

CHAPTER I

INTRODUCTION

1.1 Background of The Problem

In the educational aspect, scientific literacy is required, and this began to be accommodated in the KTSP (Education Unit Level Curriculum in 2006, then in the 2013 Curriculum it became increasingly clear through inquiry and a scientific/scientific approach). In general, scientific literacy focuses on four aspects which are related to each other, namely knowledge, context, competence, and attitude. Scientific literacy is an individual's ability to apply their knowledge to identify questions, provide scientific explanations or understanding, compile or construct new knowledge, conclude based on various scientific evidence, and the ability to develop hypothetical mindset so that they can participate and overcome various ideas and issues related to science (Pertiwi, 2018). The description of scientific literacy shows that when students learn scientific literacy, they can use scientific knowledge, identify questions, and formulate conclusions based on evidence to understand and help make decisions about the natural world and human interactions with the environment (Ardiyanti et al., 2019). Building scientific literacy in the current generation does not mean making students become researchers, it is more about building knowledge of science and technology to play a role in making choices that have an impact on current and future survival (Ramli et al., 2022).

There are 16 skills needed in the 21st century that have been identified by the WEF (World Economic Forum), and scientific literacy is one part of them (WEFUSA, 2015). The point of view that can be viewed through scientific literacy skills is the importance of thinking and acting skills, using scientific thinking, and involving mastery of thinking in responding to social issues. The scientific way of thinking is realized through a scientific/scientific approach which is described into five components, namely observing, asking, gathering information, associating and communicating (Budiono, 2022). The urgency of scientific literacy for students is to understand the environment, technology, economy, health and modern society (Pratiwi et al., 2019).

One way to measure the level and level of students' scientific literacy skills is through assessments. One of the assessments of the education system, especially secondary education, is through PISA (Program for International Student Assessment). PISA measures student performance in three main areas, namely reading, mathematics and science. PISA is part of the OECD (Organization for Economic Cooperation and Development) program, an organization that operates in the field of economic cooperation and development. PISA members consist of 72 countries around the world, and PISA tests students aged 15 years, namely when they are in grade 9 of Junior High School (SMP) or the beginning of Senior High School (SMA) through basic tests, namely reading, mathematics, and science by focusing on one subject every 3 years. Based on the PISA test, the scientific literacy of Indonesian students is lower than the average scores of students from other countries (Jufri et al., 2019). The OECD has announced the results of Indonesia's 2018 PISA scores (Markus, 2019). Based on these results, Indonesia's ranking experienced a decline compared to the 2015 PISA results (Merta et al., 2020a). The results of the PISA assessment of Indonesian students over the last four years, namely 2006, 2009, 2012 and 2015, have a low average achievement of scientific literacy scores in the score range of 382-403 (Hidayah et al., 2019a, 2019b). Then in 2018 it experienced another decline, producing a scientific literacy score of 396 (Yusmar & Fadilah, 2023).

Based on the 2022 public education report in North Sumatra, Medan City, there is a table of literacy skill achievement results, the results of literacy skill acquisition in 2022 Middle School in Medan City are still below the minimum qualifications. Based on indicators of literacy skills on students' ability to understand, use, evaluate and reflect on various texts to solve problems and develop individual skills as citizens of Indonesia and the world to participate productively in society, still less than 50% of students reach the minimum level of literacy skills (Puseddik, 2022).

From this information it can be understood that the scientific literacy of Indonesian students is still low compared to the international average and is at a low level in the PISA measurement. This is an urgent problem that needs to be resolved and a solution is currently being sought.

One of the contexts tested in PISA is environmental pollution. Environmental pollution can occur in springs, wells, rivers, swamps, lakes and seas. Water pollution can come from industrial waste, household waste and agricultural waste. One of the current issues that connects science with people's lives is environmental pollution. Several efforts to deal with environmental pollution have been carried out, one of which is through environmental education programs (Subiantoro, et al., 2013).

The low ability of students in scientific literacy is caused by several factors. There are several factors causing the low scientific literacy abilities of Indonesian students which have been put forward by researchers in relation to the results of PISA Indonesia. Among them (1). Selection of textbooks, (2). Misconceptions, (3). Non-contextual learning, (4). Low reading ability, and (5). The learning environment and climate are not conducive (Fuadi et al., 2020). Another factor that influences students' scientific literacy is the teacher (Fakhriyah et al., 2017). Based on research by Ardan (2016), it is said that teachers mostly use printed books or traditional teaching materials to interpret and understand the material, so that the content of the book material is not extensive and focuses on the topic.

Therefore, it is necessary to use teaching materials that help learning by utilizing the role of technology in the form of electronic tools. The role of electronic teaching materials can stimulate students' interest in being active and independent as well as increasing scientific literacy competency abilities (Mijaya et al., The weakness of the current learning process is not only the lack of teacher competence in learning, but also the lack of innovation in learning resources/teaching materials used in learning, so that students are less able to master the material well and correctly during learning (Farhana et al., 2021). Electronic books (E-books) are innovative and interactive teaching materials in digital form and a new trend in various parts of the world, which have advantages compared to books conventional in general (Huda, 2021). The use of E-books can show a positive response to interest in learning, especially in increasing students' scientific literacy (Taufaliyati et al, 2020). This is reinforced by Ozturk (2021) who states that, E-books can improve students' scientific literacy skills and language skills in terms of word recognition and fluency in learning.

Ariyanti & Wilujeng (2018) stated that the aim of SETS is to present science and technology as a methodology by involving students. Students can make the best decisions by comparing the advantages and disadvantages of knowledge that arise as a result of scientific developments when solving problems that occur in society. The advantages of the SETS approach are that students' activity experiences are always relevant to their level of development, the activities chosen are in accordance with the students' wishes so that learning is more meaningful, preparing pragmatic activities that are adapted to the problems usually encountered in the students' environment, besides being able to improve thinking skills. as well as students' social skills. Therefore, by implementing the SETS (Science, Environment, Technology, and Society) approach, it is hoped that it will be able to improve scientific literacy skills so that it has a positive impact on subject grades, especially science lessons. The SETS approach has a close relationship with science subjects because this approach can increase motivation, activity and scientific literacy skills. The development of E-books based on the SETS approach brings students to learn actual phenomena directly that exist in everyday life combined using the SETS approach with the hope that in carrying out the learning process they can provide responses and initiatives both individually and in groups so that they are able to learn actively. The advantage of this approach is that it can clarify problems that exist in the student's environment and then understand them and take a stand to resolve these problems, while the function of E-books is learning media that is used independently to improve mastery of the material.

The results of the first phase of ADDIE observations and interviews, there is analysis in the field of data showing that the school uses K-13 for the learning process, the AKM scores are shown in the Appendix and then the students' low scientific literacy abilities. caused by teachers who still use conventional books in learning, teaching methods that still use the lecture method, and the lack of available books to support learning in class to increase students' scientific literacy. This factor is supported by Purwani et al. (2018) research, states that the lack of use of books, school infrastructure, curriculum, learning methods and models are factors causing low scientific literacy.

Based on these problems, researchers decided to research and develop teaching materials in the form of SET-based E-books as electronic teaching materials that can improve students' scientific competence regarding environmental pollution through analysis, design, development, implementation and evaluation (ADDIE).

Development is carried out through analysis of boundary conditions and needs, planning the product to be produced, product development, implementation through experimentation and, in the final step, evaluation of the product produced. It is hoped that with the development of SETS-based E-books, the resulting products will not only improve the scientific reading skills of low achieving students, but can also serve as a guide for teachers in developing teaching materials that are useful for use in learning. This problem made researchers interested in conducting this research with the title "**Development of a SETS-Based E-book on Environmental Pollution Material on Science Literacy Skills for RK Serdang Murni Lubuk Pakam Private Middle School Students**".

1.2 Identification of Problems

Based on the background of the problem above, several problems can be identified as follows:

1. Students' scientific literacy abilities based on PISA and the 2023 general education report in junior high schools are still low.
2. Lack of practicality of conventional teaching materials in the form of printed books which are used as student learning resources.
3. Lack of development of electronic teaching materials to improve students' scientific literacy.
4. Teachers still use conventional teaching materials in the form of printed books which are used as student learning resources.
5. Students have difficulty understanding the concept of environmental pollution material.

1.3 Scope of Problem

In order for this research to be more focused, the researcher limited the research problem as follows:

1. The research method used is the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) development research method.

2. The aspects of scientific literacy used are limited to the competency aspect, namely explaining scientific phenomena, evaluating and designing scientific investigations, and interpreting scientific data and evidence.
3. The evaluation stage of the effectiveness of SETS-based E-books can only be seen from the N-gain results obtained.

1.4 Formulation of The Problem

The formulation of this research problem is as follows:

1. What is the feasibility of a SETS-based E-book based on material experts?
2. What is the feasibility of a SETS-based E-book based on media experts?
3. What is the feasibility of SETS-based E-books based on language experts?
4. What is the practicality of SETS-based E-books based on teacher responses.
5. What is the practicality of SETS-based E-books in implementing student responses?
6. How effective is the SETS-based E-book material on human environmental pollution to improve students' scientific literacy skills?

1.5 Research Purposes

In accordance with the problem formulation, the aim of this research is to find out:

1. Feasibility of SETS-based E-books based on material experts.
2. Feasibility of SETS-based E-books based on media experts.
3. Feasibility of SETS-based E-books based on language experts.
4. Practicality of SETS-based E-books from teacher responses
5. Practicality of SETS-based E-books in terms of implementing student responses.
6. The effectiveness of SETS-based E-books on environmental pollution on students' scientific literacy abilities.

1.6 Benefits of Research

The benefits or contributions obtained from this research can be described as follows:

1. Theoretical Contributions

It is hoped that the results of this research can increase and expand knowledge about scientific literacy in science lessons, as well as increase knowledge about the

importance of scientific literacy, especially science subjects for environmental pollution material.

2. Practical Contribution

- 1) For students in this research, it is hoped that after learning using SETS-based E-book-based teaching materials, it is hoped that students can increase their scientific literacy on environmental pollution material.
- 2) For teachers, it is hoped that this research can be a reference in developing SETS-based E-book-based teaching materials to increase students' scientific literacy.
- 3) For schools, it is hoped that this research can be used as material for evaluating learning in schools regarding the effectiveness of the teaching materials used by teachers in science learning, especially regarding environmental pollution material.
- 4) For researchers, this research provides direct experience in developing SETS-based E-books to improve scientific literacy skills on environmental pollution material in class VII SMP.

1.7 Operational Definition

Operational definitions to understand the terms used in this research are as follows:

1. 21st century learning is learning that refers to the development of SETS-based E-books, literacy and life skills as part of the classroom experience
2. Scientific literacy is knowledge and understanding of scientific concepts and processes that enable a person to make the right decisions and be able to play an active role in all aspects of life. The literacy aspects measured are (1) students' ability to explain scientific phenomena, (2) students' ability to evaluate and design scientific investigations and (3) students' ability to interpret scientific data and evidence.
3. One of the electronic-based teaching materials is electronic books (E-books). E-books are described as books that are published digitally, or converted to electronic format from printed paper. E-books can be accessed on mobile devices.

4. SETS is a learning approach that involves students in exploring real world problems and contexts, by utilizing the abilities of four scientific disciplines, namely Science, Environment, Technology and Society.
5. SETS-based E-books are electronic teaching materials that integrate Science, Environment, Technology and Society simultaneously in one material
6. Environmental pollution is one of the learning materials studied in science subjects in class VII SMP, which can occur in springs, wells, rivers, swamps, lakes and seas. Water pollution can come from industrial waste, household waste and agricultural waste.