CHAPTER I
INTRODUCTION

1.1 Background of the Study

Science is a way to understand about nature and the world. The essence of science is as a product, process, attitude, and technology. Science as a process is developing skills through discovery activities so that they can behave and act appropriately. The implementation of science is realized in the learning of Natural Science. Science is essentially a science that studies various natural phenomena that occur while maintaining competencies related to science, namely science as a scientific process ability, scientific product (concepts, understandings, facts, and ideas), and scientific attitude (Budiarso et al., 2020). This shows that science learning needs to be based on phenomena that occur in everyday life.

Science learning activities by observing phenomena have the aim of increasing student curiosity and making it easier for students to understand abstract concepts. Observing phenomena before conducting an experiment makes students curious about the problems found and more directed in conducting investigations. Learning by observing phenomena can build students' knowledge, then connect it with initial knowledge so that a complete concept is obtained. This is in line with Naik (2019) which explains that phenomenon-based learning ensures students have a positive learning experience and have the opportunity to gain insights and use them in connection with scientific concepts, theories, and principles in order to solve problems in everyday life.

The process of science either using knowledge or through the process of creating requires a certain understanding in practice referred to as scientific literacy (Snow & Dibner, 2016). According to the Organization for Economic Cooperation and Development (OECD, 2017) Scientific literacy is defined as the ability to engage with science-related issues. Scientific literacy skills enable students to be active in understanding and solving problems related to natural phenomena and everyday life.

In addition to scientific literacy skill, other skill needed by students is scientific argumentation. Argumentation is the process of reaching mutual agreement through a rationale that can be in the form of justification and refutation, and is related to decision making (Sakai et al., 2020). Scientific argumentation is the ability of students to think, to communicate, and to make their own decisions related to scientific phenomena. According to Probosari et al (2016) the scientific argumentation skill is one of the natural science learning main objectives because students who study natural science must understand the scientific explanations of a certain natural phenomena, use the science concept to solve problems in everyday life and be able to relate them to other findings. This is in line with Hasruddin et al (2024) which stated that through writing down problems can improve 21st century skills such as critical thinking, problem solving, communication, collaboration, as well as creativity and innovation.

The relationship between scientific literacy and scientific argumentation is explained by Noviyanti et al (2019) that scientific argumentation skills consist of literacy skills, critical thinking, reasoning, and building metacognitive communication. Scientific argumentation as an intellectual practice involves students in constructing and critiquing scientific ideas. Students will gain experience from scientific practice and be used to justify and support arguments according to the results of their scientific literacy. Scientific literacy and scientific argumentation are important for students to understand and respond appropriately to phenomena in everyday life.

The reality in the field of education shows that the scientific literacy ability of students in Indonesia is still lace. According to data published by the OECD from the Programme for International Student Assessment (PISA) survey period, Indonesia is usually in the bottom 10. The latest data in 2018 shows Indonesia is ranked 74th out of 79 countries. It showed that the Indonesian students' scientific literacy is still far below the global average.

Diniya et al (2021) stated that scientific argumentation is needed to measure students' abilities in accordance with the Standar Nasional Pendidikan Indonesia (SNPI). Several studies on students' scientific arguments in science learning have been conducted, but the results show that the discussions carried out are weak and

some students are not involved in giving arguments. The results of research by Ambarawati et al (2021) show that the scientific argumentation skills of junior high school students are only able to write down a few of the scientific argumentation indicators because learning at school has not been able to develop students' abilities in every scientific argumentation indicator consisting of claim, data, warrant, backing, qualifier, and rebuttal. Furthermore, the applied learning has not been able to train argumentation skills properly.

The low level of Indonesian students' ability in scientific literacy and scientific argumentation can be affected by many things, including the curriculum and education system, the selection of learning methods and models by teachers, the lack of the learning facilities or learning resources, teaching materials, and so on. The practices of science learning in the school show that students have not had the opportunity to develop their scientific literacy and argumentation ability.

Based on preliminary studies conducted by the researcher in grade VII of SMP Negeri 18 Medan through observation and interviews, students' scientific literacy and argumentation skills have not been explored optimally. Science learning activities have not raised problems from phenomena in everyday life into natural science learning. The teaching materials used in learning are science package book with Kurikulum Merdeka. Students were only able to answer rote questions and cannot answer questions that require understanding concepts of science. It showed that these questions have begun to lead to scientific literacy skills, but during observations the researcher saw that students had not been able to solve these problems correctly. The researcher observed that teachers often ask students to give responses in learning, but the answers given by students are only in the form of logic or only reading what is written in the book. It showed that the level of scientific argumentation of students is still very low. Based on these cases, it can be concluded that students' scientific literacy and argumentation skills have begun to be explored, but not yet with appropriate indicators and instruments.

One solution that can be provided by the researcher to help improving students' scientific literacy and scientific argumentation skills is through phenomenon-based learning. Mattila & Silander (2015) explained that phenomenon-based learning is a learning in which students are asked questions and

problems raised from phenomena in the real life. This is in line with the objectives of the Kurikulum Merdeka. The Kurikulum Merdeka aims to create learning that is in accordance with the needs and learning environment of students so that it can be adapted to local contexts and content. It focuses on essential materials, one of which is literacy, besides that students in the Kurikulum Merdeka are also given the opportunity to learn about culture and daily life (https://kurikulum.kemdikbud.go.id).

Phenomenon-based learning needs to be integrated with ethnoscience. Mukti et al (2022) explained that ethnoscience is a community knowledge system that contains cultural elements and can be integrated in science learning. Regarding phenomena, ethnoscience can be viewed as a new way of investigating, analysing and describing culture into the context of scientific phenomena (Putra, 2021).

Students come from different cultural backgrounds and societies, in addition, the development of modern society today is quite worrying about shifting the existence of indigenous Indonesian culture. The teacher also mentioned that science learning needs to be integrated into culture. Based on observations and interviews of the researcher in class VII of SMP Negeri 18 Medan, it was found that students are currently not proficient in speaking their regional language, students do not know the characteristics of their tribe such as traditional houses, traditional clothing, and so on.

Temperature, heat, and expansion material in class VII Junior High School was chosen by the researcher in this study. The material was chosen because it is related to natural phenomena that are also integrated with Indonesian culture, especially North Sumatra. Some cultural phenomena that can be raised are the diversity of traditional houses in North Sumatra with different roofing materials, food preservation techniques with smoking and many other phenomena related to the concept of temperature, heat and expansion. These phenomena will later be packaged by the researcher into natural science learning to improve students' scientific literacy and argumentation ability.

Based on the description of the problem above, the title of this study is **"The Effect of Ethnoscience Integrated Phenomenon-Based Learning on Scientific Literacy and Argumentation on Temperature, Heat, and Expansion Material in Class VII SMP Negeri 18 Medan"**.

1.2 Problem Identification

The problems identified from the background of the above problems are as follows:

1. Science learning has not been based on phenomena that occur in everyday life.
2. The ability of scientific literacy and scientific argumentation of Indonesian students is still low compared to other countries, especially at SMP Negeri 18 Medan.
3. The implementation of science learning activities in schools has not supported to improve students' scientific literacy and argumentation skills.
4. The learning tools used by teachers are not yet suitable for improving students' scientific literacy and argumentation skills.
5. Indonesian cultural values and local wisdom are increasingly eroded and neglected due to the rapid flow of globalization, especially at SMP Negeri 18 Medan.
6. Natural science learning has not been linked to culturally related phenomena.

1.3 Scope of Study

This research is related to several aspects, namely:

1. The study of ideas about the world, nature, and human life that are held by different cultures called as ethnoscience that was integrated into natural science learning.
2. The study in science and engineering called phenomenon-based learning that is an educational approach that uses real-world phenomena or complex problems as the basis for teaching and learning. This way of teaching is based on the idea that students can learn about science by investigating events that happens around them every day.
3. The study related to students' ability to ask, to find, or to determine answers to questions derived from curiosity about everyday experiences called scientific literacy. It means that students have the ability to describe, to explain, and to predict natural phenomena.
4. The study related to students' ability to support their claims (either for or against a particular idea or explanation) with evidence that has been gathered

through observation or experimentation and then to use logic and reason to justify why that evidence supports their claims.

1.4 Problem Limitation

The problems in this study need to be limited so that the researcher can focus on specific aspects of the problems that have been identified. The researcher set the boundaries of this study as follows:

1. Ethnoscience integrated into learning in this study was taken from the cultural values and local wisdom of people living in North Sumatra who come from several tribes such as Batak and Malay along with their habits in daily life related to natural science learning.
2. The phenomenon raised in this study were related to Temperature, Heat, and Expansion material that were often encountered by students in daily life which of course were also related to ethnoscience.
3. Scientific literacy ability consists of three competencies indicators, namely explaining phenomena scientifically, evaluating and designing scientific investigation, and interpreting data and evidence scientifically.
4. Scientific argumentation skill will be measured through written tests which include claim, data, warrant, backing, qualifier, and rebuttal.

1.5 Research Question

Based on the background of the problems that have been described earlier, the following problems have been formulated that will be solved through this research, namely:

1. How is the effect of ethnoscience integrated phenomenon-based learning on students' scientific literacy and argumentation on Temperature, Heat, and Expansion material for seven-grade SMP Negeri 18 Medan?
2. How is the increase of students' scientific literacy and scientific argumentation by implementing ethnoscience integrated phenomenon-based learning on Temperature, Heat, and Expansion material for seven-grade SMP Negeri 18 Medan?

3. How is the relationship between students' scientific literacy and argumentation on Temperature, Heat, and Expansion material for seven-grade SMP Negeri 18 Medan?

1.6 Research Objectives

In accordance with the problems that have been formulated, this research is carried out with the aim of:

1. Knowing the effect of ethnoscience integrated phenomenon-based learning on students' scientific literacy and scientific argumentation on Temperature, Heat, and Expansion material for seven-grade SMP Negeri 18 Medan.
2. Knowing the increase of students' scientific literacy and scientific argumentation by implementing ethnoscience integrated phenomenon-based learning on Temperature, Heat, and Expansion material for seven-grade SMP Negeri 18 Medan.
3. Knowing the relationship between scientific literacy and argumentation on Temperature, Heat, and Expansion material for seven-grade SMP Negeri 18 Medan.

1.7 Research Benefits

The benefits of this research are:

1. Theoretical Benefits
   a) As a reference and input for the academic community of Universitas Negeri Medan and other parties in conducting similar research.
   b) To increase researchers' insight and knowledge about ethnoscience integrated phenomenon-based learning on Scientific literacy and students' scientific argumentation, especially on Temperature, Heat, and Expansion material in junior high school.
2. Practical Benefits
   a) For School

      As input and consideration material regarding the application of learning that can make students more active in science learning in grade VII SMP Negeri 18 Medan.

b) For Teachers

Adding teacher references in implementing ethnoscience integrated phenomenon-based learning that makes science learning more meaningful.

c) For Students

Providing a more meaningful natural science learning experience and making students more active in learning Temperature, Heat, and Expansion as well as increasing students' scientific literacy and scientific argumentation.