CHAPTER I

INTRODUCTION

1.1 Background of the Study

Natural Sciences is one of the groups of science subjects related to science and technology. These subjects provide a way to know about nature systematically and purposefully. Science learning at the junior high school level emphasizes more direct learning experiences in the form of presenting facts encountered by students as the beginning of planting scientific concepts and attitudes that are expected to continue at the stage of phenomena experienced by students themselves. The science learning process is not enough to be carried out by conveying information about concepts but must also understand the process of occurrence of science phenomena by sensing as much as possible, observing events that occur directly through demonstration and experimental activities, and recording information that arises from these events. Actively involve students in exploring the subject matter, constructing their own ideas obtained from observations and discussions, it is hoped that students can master the material well and improve scientific literacy ability (Pratiwi & Rachmadiarti, 2021).

Scientific literacy is scientific knowledge and the ability to identify, explain scientific phenomena, draw conclusions based on facts, understand science and technology to shape the environment, nature, and culture, and overcome scientific problems (Shofawati et al., 2023). Scientific literacy is important for students to have in carrying out learning activities, especially natural science learning. Scientific literacy is important for students in terms of how they understand the environment, health, economy, and other issues faced by modern society, which relies heavily on technology, and the advancement and development of science (Primastuti & Atun, 2018). In line with opinion of Pratiwi et al (2019) which states that scientific literacy is important for students to be able to have the ability to solve problems with science concepts, creatively make simplified technological results, and be able to make decisions based on community values and culture.

Scientific literacy also includes the ability to communicate about science concepts clearly and effectively with others. This communication ability can be demonstrated through the argumentation ability possessed by students.

Scientific argumentation ability is the process of learners engaging themselves to propose, support, criticize, correct, justify, and defend their position on a problem (Llewellyn, 2013). Argumentation ability is very important for students because argumentation ability is one of the goals of science learning because students learn to know scientific explanations about natural phenomena and use argumentation to solve problems so that they know science. Argumentation ability is very important to be trained in learning so that students have logical reasoning, clear views and rational explanations of things learned. Argumentation-based learning activities can encourage students to be involved in providing valid evidence, data, and theories to support opinions on a problem. The ability to scientific argumentation is an ability that must be mastered by students as part of scientific literacy. Cigdemoglu et al (2017) states that decision-making through argumentation is a process that contributes to students' scientific literacy levels by creating an active learning environment of opinion and critical thinking. It can be said that through the ability to argumentation, students can communicate the results of their scientific iterations. It can be concluded that scientific literacy and scientific argumentation ability are important to be mastered by students in relation to being able to understand the environment and phenomena based on scientific evidence that is very dependent on technology and scientific developments.

The reality on the ground shows the low scientific literacy ability of students in Indonesia. Based on the findings of the Program for International Student Assessment (PISA), Indonesia's ranking in 2018 is 70 out of 78 countries with a score of 396 (Schleicher, 2018). This shows that the scientific literacy ability of Indonesian students is still low when compared to the average international score and is generally at the lowest measurement stage of PISA.

In addition to scientific literacy, students' scientific argumentation ability is still relatively low. The low argumentation ability of students is evidenced by students who are not trained in scientific arguments which results in new problems, namely students lack in expressing opinions, low mastery of vocabulary and

determining ideas in expressing opinions or statements to influence others so that others believe, lack of student activity to obtain opinion justification data which is the main basis for the cause of low skills Students in pouring their scientific arguments. In line with the theory put forward by Pritasari et al (2016), that if students are not trained in arguments then students will not be able to formulate questions and describe mechanisms, while it is one of the main components in the learning process to build good student arguments. The same thing was also stated by Budiyono (2020) which state that the ability of students to provide argumentation in the learning process is considered still very low because the ability to argue is rarely trained. Based on research conducted by Ria et al (2022) state that the low argumentation ability of students can be seen from every aspect of argumentation, namely the claim aspect, the data aspect (evidence) and the justification aspect (warrant), as well as the support aspect (backing), during science learning students are given the opportunity to ask questions or give opinions but only a few students are able to express their opinions. Students expressing opinions are only able to make claims, and have not been able to explain accurate statements in accordance with the problems presented.

Based on observations at SMP Negeri 1 Palipi, it was found that students' scientific literacy and scientific argumentation ability had not been explored. This is due to the lack of use of models and learning media used is only a whiteboard. The learning process is still teacher-centered and the method used during the learning process in the classroom, namely the lecture method that is only focused on theory, causes a lack of interest and motivation in learning students who tend to listen, memorize, and copy the content of learning material provided by the teacher without finding meaning and understanding its application. In line with the opinion of Jufri et al (2016) stated that students' low scientific literacy was caused by limited understanding of concepts in science learning, where students only focused on memorizing rather than understanding concepts. The selection of learning resources is also the cause of students' low scientific literacy. Learning resources in science learning have been limited to student textbooks, the application of scientific literacy that only relies on textbooks has not fully touched the souls of students, as a result the lessons become boring and students do not understand the subject matter. In

addition, during the learning process only a few students were seen expressing opinions regarding the material. Students still answer the teacher's questions in the form of simple statements without supporting evidence and reasons. Discussion activities and interactions between students and students with teachers are also less intensive, which shows that students have not been trained to argue.

The low ability of scientific literacy and scientific argumentation of students in Indonesia is influenced by many things, including the state of school infrastructure, school human resources, educational curriculum, selection of teaching methods and models by teachers, learning facilities and facilities, and teaching materials. In line with the opinion of Suparya et al (2022) which states that several factors causing the low scientific literacy of students, including science learning that is carried out not contextually and is not associated with things related to daily life, low ability to read and interpret reading, science learning has not been supported by an adequate learning environment, both in the family, school and community environments, the lack of equipment to support the learning process will cause learning cannot run optimally, the quality of teaching staff in schools, the role of the principal in facilitating educators and education staff to improve the professionalism of teaching staff. On the other hand, the cause of students' low scientific argumentation ability is because teachers have not provided a place to develop argumentation ability.

One solution that can be provided by writer to help improve students' scientific literacy and scientific argumentation ability is through phenomenon-based learning. Phenomenon-based learning is learning that encourages students to learn a topic or concept through a holistic approach that can help in improving the quality of learning activities by displaying new things for students in a real context (Mattila & Silander, 2015). Phenomenon-based learning refers to facts that occur every day and represent the lives that students must experience. It refers learners to truth and facts and makes them search for more facts (Mascaliuc, 2022). Studying real-life phenomena makes students relate them to their personal lives and opinions can significantly increase their interest in learning and allow students to understand the true meaning of content in relation to their own lives, communities, and

environments. In line with the statements of Johnson (2021) state that when lesson content is connected to real life, students can participate more actively in learning.

Science learning is very close to students' daily lives and can be learned in all aspects of local and national culture (Sarini & Selamet, 2019). Science learning is closely related to local culture but science learning in schools is less associated with local wisdom. Incorporating local wisdom into learning can clearly explain the details of learning materials, classrooms, learning environments, learning methods, and culture-based learning approaches. The learning process is effective if local wisdom as the main topic of learning is integrated into the learning topic. For example, around traditional rituals, traditional medicinal plants, traditional houses, and cultural knowledge related to other cultural knowledge related to learning topics. Learning that links culture and science is known as ethnoscience integrated learning. Ethnoscience is learning based on a constructivist view and prioritizes meaningful learning. Ethnoscience can be a learning approach to reconstruct indigenous science that develops in people's lives to be transformed into scientific science. Some of the benefits of integrating ethnoscience in science learning aim to introduce students that there are facts or phenomena that develop in a society that can be associated with existing scientific science materials as science, as a vehicle for students to find and build their own knowledge, students can better appreciate nature and utilize science in everyday life.

Awareness of exploring the values of wisdom and integrating in educational activities is very important, especially in science learning. Each student comes from a different cultural background so that the value of foreign cultures that develop so rapidly in people's lives has an impact on the love for culture and local wisdom that is fading. Moreover, there is a phenomenon of students who increasingly believe that scientific knowledge concepts are more important, more needed, and as if they are not related to the culture of the local community. The shift in cultural values causes local cultural values to be increasingly forgotten. For the existence of local culture and wisdom to remain strong, students as the next generation of the nation need to be instilled with a love for local culture and wisdom by integrating cultural knowledge in the learning process. With culture-based learning, students are expected to have attitudes, knowledge, and skills that love the culture of the

Indonesian nation and are beneficial in the survival of the learners themselves. These three are needed as an educational breakthrough that combines culture with science called ethnoscience.

Temperature, Heat, and Expansion topic is the choice of writer in this study. The material was chosen because the material is included in a lesson that is quite difficult for students to understand, there are many questions with formulas so it is boring to learn. In addition, the material is related to natural phenomena that are integrated with local wisdom that can be encountered in everyday life by students. Through ethnoscience, students learn science contextually, namely linking science learning materials in schools with native science around their communities and regions that can be tested for correctness, so that students can know the direct impact of science material that has been learned in class. Based on this, researchers will use the phenomenon of local wisdom as a source or learning medium to improve students' scientific literacy and scientific argumentation ability.

Based on the background of the problems presented, it is necessary to conduct research with the title **"The Effect of Ethnoscience Integrated Phenomenon Based Learning on Scientific Literacy and Scientific Argumentation of Junior High School Students".**

1.2 Problem Identification

Based on the background above, the identification of the problem is as follows:

1) The learning process is still teacher-centered because of which students are less active in the learning process
2) Science learning activities do not apply to natural phenomena experienced by students
3) Students' scientific literacy ability is still poorly explored by teachers during the learning process
4) Students' scientific argumentation ability is poorly trained by teachers during the learning process
5) Science learning in the classroom is rarely associated with local wisdom

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 Samosir who come from tribes such as Batak Toba 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, warrant, backing, qualifier, and rebuttal.

1.5 Problem Formulation

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. Is there 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 1 Palipi?
2. Is there the increase of students' scientific literacy by implementing ethnoscience integrated phenomenon-based learning on Temperature, Heat, and Expansion material for seven-grade SMP Negeri 1 Palipi?
3. Is there the increase of students' scientific argumentation by implementing ethnoscience integrated phenomenon-based learning on Temperature, Heat, and Expansion material for seven-grade SMP Negeri 1 Palipi?
4. Is there the relationship between students' scientific literacy and scientific argumentation on Temperature, Heat, and Expansion material for seven-grade SMP Negeri 1 Palipi?

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 1 Palipi.
2. Knowing the increase of students' scientific literacy by implementing ethnoscience integrated phenomenon-based learning on Temperature, Heat, and Expansion material for seven-grade SMP Negeri 1 Palipi.

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

1.7 Benefits of Research

The benefits or contributions obtained from this research are as follows:

a. Theoretical Contribution

The results of this study are supposed to provide knowledge about the effect of ethnoscience integrated phenomenon-based learning on students' scientific literacy and scientific argumentation ability on science material in junior high schools.

b. Practical Contribution

1) For students, this research is expected to improved students' scientific literacy and scientific argumentation ability in science learning by using ethnoscience integrated phenomenon-based learning
2) For teachers, this research is expected to be used as input and reference material to improve students' scientific literacy and scientific argumentation ability in science learning by using ethnoscience integrated phenomenon-based learning
3) For Schools, this research can be used as a recommendation to provide facilities and insights for teachers to apply appropriate learning approach to improve students' scientific literacy and scientific argumentation ability for science subjects in junior high schools.