CHAPTER I

INTRODUCTION

1.1.Background

Based on *Program for International Student Assessment* (PISA) surveys started from 2000 to 2012, Indonesian students' achievement in PISA, especially in science always below the average score of OECD's countries (500) and took the fifth last place among all participants (Hadi & Endang, 2009; Burckhardt,2014; OECD,2003; OECD, 2004; OECD,2006; OECD, 2013). Since the first survey of PISA in 2000, Indonesia attained 38th rank from 41 participants with mean score 393 (OECD,2003). Followed by 38th rank from 40 participants with score 395 in 2003 (OECD, 2004). While the third survey in 2006, Indonesia occupied in 53th rank from 57 participant by mean score 395(OECD, 2006). It was getting worse in 2009 and 2012, where Indonesia only able to reached 62th and 64th rank from 65 participant countries with 382 mean score.

Data above showed that Indonesian students only achive score about 400 constantly from year to years, which means students' scientific literacy still at the beginner level. This level indicate that students' tend to gain knowledge by remembering the simple fact (i.e. name, fact, term, simple formulation). Or in othe words, students at this level only used a common scientific knowledge to make and evaluate a conclusion (Rustaman,2010).

If this situation is continiously happen, Indonesian students may have low science process skills and ultimately unable to survive in the era of

globalization. The finding and exposure above clarify that adevelopmental research of learning materials based on scientific literacy is necessary to do.

Recent study delineate that most of biology textbook in high school nowadays are not completely discussed material based on scientific literacy aspects (Adisendjaja, 2008; Ariska, 2014). According to Chiappeta, *et.al* (1991) it is recommended to have four components in developing a learning materials for science. The four components are: (1) science as a body of knowledge, (2) science as a way of investigating, (3) science as a way of thinking, and (4) interactionof science, technology and society.

Another weakness derived from the learning material, where not all learning materials which available today contain issues that close to students' daily lives. In order to provide valuable experience to students, learning biology in schools should be linked to the real environment around them. As the result, students are able to make connections between what they learn in classroom and what they see in daily life. (Chamany, *et al*, 2008).

Ecology is one of topic in biology course that use environment as the object of learning. This topic will discuss both of biotic (living organism) factors and abiotic (non-living things) factors of environment and also the interactions between living organisms to live together and how they influence each other in their environment. The intended environment here is everything that lives and not lives around certain living creatures.(Miller, 1998).

The development of learning materials for ecology and environment topics so far has not been done and yet contains four components of scientific literacy. According Holbrock (2009), the existing activities on the learning

material with a scientific literacy can encourage and inspire students to be able to understand, implement, and develop ways of thinking rationally and objectively in response to the substance or teaching materials.

Learning material in ecology and environment topics of high school Biology textbook is rare arranged based on local potential, especially North Sumatera.While in biology textbook in Canada, Texas, Mexico and Thailand (Feedman, 2009; Miler,1998; Veeravatnanond, 2001) have highlight the example of real environment that known by students. This bring a very positive and good impact on students' scientific capabilities ininterpret information, solve problems, create appropriate decisions, accommodate change, and achieve new understandings.

To help student easy to understand, teachers can give close examples in their daily life or local potential in their region. The use of local potential in learning to train the student's ability to socialize and problem-solving skills, in line with that described by Ahmadi (2012) that based education locally will provide the opportunity for students to learn to identify problems and solve the problem of local potential in the region and an investment for public welfare and social action.

Susilo on his research (2013) has been develop a teaching material related to local potencial of Gunung Puyuh Pundong, Kab. Bantul, Yogyakarta in order to help student to get knowledge by direct investigating. This method help student to own their experience in having knowledge and success to bring a positive student's respons.

Sajidan (2013) states that the use of local potential in accordance with

a curriculum and sylabus that gives freedom to each school consider the potential of the school and the surrounding area. Dimensional space that is affordable, gives learners the opportunity to be able to observe the history and potential of local conditions futuristic raised in learning. Local potential provides an opportunity for teachers to facilitate the linking of new knowledge that will be delivered to students.

One of the important ecosystems from throughout Indonesia is rice field. As one of ecosystem, rice field has a natural combination of biotic and abiotic factors. It's include collection of organisms like producers, consumers, and decomposers which interact to each other and with their physical environment

According to BPS (2015) North Sumatra has 181,860.65 km² of its total area, consist of 71680.68 km² land area (3.73% of the total area of the Republic of Indonesia) and the 110,000.65 km² marine area. This geography makes Sumatera Utara rich of natural resource. There are about 10,000 species of plants, of which 17 of them are endemic genus. North Sumatera also rich of cultures and has some historical sites. This potential can be optimized through the availability of learning materials for ecology and environment topics based on North Sumatera ecosytem characteristic.

Ecosystem of rice field, ecosystem of palm oil plantation, vegetable and flower garden in Berastagi can be integrated into the ecosystem material; Abiotic and biotic factors, food web, energy flow in rice field in Binjai and Langkat, ecosystem of palm oil plantation in Deliserdang, vegetable and flower garden in Berastagi can be integrates into Interaction in ecosystem.

Another example are the eruption of Sinabung, large flood in Binjai, noisy of train Medan-Binjai, aiport in Kualanamu, waste from house or factory in Industry Area in Medan (KIM-Belawan) also trash in Lake Toba can be linked to pollution and carbon cycle.

Based on results of preliminary observations by researcher, which conducted through interviews with biology subject teachers and also distributing the initial questionnaire to students who have studied the topic of ecology and environment, it obtained results that there are some obstacles in the learning process. The main obstacles are the lack of learning resources in the form of teaching materials that provided by the school and goverment. Goverment only provide *BSE,* while some school provide *Erlangga* and *Yudistira*in their library. The content of this textbooks was deemed not comlplete yet, it has not contain 4 components of scientific literacy and most of the content in the book is not yet utilizing local potentials that exist around students in North Sumatera.

Based on the problems mentioned above, a research entitled "The Development of Learning Material on Ecology and Environment Topics Based on Scientific Literacy and Local Potencial of North Sumatera"was conducted to overcome the problems that have been described above.

1.2.Problem Identification

According to the background, the identification problem are:

1. Indonesian achievement is low in science literacy based on PISA survey.
2. The teaching materials hasn’t or less developed to contains four components of scientific literacy.

3. Not all learning materials used as learning source provide issues that close to students' daily lives.
4. The lack of learning resources in a form of learning materials be based on North Sumatera environment that provided by the schools.
5. Learning materials that used by students for ecology and environment also has not been developed based on local potencial of North Sumatera.
6. Learning material that exist in textbook is less engaging students to observe environment directly.
7. Local potencial such as rice field, palm oil plantation, vegetable garden have not optimally used by teacher as a source of learning material.

1.3.Scope of study

1. This research is limited to the topic of ecology and environment with a development of scientific literacy learning material based on rice field, palm oil plantation, vegetable garden, industrial area as local potencial of North Sumatera.
2. This development research is conducted only at preliminary field testing stage.
3. Product of developed learning material will be validated based on content and design by experts.
4. The product will be assessed by a biology teacher to determine the feasibility of learning material that has been developed.
5. The research focused on the second semester at grade X (tenth) of senior high students.

1.4.Research Question

In accordance with the issues that has been stated, then the problem can be formulated as follow:

1. How is the feasibility of learning material on ecology and environment topics based onscientific literacy and local potencial of North Sumatera which developed basedon *scienceasa body of knowledge*?
2. How is the feasibility of learning material on ecology and environment topics based onscientific literacy and local potencial of North Sumatera which developed basedon *science as way of thinking?*

3. How is the feasibility of learning material on ecology and environment topics based onscientific literacy and local potencial of North Sumatera which developed basedon *scienc eas a way of investigating*?
4. How is the feasibility of learning material on ecology and environment topics based onscientific literacy and local potencial of North Sumatera which developed basedon i*nteraction of science,tecnology and society*?
5. How is the feasibility of learning material on ecology and environment topics based onscientific literacy and local potencial of North Sumatera which developed based on design expert?
6. How is the feasibility of learning material on ecology and environment topics based onscientific literacy and local potencial of North Sumatera which developed based on assessment of biology teacher and students' response?

1.5.Research Objectives

This study is aimed to:

1. Reveals the feasibility of learning material on ecology and environment topics based onscientific literacy and local potencial of North Sumatera which developed basedon *scienceasa body of knowledge*.
2. Reveals the feasibility of learning material on ecology and environment topics based onscientific literacy and local potencial of North Sumatera which developed basedon *scienceasas way of thinking*.
3. Reveals the feasibility of learning material on ecology and environment topics based onscientific literacy and local potencial of North Sumatera which developed basedon *scienceasa way of investigating*.

4. Reveals the feasibility of learning material on ecology and environment topics based onscientific literacy and local potencial of North Sumatera which developed basedon i*nteraction of science,tecnology and society*.
5. Reveals the feasibility of learning material on ecology and environment topics based onscientific literacy and local potencial of North Sumatera which developed based on design expert.
6. Reveals the feasibility of learning material on ecology and environment topics based onscientific literacy and local potencial of North Sumatera which developed based on assessment of biology teacher and students' response

1.6.Research Significances

1.6.1. Theoretical Significance

1. Providing an information related to the development of scientific literacy learning materials for ecology and environment topics based on local potencial of North Sumatera.
2. Encouraging the educators and publisher to create a better learning material by using a local potencial or daily life environment based on scientific literacy to improve the quality of learning.
3. As a references to get information for other reseachers who want to continue and develop this research.

1.6.2. Practical significance

1. It can be used as a reference to develop a better quality of textbook or learning material for Senior High School.
2. As a reference for educators to make students become familiar in real life situation issues, solving complex problem and initiates them to think critically.

3. As an alternatif for educators to choose learning materials for ecology and environment topics be based on scientific literacy based on local potencial of North Sumatera that can be used in learning process.

1.7.Operational Defenition

1. Scientific literacy is the knowledge and understanding of scientific concept and process require that involved science as a body of knowldege, science as a way of investigating, science as a way of thinking and interaction of science, technology and society. Scientific literacy help students to develop their technical skill,communication skill, personal decission making and build confidence.
2. Local potencial is everything that characterizes regionalism, unique, has a competitive advantage and can be utilized as product or service to interests of people's lives, meet the economic, cultural, information technology, communications, ecology and more.
3. Learning material on ecology and environmental topics based on scientific literacy and local potencial of North Sumatera is a learning material that developed based on scietific literacy components and involved local potencial of North Sumatera for ecology and environment topics in Biology course for X (tenth) grade Senior high school students.