CHAPTER I
INTRODUCTION

1.1 Background

Education is a means that has a great role in realizing the progress of a nation and state. The governments make serious efforts to improve the quality of education along with the development of the mindset of community and technology needs. Therefore, education should be managed both in quality and quantity. Increased ability in order to adjust to change and enter the era of globalization, among others, can be done through improving students' ability in learning physics.

Learning physics is a psychological process of one's actions to reconstruct, understand a natural phenomenon. Physics subjects at school are taught to equip learners with knowledge, understanding, concepts and a number of abilities to enter higher education and develop science and technology. According Ahmad et al (2016) cognitive development is the construction of thought processes, including remembering, problem solving and decision making, from childhood through adolescence to adulthood. Mastery of the concepts becomes very important for students because it is an indicator that students have fully understood what has been taught, not just memorizing. So that later mastery of this concept can help students in solving problems, not only in school learning, but also in everyday life. The concept itself is a set of ideas about the relationship between interrelated facts. Therefore, the process of mastering the concept is a process that is closely related to thinking.

One of the physics-related material in everyday life but still difficult to understand students is sound waves. The concept of sound waves that are abstract so that many students who do not understand and understand, this is reinforced by a statement from Wittmann (2003) from the results of his research which states that sound waves are difficult to understand material because many misconceptions in understanding the equation and convey the propagation

medium until the listener's ears. The difficulties of students in learning physics also occur because the subject matter presented by teachers in learning consists of concepts that are mostly abstract, using numbers, unique symbols and formulas (Erlina, 2011).

Based on the results of the Integrated Field Experience Practice conducted at SMA Negeri 1 Tebing Tinggi, many students are not interested to study physics because it is considered a difficult and tedious lesson. This is apparent in the physics-based learning that is still material-based, teacher-oriented and students tend to be passive. Learning activities begins with the giving of facts and concepts through lecture methods, followed by giving examples of problems and assignment of home duties. This learning model is not relevant with the physical characteristics itself, less involving students in learning to implement the skills of the process of science. The presentation of abstract concepts and very much content is accompanied by mathematical formulas taking place in learning. This condition resulted in the student's formal operational thinking is low and does not develop properly. The low level of formal operational thinking of the students can be seen from the quality of the answers and the questions that are conveyed during the learning activities.

Internationally the questions of natural science require students to solve abstract problems and have the ability to analyze, synthesize and evaluate, these abilities are formal operational thinking. The ability to think formally determines the success of students in learning physics, as said Erman and Mintarto (2011) that for students to understand the basic concepts of physics required the ability of formal thinking. Specifically, students were assessed for formal operational ability and intellectual flexibility at the beginning of their freshman year, as sophomores, and finally, as seniors. Although it is not possible to differentiate them from those changes that might have occurred just because of the passage of time, these findings do suggest that the young adults in this sample did become less concrete and more formal thinkers over their college careers (percent concrete thinkers decreased from 21.8% to 7%) (Anderson, 2003).

Some research results indicate that many students who cannot operationalize their thinking ability according to age group. Results of research show that 25-75% of high school students and students have not yet reached formal operational level. This is also in line with Harahap (2005) research which found that 60.9% of MIPA students of Medan State University of first semester are still in the level of concrete thinking ability.

The tendency of general education in Indonesia in curriculum and learning model is still dominant of direct instruction learning and less varied model of learning applied by the teacher so that only one-way communication and science is transferred quickly from teacher to student. This is what makes the students absorption weak because they only listen from the teacher. So it is necessary to change the paradigm of learning from the teacher-centered to the students-centered. This can make students more proactive to build their own knowledge through learning experiences and interactions with the environment. In teaching and learning activities there is a process that becomes the core of learning activities called learning that focuses on the involvement of students in learning something.

In order to make the standards of education better, the nature of development of cognitive skills is required to be understood in all components of education, such as curriculum development, teaching practices and assessment and evaluation. But, unfortunately, cognitive development is used more to discuss whether the syllabus subjects are suitable for the level of students or not. The teachers do not practice teaching in their courses which will support the development of high order cognitive abilities in students. The teachers are also not aware of whether their teaching practices contribute to the development of students' cognitive ability or not (Çil & Çepni, 2012).

The facts based on the results of observations indicate the need for improvement on the learning of physics with a model of learning that can improve student's formal operational thinking, among others, with the model inquiry training. Learning with inquiry training model emphasizes the active role of students in learning. This is in line with Derlina and Mihardi (2015) study which

found that learning with inquiry training model is more effective in improving student's formal thinking ability compared to direct instruction learning.

In general, since inquiry learning and teachers are envisioned to play a key role in the reform of science education, more and different kinds of interventions, training courses, and studies are needed on this theme. The present study and the training course that was implemented in the context of the study form a foundation for future work (Ahokoski et al, 2017). According to Joyce and Weil (2009) instructional model inquiry training is a learning that is designed by involving students directly perform scientific processes to learn depart from fact to theory, expect students to ask why an event occurred, what causes something to happen, then students conduct an investigation to search for answers, experiment, analyze data logically so as to find the cause of a symptom or fact may occur. Inquiry training model consists of five phases: (1) confrontation with the problem, (2) data gathering-verification, (3) data gathering-experimentation, (4) organizing, formulating and explanation, and (5) analysis the inquiry process. From the learning stage, it appears that students are more required to solve problems in the thinking process through submission of hypotheses and collect data on the problems given. This learning stage is in accordance with the general inquiry stage according to some experts (Looi, 1998).

In contrast to the inquiry training model, direct instruction learning emphasizes the process of verbal material delivery from teacher to student. The student becomes a passive listener, accepting the knowledge transferred by the teacher. Learning does not provide opportunities for students to engage in activities that can develop their formal operational thinking. While in the learning model of inquiry training can make students more active because here students become learning centers so as to improve the formal operational thinking.

Based on the above problems, the author intends to conduct research under the title **"The Effect of Inquiry Training Learning Model on Sound Waves Topic to Improve Student's Formal Operational Thinking in Class XI SMA Negeri 1 Tebing Tinggi A.Y 2017/2018"**.

1.2 Problem Identification

Based on the background presented above, can be identified several issues as follows:

1. Students regard physics lessons as lessons that are difficult to understand and boring
2. Physics learning process is still material-based, teacher-oriented and students tend to be passive
3. The low of formal operational thinking of students
4. Sound waves material is still difficult to understand students

1.3 Problem Limitation

The problem limitations in this research are as follows:

1. The low of student's formal operational thinking in physics learning
2. Sound waves is still difficult to understand

1.4 Problem Formulation

The formulations of problem in this research are as follows:

1. Is the use of inquiry training model can improve student's formal operational thinking in sound waves material in class XI SMA Negeri 1 Tebing Tinggi?
2. How does the influence of learning inquiry training model on student's formal operational thinking on the subject matter of sound waves in class XI SMA Negeri 1 Tebing Tinggi?

1.5 Research Objectives

The purposes of this research are as follows:

1. To know the effectiveness of instructional model inquiry training in improving student's formal operational thinking in sound wave materials in class XI SMA Negeri 1 Tebing Tinggi

2. To know the effect of instructional model inquiry training on the formal operational thinking on the subject matter of sound waves in class XI SMA Negeri 1 Tebing Tinggi

1.6 Research Benefits

Benefits to be gained in this research are:

1. As an information material for teachers, especially physics teachers to determine the effect of learning inquiry training model to improve student's formal operational thinking
2. As an input for the authors in improving the insight and knowledge about the influence of learning inquiry training model to improve student's formal operational thinking

1.7 Operational Definition

1. Inquiry training model is a learning that is designed by involving students directly perform scientific processes to learn depart from fact to theory, expect students to ask why an event occurred, what causes something to happen, then students conduct an investigation to search for answers, experiment, analyze data logically so as to find the cause of a symptom or fact may occur.
2. Formal Operational thinking is the ability to think more abstractly, reason logically, and draw conclusions from available information. Adolescents are no longer confined to real and concrete experiences as the basis for their thinking. They are able to imagine a fictitious situation, an event that is solely a possibility of a hypothesis or an abstract proposition, and tries to treat it logically. At this stage, individuals move beyond the actual and concrete world of experience, and think more abstractly and logically. As part of the ability to think more abstractly, adolescents develop an image of the ideal. In solving problems, formal operational thinkers are more systematic, developing hypotheses about why something happened like that, and then testing this hypothesis deductively.