

# CHAPTER I

## INTRODUCTION

### 1.1. Problem Background

Science literacy is the capacity to use scientific knowledge, identify questions, and draw conclusions based on facts to understand the universe and make decisions from changes occurring due to human activity (OECD, 2003). Scientific literacy skills are essential for people to develop and to deal with issues related to science on a routine basis in everyday life (Kelp et al., 2023). An individual with scientific literacy is willing to engage in activities about science and technology, which require competencies to explain phenomena scientifically, evaluate and design scientific investigations, and analyze data and evidence scientifically (OECD, 2015). It can be interpreted that science literacy is closely related to a person's ability to solve problems in daily life based on scientific knowledge.

Indonesia is one of the participants in the Programme for International Student Assessment (PISA), organized by the Organization for Economic Cooperation and Development (OECD). The program aims to evaluate students' abilities and knowledge in reading, mathematics, and science literacy. Implemented in several countries since 2000, PISA assesses students in three-year intervals (OECD, 2004). From 2000 to 2022, Indonesian students' average score in science literacy skills has remained below the completeness standard set by PISA. This indicates a lack of understanding among students about the scientific processes and concepts and the application of scientific knowledge in everyday life.

Indonesia's performance in the science literacy assessment has been consistently low over the years. In 2000 and 2003, with 41 and 40 participating countries respectively, Indonesia ranked 38th. In 2006, Indonesia's rank dropped to 50th out of 56 participating countries. In 2009, Indonesia ranked 60th out of 65 countries. In 2012, Indonesia's rank dropped from second to last, at 64th out of 65 countries. In 2015, Indonesia's rank improved slightly to 62nd out of 69 participating countries. The assessment in 2018 revealed that Indonesia's ranking had dropped further to 71st out of 79 participating countries. The 2022 science

literacy assessment indicates that Indonesia ranks 67th among 81 countries, which is an improvement of 5-6 positions from PISA 2018. However, the country's average science literacy score in PISA 2022 is 383, which is 13 points lower than the PISA 2018 average score. The global average score in PISA 2022 is 485, The data shows that the student scores in Indonesia on the PISA test are still at the lowest score.

One of the factors that causes the low level of science literacy is the quality of learning resources. One of the main learning resources for learners is using textbooks provided by the school. Textbooks play an important role in the success of the learning process. The suitability and quality of textbooks can affect the quality of learning outcomes, which means that good quality textbooks will help students acquire knowledge and information, and teachers will find it easier to guide students in the learning process (Puslitjakkdikbud, 2017). Textbooks are mandatory references containing learning materials to enhance knowledge and technology skills, compiled based on national education standards. (Permendiknas No. 11 of 2005). To facilitate the learning process, textbooks are needed, both for students and educators, and the competence of learners can be achieved as expected (Puslitjakkdikbud, 2017). It can be concluded that the role of textbooks is very important to improve students' knowledge and abilities, including improving science literacy skills.

It is important to understand the existence and role of science textbooks, especially Biology textbooks. Therefore, It is necessary to analyze the content of the Biology textbook. Biology textbooks as part of science must display aspects of science learning, namely concepts, processes, and contexts of science as well as the relationship between science and technology and society in the book's content (OECD, 2003). If the Biology textbook applies aspects of the nature of science, it will increase students' potential to learn science and science process skills. Improving science process skills will be able to improve students' scientific literacy. Scientific literacy is concerned with how students understand science and apply scientific thinking in daily life.

Analysis of science textbooks that have been carried out by previous researchers such as Ginting and Suriani (2018) shows that the results of the study

analyzed the scientific literacy of high school biology textbooks measured by referring to the rubric of scientific literacy dimension instrument assessment. The highest value is found in the science of the body of knowledge at 77.20% with fairly good criteria, based on the dimensions of science literacy as an investigative process with an average of 11.32% with unfavorable criteria, based on the dimensions of science literacy as a way of thinking with an average of 3.39% with unfavorable criteria, based on the dimensions of science literacy as a technology and society relationship with an average of 8.09% with unfavorable criteria (Ginting & Suriani, 2018). Therefore, it can be seen that the dimensions of science literacy are unbalanced, with three dimensions of science having poor criteria.

Previous research on the meta-analysis of misconceptions in grade XI biology textbooks from Hanifah & Zulyusri (2021), showed that in the three grade XI biology textbooks analyzed, misconceptions were found in textbooks with the category of oversimplifications, which is the concept put forward too simply so that the concept becomes incomplete or even wrong. Simplification of a concept should follow the main concept, not reduce or even lead to misconceptions. The book contains obsolete concepts and terms. The order of misconception categories from the largest to the smallest found in several Grade XI high school biology textbooks are oversimplifications category, misidentifications, over-generalizations, under-generalizations, and obsolete concepts and terms (Hanifah & Zulyusri, 2021). This can be one of the reasons why Indonesian students have difficulty in answering questions contained in the PISA test.

Based on the result of the PISA test about Indonesia's low science literacy score compared to other countries, it is necessary to analyze the comparison of the level of science literacy in biology textbooks used by Indonesian students and other countries which has a higher PISA test score than Indonesia based on four aspects of science literacy according to Chiapetta et al., (2007), include the knowledge of science, the investigative of science, science as a way of thinking and the interactions of science, technology and society.

## **1.2. Problem Identification**

Based on the background description of the problem above, the problems obtained can be raised:

1. Indonesia's performance in the science literacy assessment has been consistently low over the years.
2. The textbooks have not included the four components of science literacy.

## **1.3. Scope of Study**

For this research to be carried out properly while making it easier for researchers to focus research, this research needs scope. The scope of the research conducted is:

1. Books focused on three student biology textbooks published by Cambridge, Sasbadi Holdings Malaysia, and Erlangga.
2. Book comparison focused on the topic of the respiration system.

## **1.4. Scope of Problems**

For the research to not be separated from the objectives and to avoid confusion in the discussion, interpretation of the title, and the problem, the researcher makes the following limitations. The level of science literacy in the content of biology textbooks can be known by analyzing four themes or dimensions of science literacy in the content of the book which include:

1. Science as a body of knowledge.
2. Science as a way of thinking.
3. Science as a way of investigation.
4. Interaction of science, technology, and society.

## **1.5. Research Question**

Based on the background described above, the problem formulation in this study is how the level of science literacy of high school Biology textbooks based on themes or dimensions of science literacy which include:

1. What is the comparison of the level of science literacy in the aspect of (science as a body of knowledge) in student Biology textbooks of Erlangga, Sasbadi Holdings, and Cambridge?
2. What is the comparison of the level of science literacy in the aspect of (science as a way to investigate) in student Biology textbooks of Erlangga, Sasbadi Holdings, and Cambridge?
3. What is the comparison of the level of science literacy in the aspect of (science as a way of thinking) in student Biology textbooks of Erlangga, Sasbadi Holdings, and Cambridge?
4. What is the comparison of the level of science literacy in the aspects of (Interaction of Science, Technology and Society) in students' Biology textbooks of Erlangga, Sasbadi Holdings, and Cambridge?

#### **1.6. Research Objectives**

Based on the formulation of the problem above, the objectives to be achieved in this study are:

1. To determine the comparison of the level of science literacy in the aspect of (science as a body of knowledge) in students' Biology textbooks of Erlangga, Sasbadi Holdings, and Cambridge?
2. To determine the comparison of the level of science literacy in the aspect of (science as a way to investigate) in students' Biology textbooks of Erlangga, Sasbadi Holdings, and Cambridge?
3. To determine the comparison of the level of science literacy in the aspect of (science as a way of thinking) in students' Biology textbooks of Erlangga, Sasbadi Holdings, and Cambridge.
4. To determine the comparison of the level of science literacy in the aspect of (Interaction of science, technology, and society) in students' Biology textbooks of Erlangga, Sasbadi Holdings, and Cambridge?

### **1.7. Research Benefits**

The results of this analytical research are expected to provide benefits:

1. For students, this serves as material to enhance their knowledge in scientific literacy.
2. For Teachers, the results of this research are expected to be used as a reference for consideration in selecting biology textbooks in accordance with aspects of science literacy to improve the quality of learning.
3. For Researchers, the results of this study can be used as a reference for creating and developing biology textbooks that are appropriate and fulfill aspects of science literacy.