the issue; 3) using the pattern and nature of reasoning, mathematical manipulation in making generalizations, compile evidence, or explain ideas and mathematical statements; 4) solving problems that include the ability to understand the problem, devised a mathematical model , completing the model and interpret the obtained solution; and 5) have a respect for the usefulness of mathematics in life, namely to have

curiosity, concern, and interest in studying mathematics, as well as a tenacious attitude and confidence in solving problems.

Similar feelings were expressed by Abdurrahman (2009: 252), from various fields of study that are taught in school, mathematics is a field of study that is considered the most difficult by the students. So it is not uncommon complained that math just makes dizziness students (and also parents) and is regarded as something scary by some students, besides that few students who view mathematics as a subject that is very boring, creepy and even scary to many students and trying to avoid these subjects. These statements prove that the tremendous weight of responsibility and degree of mathematical carried raising concerns on students who ultimately will make student is lazy to learn. This is feared will effect the mathematical learning achievement which will also influence students' mathematical abilities.

In mathematics there are several characteristics that need to be improved and developed to address the problem of mathematics in daily life. The characteristics of math abilities also as principle and process standards in mathematics that will be developed in the National Council of Teachers of Mathematics (NCTM, 2000) are problem solving, reasoning, communication, connection, and representation. The five of characteristics are the goal to be achieved in mathematics learning. Among these five characteristics that will be achieved and developed is mathematical communication ability, because researcher finds that students' mathematical communication ability is still low.

Therefore, based on NCTM (in Wardani, 2013: 6) describes the communication is a very important part of mathematics and mathematics education. Communication is a way of sharing ideas and clarifying understanding. Through the communication of ideas can be reflected, repaired, discussed, and developed. Communication process also helps build meaning and permanents ideas and communication process can also publish the idea. When students challenged their minds and their ability to think about mathematics and communicate the results of their thoughts orally or in writing, they are learning to explain and convince. Listen to the explanation of the other students, giving

students the opportunity to develop their understanding. Communication is essential for students because every problem in daily life needs good communication to find its solution. In an effort to develop communication, students have to be able to deliver information to the mathematical language, for example, presents the question or problem into a mathematical model to make it more practical, systematic, efficient, and easy to understand.

Nita (2011: 29) says that:

"There are several indicators that are expected in the communication of mathematics, which reflect the real objects, drawings, and diagrams into mathematical ideas; create a model of a situation or problem using oral, written, concrete, graphs, and algebra; declare daily occurrence in the language or mathematical symbols; listen, discuss, and write about mathematics; listen with an understanding of mathematical representations in writing; make conjectures, compile arguments, formulate definitions and generalizations; explain and make inquiries about the mathematics they have learned; revealed back a mathematical paragraph or description in own language itself."
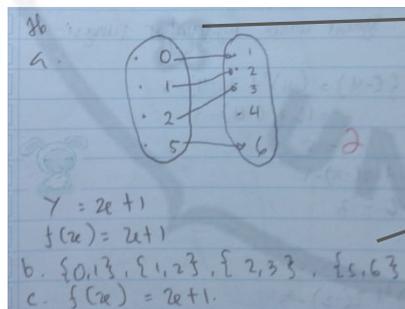
Mathematical communication ability can occur when students work in groups, when students describe an algorithm to solve an equation, when students construct and describe a graphical representation of the real-world phenomena, and when students give a conjecture on geometry images. Furthermore, in learning students need accustom to give arguments of each answer and give responses to the answers given by others, so that what is learned becomes meaningful.

Based on the observation result which had done towards students in grade XI Science SMA Negeri 1 Perbaungan showed that students are less able in communicating to deliver information, such as expressing ideas, asking questions, and answering questions/opinions the other students. They tend to passive when teacher is asking a question to check student's knowledge. Students seem bashful to ask when teacher gives the opportunity. Even though there was student who answered the question, it seems clumsiness, less of variation, monotone, and not actual. It makes that the learning process in class "not alive". Majority teachers teach with lecturing method and writing notes on blackboard. It means that the learning process in class does rarely practice and rarely develop mathematical communication ability and interaction process among students, such as

cooperative, expressing idea, asking question, and answering question/opinion the other students. Teacher has implemented discussion in learning model, however what has done is discussion in conventional way. In instructing the discussion, teacher only give some questions to students/groups that consist almost of materials in that topic, such that student's thinking is not developed and not stimulated to think critically. In writing mathematics, students can draw diagram, graph, or table, but they cannot draw it completely and clearly. Students also can write mathematical model or algebraic form, but not completely. These were diagnostic test that given to students:

1. Given set $A = \{0, 1, 2, 5\}$; $B = \{1, 2, 3, 4, 6\}$ from the relation "is less one of" set A to set B.

    a. Express that relation by matching diagram.
    b. Write set of ordered pairs that satisfy the given relation.
    c. Define that relation by formula.

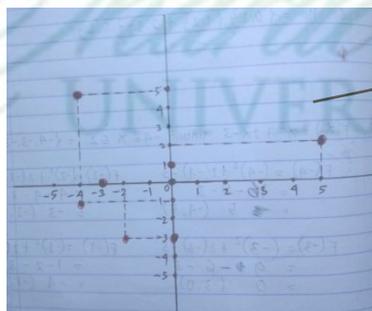The picture below showed one of the student answers:

Student did not write the name of set, namely set **A** and **B**

Student did not know how to write set of ordered pairs rightly, namely $\{(0,1), (1,2), (2,3), (5,6)\}$
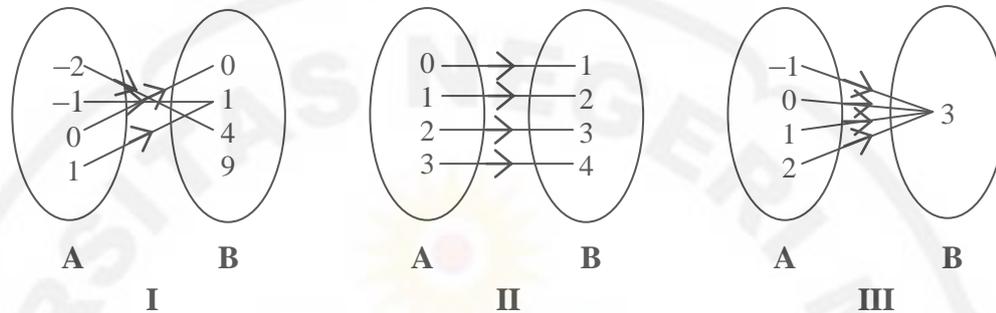
2. Given $f(x) = x^2 + 2x - 3$ for $-4 \le x \le 2$. Draw the graph of function given.

The picture below showed one of the student answers:

It shows that student cannot create mathematical model, such as draw graph like picture beside.

3. From the set of *A* and *B* as follow, which is the function? Why?

The picture below showed one of the student answers:

Yang merupakan fungsi adalah Gambar I dan II
karena masing-masing himpunan mempunyai pasangan
masing 2 atau ~~terminal~~ hanya satu pasangan, karena
fungsi hanya boleh memiliki satu pasangan tdk boleh
lebih.

It shows that student cannot explain mathematical model right and complete.

The results of students' answers on diagnostic tests given toward 27 students with mathematical communication ability earned average 55.80 with 0 student (0%) who gained mastery value ≥ 75 with details there were 4 students who obtained score 73.33, 4 students who obtained score 66.67, 7 students who obtained score 60.00, 4 students who obtained score 53.33, 3 students who obtained score 46.67, 2 students who obtained score 40.00, 2 students who obtained score 33.33, and one student who obtained score 26.67.

Based on the results of diagnostic test above, can be concluded that the students' mathematical communication ability was in low category because there was no student who gained score ≥ 75. Students had difficulties in answering the questions, students had difficulties to express mathematical description into mathematical model; students were not able to create mathematical model through diagram, graph, or table; and students had difficulties to explain mathematical model and do calculation.

Based on observation had done, majority teachers teach with lecturing method and writing notes on whiteboard. The selection of varied teaching methods will improve teaching and learning activities and motivate students to learn. Such that students can learn well, then the teaching methods to be undertaken as efficiently and effectively as possible. In addition, the selection of learning approaches also influences the students' abilities on mathematics. The selection of learning approaches should be tailored to the learning objectives with the needs of students, and can guide students to gain learning experience in order to improve students' math abilities, such as mathematical communication ability. Learning approach chosen should be meaningful, because through learning approach students should be able to find their own knowledge and abilities they need, not only notification. Therefore, the learning approach is designed so that students are able to construct knowledge in the minds of students, so the students were able to learn active and independent and able to solve problems.

One alternative that can be applied to increase students' mathematical communication ability is Somatic, Auditory, Visual, and Intellectual (SAVI) approach. SAVI is a learning approach that emphasizes the learning should make useful all of the student senses. Somatic means that learning must be through moving and doing (hands-on, physical activity). Auditory means that learning must be through listening, speaking, presentation, argumentation, express opinions, and respond. Visual means that learning should use eye senses through observing, drawing, demonstrating, reading, using media and props. While the meaningful of Intellectual is learning by problem solving that free and brooding (minds-on). Learning can be optimal if the four elements of SAVI are in learning situation. Learning by combining these four modalities of learning in a learning situation is the essence of multisensory learning. Through the application of SAVI is expected capable to accommodate students with different characteristics to take advantage of all senses which belonged to students.

Dave Meier as owner of SAVI concept suggested to teacher to manage the class using this learning approach. SAVI approach is a form of learning created by Dave Meier in his book "The Accelerated Learning Handbook" which is a guide

book in designing creative and effective educational programs. The basic concept of learning is learning takes place in fast, fun, and satisfying.

Thus, through the SAVI approach, students can learn mathematics with an optimal intellectual activity and all the senses are combined in a learning process. So it can create a fun learning, student-centered, and actively involve students in order to develop their well potential by ability, interest, learning styles, experience, and can improve students' mathematical communication ability.

Based on the above, researcher interested in conducting research with title: **"The Effort to Increase Students' Mathematical Communication Ability through Somatic, Auditory, Visual, and Intellectual (SAVI) Approach on Topic Inverse Function at Grade XI SMA Negeri 1 Perbaungan Academic Year 2013/2014."**

1.2 Problems Identification

Based on the background above, some problems can be identified as follows:

1. The students' mathematical achievement is still low.
2. Mathematics is considered difficult and not interested.
3. The students' mathematical communication ability is still low.
4. The involvement of the students in the learning process is very less.
5. The less of variations in the learning approaches that teachers do in the learning process.
6. SAVI approach is not used in the school yet, generally still uses conventional model.

1.3 Problems Limitation

Based on problems identification above, it needs problems limitation to be more focused. The limit problem researched is to increase students' mathematical communication ability by applying Somatic, Auditory, Visual, and Intellectual (SAVI) approach on topic inverse function at grade XI SMA Negeri 1 Perbaungan academic year 2013/2014.

1.4 Problems Formulation

The problems formulation of this research is:

1. How is Somatic, Auditory, Visual, and Intellectual (SAVI) approach can increase students' mathematical communication ability on topic inverse function at Grade XI SMA Negeri 1 Perbaungan?

2. How is the increasing of students' mathematical communication ability on topic inverse function at Grade XI SMA Negeri 1 Perbaungan by applying Somatic, Auditory, Visual, and Intellectual (SAVI) approach?

1.5 Research Objectives

Based on the problem formulation which has been described, the objectives of this research are to:

1. To describe Somatic, Auditory, Visual, and Intellectual (SAVI) approach in mathematics learning process increase students' mathematical communication ability on topic inverse function at Grade XI SMA Negeri 1 Perbaungan.

2. To describe the increasing of students' mathematical communication ability on topic inverse function at Grade XI SMA Negeri 1 Perbaungan by applying Somatic, Auditory, Visual, and Intellectual (SAVI) approach.

1.6 Benefits of Research

Results of this research are expected to provide inputs and contributions for several parties, including:

For Students:

1. Giving new experience and making students more actively in learning process because this approach directly involves students, improving students' achievement, and improving their activities.

2. Growing cooperation, communication among students, and students with teachers.

For Teachers:

1. To introduce teacher one of mathematics learning approaches, i.e. SAVI, that good to use.

2. Teacher may provide additional knowledge and can practice it which is by using SAVI can increase students' mathematics abilities, especially communication ability.

3. To motivate teacher in doing innovation of teaching and learning process that makes students more actively and interested.

For Researcher:

The results of this research are expected to add insight about influence of SAVI in increasing mathematics abilities, especially mathematical communication ability.

For School:

As an input to school administrators in order to improve the learning model and the quality of education.

1.7 Operational Definitions

To avoid differences or lack of meaning clarity, the following operational definitions are important terms in this research:

1. Mathematical Communication

   Mathematical communication consists of two aspects, namely oral communication (*talking*) and written communication (*writing*). *Talking,* such as reading, listening, discussing, explaining, and sharing. While *writing,* such as expressing mathematical ideas in a real-world phenomenon through graph,/figure, table, algebraic equation, or with daily language (written words).

2. Mathematical Communication Ability

   Mathematical communication ability referred to in this research is the ability of students to use their vocabulary, notation, and mathematical structure in the form of reasoning, connections, and problem solving. Mathematical communication ability can occur when students work in groups, when the students explain an algorithm to solve an equation, when

students construct and describe a graphical representation of the real-world phenomena, or when students give a conjecture on geometrical images. In this research, students expected able to express mathematical description into mathematical model; create mathematical model through diagram, graph, or table; and explain mathematical model and do calculation.

3. SAVI (Somatic, Auditory, Visual, and Intellectual) Approach

SAVI is a learning approach which emphasizes that learning should use all of student senses by combining physical movement with intellectual activity and use all senses in the learning process. This approach is intended to increase the student's activity in learning activities that can improve students' communication ability.

SAVI is short term of:

a. Somatic means that learning by experience, doing, moving, and act. Learning by involving physical activity, especially sense of touch, move your body uses during the learning process.

b. Auditory means that learning must be through listening, speaking, presentation, argumentation, express opinions, and responding.

c. Visual means that learning should use eye senses through observing, drawing, demonstrating, reading, using media and props (learning by observing and picturing).

d. Intellectual is ability to think through the reasoning needs to be trained, creative, solving problems, constructing, and applying (learning by problem and reflecting).

Learning can take place optimally when the four of SAVI elements present in a learning process.