CHAPTER I
INTRODUCTION

This chapter contains the introduction to the research conducted by the researcher. In this chapter, it consists of background, research problem, limitation of problem, research objectives, research benefits, and organization structure of the research paper.

1.1 Background

Over the last two decades, people have to face several environmental issues. According to ABC News' survey, one of the biggest environmental issues is concerned on global warming issue (Malka, Krosnick & Langer, 2009). Through thousand scientific journals and industry publications by researchers from Intergovernmental Panel on Climate Change (IPCC), they confirm if global warming is a crucial issue nowadays (Rye, Rubba & Wiesenmayer, 1997). IPCC claimed if one of the main culprits causing global warming is human activities (Shepardson, Niyogi, Choi & Charusombat, 2009). Human activities continue to increase the concentration of greenhouse gases to the Earth's atmosphere, causing the global temperature to increase gradually (Shepardson, Niyogi, Choi, & Charusombat, 2009). The increased global temperature poses a serious potential threat to our biosphere, with the possible economic and climatic effects (Rye, Rubba, & Wiesenmayer, 1997).

Those effects influence many countries around the world begin to take urgent action to fight global warming in order to prevent it occur. One of their actions is to make their people aware of global warming issue through the education. They have made the awareness and mitigation of global warming as the main issue in primary and secondary schools' science education (Lin, 2017). Thus, it is important for students to learn about global warming since they are young.

Learning about global warming is essential for increasing people's responsibility and scientific literacy to combat the environmental issues (Lin, 2017). Including global warming in science education curricula is also fundamental

for developing well students' awareness to global warming and also for overcoming the life-threatening environmental problems in the future. As well, learning global warming is expected to provide a well understanding for future citizens to take action through personal and social implementations when against the global warming.

Indonesia as one of the largest population countries in the world, also has included the global warming issue to the secondary school science curricula as the effort to against global warming. Not only about the global warming, but also about environmental pollution and climate change included in science curriculum 2013. The global warming topic is included in seventh grade junior high school. Through those topics, government expects by learning global warming, students will increase their awareness and take action to overcome the environmental problem in this country. But in fact, learning global warming for students is not as easy as the expectation.

Students who learn global warming in the school tend to have the different ideas about the topic. Through some previous studies that already conducted, researchers found many ideas about global warming accepted by the students are different from generally accepted by the scientific community (Arslan, Cigdemoglu, and Moseley, 2012; Lin, 2017; Shepardson, Niyogi, Choi, & Charusombat, 2009; Rye, Rubba, & Wiesenmayer, 1997; Chang & Pascua, 2016). Researchers refer the students' ideas which are different from scientifically acceptable understandings as misconceptions (Daniel, Boyes & Stanisstreet, 2004; Chang & Pascua, 2016; Treagust, 1988; Akgun, 2009), students' alternative conceptions (Rye, Rubba, & Wiesenmayer, 1997), or students' conceptions (Shepardson, Niyogi, Choi, & Charusombat, 2009; Lin, 2017). In this study, the term "misconception" was used to refer the incorrect students' ideas because of its frequent appearance in research studies. The students' misconceptions are crucial to be detected earlier because it can inhibit the students to get the correct concept about the global warming. Further, if the misconceptions are not detected earlier, it might lead to another misconception while the objectives of learning global warming will not be achieved.

From the 1990s onward, many researchers have studied primary and secondary school students' misconceptions about global warming topic. Those studies mainly focus on scientific mechanism, influence factors, and how resolving global warming. From those studies, researchers revealed that students' ideas about global warming are still not correct. The most common students' misconceptions have been detected by previous researchers are: (a) global warming is caused by ozone depletion, (b) global warming will cause skin cancer, (c) greenhouse gases cause ozone depletion (Arslan, Cigdemoglu, & Moseley, 2012).

Those common misconceptions have been detected by using some methodologies, included interviews (Lin, 2017; Chang & Pascua, 2016; Rye, Rubba, & Wiesenmayer, 1997), pre-instruction and post-instruction writing (Lee, Lambert & Lester 2009), open-response item (Shepardson, Niyogi, Choi, & Charusombat, 2009), close-ended questionnaire (Daniel, Stanisstreet, & Boyes, 2004), and diagnostic test (Arslan, Cigdemoglu, & Moseley, 2012). However, a researcher can deeply investigate students' understanding about the concept of global warming topic, conducting an interview is time-consuming and limited in the number of participants (Lin, 2017). In same condition, pre-instruction and post-instruction writing are also time-consuming but it can explore the details of students' ideas toward global warming before and after the instruction. In the contrast, open-response item is suitable for large-scale survey, but many of the participants do not provide any response to the item, they leave some blank responses in their answers (Dove, 1996). While close-ended questionnaires are easy to use and can be used in large-scaled population, sometimes it can draw misleading conclusions because of the limited range of responses (Arslan, Cigdemoglu, & Moseley, 2012). And the other methodology used by researchers is by using diagnostic test.

Diagnostic test becomes a relatively noticeable assessment tool to detect misconception in science concept (Arslan, Cigdemoglu, & Moseley, 2012). One of popular diagnostic tests is in the form of two-tier test. This diagnostic test is designed not only to identify students' misconception but also suggested the addition of a reason tier to derive students' actual misconception (Treagust, 1988).

Since years ago, two-tier test has been used in several studies of science education (Odom & Barrow, 1995; Bayrak, 2013; Oztas, 2013; Toman & Ergen, 2014). Although two-tier test provides some easiness when collecting the data for large-scale survey, but some limitations have been identified. One of the limitation is the probability of the participants to guess the correct answer. In order to overcome that limitation, Certainty of Response Index (CRI) is added to the diagnostic test as proposed (Hasan, Bagayoko & Kelley, 1999; Arslan, Cigdemoglu, & Moseley, 2012). Only few studies focused on environmental issues especially on global warming using this modification of diagnostic test until now. However detecting misconception also can detect the possible factors behind those misconception.

Some researchers found several factors of misconception while detecting it, included the erroneous when students construct the prior to formal knowledge about global warming, the teaching media used by teachers, the previous teachers' misconceptions, the misinformation science textbook, and their level of cognitive development related to the ability for formal or abstract thinking (Rye, Rubba, & Wiesenmayer, 1997; Benson et al., 1993). In learning and teaching process, global warming is a complex phenomenon and required an accurate understanding of the cause of global warming. While the topic is built by some abstract concepts included the concept related to the characteristics of the gases in Earth's atmosphere, students might have difficulty to understand the concept due to the lower secondary students' (ages 12 to 14) cognitive development is dominant in the level of concrete level to transitional level (Rye, Rubba, & Wiesenmayer 1997). Therefore the misconceptions in global warming topic have high possibility to occur in lower secondary school due to students' cognitive development.

As the students' cognitive development related to formal thinking is important to influence in learning global warming, the identification of students' cognitive development is needed in this research. Test of Logical Thinking (TOLT) adapted from Tobin & Chapie (1981) is appropriate test to examine students' cognitive development related to formal or abstract thinking. Furthermore, through this test, the specific of students' misconceptions in global warming based on their logical thinking level will be detected.

In brief summary, analyzing students' misconceptions on global warming topic especially in lower secondary school students is crucial topic nowadays due to the environmental issues begin to threat the life. However, in Indonesia, study about the identification of students' misconception in global warming topic is limited. Therefore this research is focused on identifying students' misconception in global warming topic by using two-tier test and Certainty of Response Index (CRI).

1.2 Research Problem

Based on the research background, the research problem of this study is formulated as "How is the analysis of students' misconception on Global Warming topic using two-tier test and Certainty of Response Index (CRI) in secondary school?"

The research problem is elaborated into several research questions. The research questions are:

1) How are students' categories of understanding global warming topic?
2) How are students' misconceptions about global warming topic?
3) How are misconceptions on global warming topic held by students based on students' logical thinking levels?

1.3 Limitation of Problem

In order to bring this research into focus, the problem is limited. The limitations of problem are:

1) The research only focuses on detecting the students' misconception in seventh grade lower secondary school students.
2) The topic is limited on global warming and greenhouse effect concepts which included in curriculum 2013 revision edition year 2017, specifically in Basic Competence 3.9 which have major topic about climate change.

1.4 Research Objectives

This research aims to analyze students' misconception on global warming topic using two-tier test and certainty response index (CRI) in secondary school. In detail, based on research questions, there are some objectives of the research which are:

1) To analyze students' understanding categories about global warming topic using two-tier test and Certainty of Response Index (CRI) in lower secondary school.
2) To analyze students' misconception on global warming topic using two-tier test and Certainty of Response Index (CRI) in lower secondary school.
3) To analyze students' misconception in global warming topic based on students' logical thinking level.

1.5 Research Benefits

This research is expected to provide some benefits for teachers, students, schools, and researchers as follow:

1.1.1 Teachers

For teachers, this research may improve teacher's knowledge of diagnosing method to identify students' misconceptions about science concept and find a better learning strategy to reduce misconception in science topic especially for global warming topic.

1.1.2 Students

This research can help students to construct and reveal their understanding of certain science concepts, especially global warming topic.

1.1.3 Schools

As the result of this research, school can plan and prepare a better learning strategy and teaching media or teaching references which can reduce the potential of misconception in the learning process.

1.1.4 Further research

This research can be a contribution to students' misconception study which could become reference for other studies.

1.6 Organization Structure of Research Paper

Generally, the organization structure section explains the details of the research paper structure based on the Universitas Pendidikan Indonesia's regulation 2016. The organization structure of this research paper is divided into five chapters. The chapters are resembled and explained as following.

Chapter I explains about the background and problem identification which are elaborated into research problem and research questions. This research problem is also limited in limitation of problem. In this chapter, the research objectives and benefits are determined. This chapter is crucial to determine the following chapters, such as literature review and methodology.

In line with the Chapter I, Chapter II of this research paper explains about the theories and relevant research needed by the researcher to analyze the result and the finding. In this chapter, there are some literature reviews that support the argument and the result analysis in this research. Some literature reviews that included in this chapter are about misconception in general, two-tier test, certainty of responds index, and overview about misconception in global warming topic.

Chapter III is about the methodology of this research. This chapter explains the details of research method used in the research. Furthermore, research sample and population, research procedure, and operational definition are explained in this chapter. A set of instruments applied in this research is also explained concisely.

Chapter IV explains the research result and discussion. This chapter explains about the finding and analysis concerning on this research. The research problem described in the first chapter is answered in this chapter. Through discussion, each findings are analyzed using the previous findings of the other researchers that already explained in the second chapter.

Chapter V is the closure chapter which includes the conclusion of this research and recommendation for the next research.