

# CHAPTER I

## INTRODUCTION

### 1.1 Background

Science education has an essential relation with the culture of the nation. Through science education, moral values in the past could be developed and examined into an acceptable current culture. The present and future education need to set new goals, focusing on developing an identity of responsible and effective national and global citizenship in students, with all the required knowledge, skills, and attitudes. We have entered an era that requires individuals to master 21<sup>st</sup> century skills in education as science and technology keep evolving. In 21<sup>st</sup> century, society needs a populace knowledgeable about scientific and technological issues (J. D. Miller, 1998). Learning in 21<sup>st</sup> century must ensure that students have (1) learning and innovation skills, including critical thinking skills and problem-solving, communication and collaboration, creativity and innovation; (2) information, media, and technology skills; and (3) life and career skills (Trilling et al., 2009). To achieve those skills, the students need to be scientifically literate.

According to OECD (2013), scientific literacy is the capacity to use science, to identify questions and to draw evidence based on conclusions to understand and help make decisions about the natural world and the changes made through human activity. Students need to have scientific literacy skills to apply the knowledge learned in solving problems in everyday life. Scientific literacy is an important element to have for the students. However, the students' scientific literacy in Indonesia is still low. Based on the 2015 PISA study results, Indonesia was ranked 64<sup>th</sup> out of 72 countries with a score of 403, which is still far below the average international standard of 493 (OECD, 2017). Another result of students' scientific literacy stated by PISA 2018 showed that Indonesia was still in the bottom 10 out of the countries that participated and were ranked 74<sup>th</sup> out of 79 countries with a score of 396, which is still far below the average international standard, which is 489 (OECD, 2019). After 3 years, there was no significant improvement in students' scientific literacy in Indonesia, proving that students' scientific literacy skills in Indonesia are still low. According to Suprpto (2016), Indonesian still got

the low achievement in PISA assessments because the students still lack knowledge about the natural world and science itself. Moreover, the students also lacked the ability to identify scientific issues, use scientific evidence, and explain the phenomena scientifically, which caused them couldn't perform good scientific attitudes. One of the reasons this happened is because of the textbook used as teaching material in the learning activity at school.

In teaching science, the textbook is very important as a learning tool in conveying information from teachers to students. Textbook is an instructional resource that supports teachers in planning and delivering science instruction to meet local and national curricular standards (Chiappetta et al., 2002). According to Penney et al. (2003), the textbook is an essential factor in learning science which impacts students' scientific literacy achievement. The understanding of NOS is highlighted in the role of achieving the students' scientific literacy skills. Widodo et al. (2019) state that low scientific literacy ability is caused by students' low understanding of the nature of science. Research done by Holbrook & Rannikmae (2007) also showed that nature of science education can enhance scientific literacy. This was strengthened by N. G Lederman et al. (2013), who state that science education aims to equip students to apply science skills to understand various kinds of natural phenomena and build students' awareness of scientific literacy through their understanding of the nature of science. Hence, the NOS element must be included in the science textbook used at school.

The phrase of nature of science is used to describe the intersection of issues addressed by the philosophy, history, sociology, and psychology of science as they apply to and potentially impact science teaching and learning (William F et al., 1998). According to Norman G. Lederman (1992), the nature of science (NOS) is defined as the epistemology of science, science as a way of knowing, or the values and beliefs inherent to the development and validation of scientific knowledge. An understanding of NOS could increase the student's comprehension of scientific knowledge. This was proven in the research done by McComas, Almazroa, & Clough (1998) which shows that a pedagogical approach which emphasizing NOS

can improve instructional delivery to promote students' interest and understanding of science. Many aspects of the nature of science are considered important to deliver while learning science, such as the empirical of science, theory-laden, the tentative of science, and the role of science in society. Moreover, the nature of science also influences the students' scientific attitudes. According to Widodo et al. (2019), natural science contains the skills and attitudes which generally state that science contains components of scientific products (scientific knowledge), scientific processes (scientific methods), and scientific perspective.

The nature of science needs to be addressed explicitly instead of implicitly in the science textbook. According to (McDonald, 2010), NOS understandings must be delivered explicitly to the learners by deliberately focusing the learners' attention on various aspects of NOS during classroom instruction, discussion, and questioning. Implicit approaches are less effective than explicit ones because they usually lack structured, opportunities or prompts to help learners reflect on their science-based activities from within a framework that would enable them to build and internalize desired NOS understandings (Abd-El-khalick & Lederman, 2000). The science textbook is considered as a teaching material to support in the implementation of the curriculum. Consequently, the curriculum influenced how the NOS was addressed in the science textbook.

The Indonesian government has implemented curriculum 2013 starting in the academic year of 2013/2014. To reach the goal of curriculum 2013, the Ministry of Education and Culture arranged the textbook based on the framework stated by *BSNP (Badan Standar Nasional Pendidikan)*. In this curriculum, student-centered learning which emphasizes in the inquiry process was carried out through the scientific approach (Narut & Supradi, 2019). However, regarding the low achievement of the student's literacy and numeracy done by the international research assessment in 2015 and 2018, it caused the need to develop Curriculum Merdeka to improve the score in the PISA assessment (Kemdikbud RI, 2022). According to the policy of the Ministry of Education, Culture, Research, and Technology of Indonesia No. 56/M/2022, the implementation of curriculum

Merdeka also aimed for restoring the learning loss because of Covid-19. In line with the implementation of the curriculum Merdeka, the government arranged the textbook based on the framework stated by *Badan Standar Kurikulum dan Asesmen Pendidikan* as a tool for delivering the content in a learning activity to students. In implementing the curriculum Merdeka, Kemdikbud (2022) stated that the learning activity focuses on applying project-based learning to support the development of the students' soft skills based on the Pancasila student profile. Moreover, it also focuses on the essential materials so that the student could have sufficient time on doing the learning in deep for the basic competencies such as literacy and numeracy. By implementing Curriculum Merdeka in the learning activity, the government is expected this curriculum can improve the students' literacy and numeracy in the future.

Based on the explanation above, this research aims to analyze the differences in how the nature of science content delivered between the science textbooks in curriculum 2013 and curriculum Merdeka. The improvement in how the nature of science representation is delivered from the science textbook of curriculum 2013 to curriculum Merdeka is needed to support the enhancement of students' literacy and numeracy. The research that is relevant to this was done by Abd-El-Khalick et al. in 2008, who analyzed the nature of science content in chemistry books in the United States of America. In that study, it was found that those books were lack of showing the important aspects of the nature of science content. The explication of the nature of science aspects targeted in the analysis textbook based on Abd-El-Khalick et al. (2008) are empirical, inferential, creative, theory-driven, tentative, myth of "The Scientific Method", scientific theories, scientific law, social dimensions of science, and social and cultural embeddedness of science.

The others relevant studies were done by Jannah et al. (2019), who analyzed the nature of science content in 10<sup>th</sup> grade physics textbooks for senior high school students in Bandung City, Hernawati et al. (2022), who analyzed the nature of science content on chemical bonding topic contained in 10<sup>th</sup> grade chemistry

textbook for senior high school in Bandung city, and Rosmiati et al. (2022) who analyze the nature of science content of science textbook on curriculum Merdeka compared to other countries. No previous research analyzed the differences of NOS aspects between the science textbooks of junior high school students in curriculum 2013 and curriculum Merdeka. The research of science textbook analysis based on the nature of science content is important to improve the teaching and learning process because the understanding of the nature of science is considered the main result of science education at the level before university (Abd-El-Khalick et al., 2008). Based on the literature reviews explained above, the work aims to analyze the difference between junior high school student science textbooks in curriculum 2013 and curriculum Merdeka in delivering the nature of science content entitled **“Nature of Science Analysis in Curriculum 2013 and Curriculum Merdeka Science Textbooks for Junior High School Students”**.

## **1.2 Research Problem**

Based on the previous explanation in the background, the research problem of this study is “What are the differences in nature of science representation conveyed in junior high school science textbooks based on curriculum 2013 and curriculum Merdeka?”.

## **1.3 Research Question**

As an elaboration of the research problem, the research attempts to explore the following questions:

- a. How is the comparison of the nature of science representation presented in junior high school science textbooks between curriculum 2013 and curriculum Merdeka?
- b. How is the nature of science aspects delivered in junior high school science textbooks based on curriculum 2013 and curriculum Merdeka?

## **1.4 Limitation of Problem**

In order to make the research more focused, the research problem is limited

as follows:

a. Science Textbook

The science textbook analyzed in this research is the junior high school science textbook based on the curriculum 2013 and curriculum Merdeka for grade 7 and grade 8. The researcher only analyzed the science textbook for grade 7 and grade 8 because the Indonesia Ministry of Education, Culture, Research, and Technology didn't release the science textbook for grade 9. The science textbook based on the curriculum 2013 was published in 2017 and passed the assessment framework of *BSNP (Badan Standar Nasional Pendidikan)*. Meanwhile, the science textbook analyzed based on the curriculum Merdeka was published in 2021 and passed the assessment framework of *Badan Standar Kurikulum dan Asesmen Pendidikan*.

b. Nature of Science Analysis

The analysis of NOS content is limited to only analyze ten nature of science content adopted from Abd-El-Khalick (2008), which are empirical, inferential, creative, theory-driven, tentative, the myth of “The Scientific Method”, nature theories, nature of laws, social aspect of scientific enterprise, and social and cultural embeddedness of science.

c. In curriculum 2013, the topics were taken from 7<sup>th</sup> and 8<sup>th</sup> grade materials in students' science textbooks, which are limited by core competencies and basic competencies of science subjects attached in *Peraturan Menteri Pendidikan Nasional No. 37* (2018). In the curriculum Merdeka, the topics are limited to learning outcomes arranged in phase D (Kemendikbudristek, 2022).

## 1.5 Research Objective

Elaborating on the research problem that has been proposed, the objectives of this research are as follows:

a. To analyze the comparison of how the nature of science representation presented in junior high school science textbooks between curriculum 2013 and curriculum Merdeka.

- b. To analyze the delivery of the nature of science aspects on junior high school science textbooks based on curriculum 2013 and curriculum Merdeka.

### **1.6 Research Benefit**

The results of this study are expected to provide the following benefits:

- a. Book Author

For Book Authors of junior high school science textbooks, this research can be used as a reference for writing and developing a science textbook that needs to consist of NOS aspects to reach the objectives of science learning in the curriculum.

- b. Teachers

For Teachers, this research can give information about the content of NOS aspects that consist in junior high school science textbooks so the teachers can deliver NOS in the learning activity.

- c. Researchers

For researchers, this research is expected to be used by other researchers as a reference to conduct further research about NOS in the student science textbook.

### **1.7 Organizational of Research Paper**

This section describes a structure that leads the information along with the study. The structure is composed of five chapters as follows:

- a. Chapter I Introduction

This chapter includes the basic information about the research, which discusses the base of this research, research questions, the limitation of the problem, the objectives of the research, the benefits of the research, and the organizational structure of the paper.

- b. Chapter II Literature Review

This chapter includes the literature review of scientific literacy, nature of science, science textbook, curriculum 2013, curriculum Merdeka, the changing from curriculum 2013 and curriculum Merdeka, and others researches which are relevant to this research.

c. Chapter III Research Methodology

The points that are attached in this chapter are the research design used in this research, data source, the technique of data collection, materials, operational definition, research instrument, the technique of data analysis, data reliability test, and research procedure which consist of three main points (preparation stage, implementation stage, and completion stage) and completed with a flowchart to give the visual representation of how the research steps conducted.

d. Chapter IV Result and Discussion

This chapter includes the result and discussion of the research following the research questions stated in chapter I. The points included in this chapter are the result and discussion of the NOS analysis on the science textbook of curriculum 2013 and curriculum Merdeka and the differences between both science textbooks.

e. Chapter V Conclusion, Implication, Recommendation

The result and discussion of this research were summarized, which answered the research questions stated in Chapter I, followed by the implication and recommendation.