CHAPTER I
INTRODUCTION

This chapter provides general outlines of the study. It covers background of study, statement of problems, aims of study, scope of the study, significance of the study and organization of the thesis.

1.1 Background of The Study

In the face of escalating environmental challenges and the rapid advancement of science and technology in the 21st century, the development of both environmental consciousness and scientific literacy has become increasingly critical in education (UNESCO, 2021; Valladares, 2021). The global community faces unprecedented environmental challenges, from climate change to biodiversity loss, making environmental awareness and action more crucial than ever (IPCC, 2022). Simultaneously, the need for scientific literacy has intensified as society grapples with complex environmental issues that require evidence-based decision-making and critical thinking skills (Kinslow, Sadler, & Nguyen, 2019).

Globally, youth are calling for climate change education that empowers them to understand and act on climate issues while recognizing humanity's role within nature. They seek interdisciplinary, learner-centered, and experiential approaches that make learning engaging, solutions-focused, and action-oriented. They emphasize the need for well-supported teachers, as many currently lack confidence and resources. They also view schools as essential spaces for climate learning and want a greater voice in school-based climate decisions. Finally, they value education that connects with local communities, ensuring climate topics are relevant to their immediate environments (UNESCO, 2022).

This global call to action strongly resonates with Indonesia's current environmental context, where students face a growing urgency to understand and respond to pressing ecological challenges. The country is battling a range of environmental problems—from deforestation in Sumatera and Kalimantan, severe air pollution in urban centres like Jakarta, to widespread water contamination in the rivers in Papua. According to Global Forest Watch (2024), from 2021 to 2024, 57% of tree cover loss in Indonesia occurred in natural forests, while IQAir (2023) reported that Jakarta ranks among the world's most polluted cities. Moreover, mining activities in Papua have caused severe environmental pollution and health

issues in regions like Buyat Bay and Weda Bay, contaminating water sources with heavy metals and disrupting the lives and livelihoods of local communities (Sulistya, 2025). These realities demand an educational response that equips Indonesian youth not only with language skills, but also with the knowledge and agency to tackle environmental problems within their own communities. Therefore, integrating green education into English language learning is essential—not just to meet curricular goals, but to cultivate future citizens who are both environmentally literate and socially responsible.

Green Education (GE) is a comprehensive educational approach that advances sustainability by integrating environmental, social, and economic domains. While GE encompasses all three pillars, this study focuses specifically on the environmental domain, which promotes a multidisciplinary understanding of ecological challenges—such as biodiversity loss, pollution, and resource depletion—through the lenses of physical, biological, social, and economic sciences (UNESCO, 2024). Notably, researchers (e.g., Jodoin & Singer, 2019; Ludwig, 2021; Garzón-Díaz, 2021; Setyowati et al., 2022) often use *Green Education* interchangeably with *Environmental Education*, referring to initiatives that raise awareness of climate change, ecological degradation, and sustainable living. In this study, GE refers specifically to the integration of environmental topics into formal education, particularly through English learning reading materials designed to enhance students' environmental knowledge and sustainability awareness.

Although GE traditionally includes skills, values, and attitudes for sustainable citizenship (McKeown et al., 2002; UNESCO, 2018), this study narrows its scope to knowledge acquisition—specifically, the factual and conceptual understanding of environmental issues as conveyed through English learning reading materials. This focus stems from the role of reading texts as vehicles for content exposure and environmental literacy, rather than direct drivers of behavioral change. According to GE, to cultivate environmentally responsible behavior, prior research highlights three knowledge types: system knowledge (understanding ecological processes), action-related knowledge (knowing how to act), and effectiveness knowledge (awareness of behavioral impact) (Kaiser & Fuhrer, 2003; Frick et al., 2004; Braun & Dierkes, 2019). This study concentrates on system knowledge, as it provides the foundational awareness necessary for environmental literacy and aligns with the cognitive objectives of English Language Teaching (ELT) (e.g., understand, apply, analyse, evaluate, and create) (Wilson, 2016). While action-related and effectiveness knowledge are critical for behavioral outcomes, they require interactive, value-based instruction beyond the

scope of reading comprehension. Thus, by prioritizing system knowledge, this study ensures that English reading materials effectively build environmental understanding while remaining pedagogically feasible within ELT frameworks.

This emphasis on environmental knowledge provides students with the essential content foundation for environmental literacy. However, to meaningfully engage with and process this content, students must also develop the skills needed to analyze, interpret, and evaluate scientific information. This is where the role of scientific literacy becomes pivotal. Aspects of scientific literacy encompass both knowledge of science and science-based technology, reflecting their distinct purposes—science seeks to understand the natural world, while technology addresses human challenges through practical solutions. In addition to conceptual understanding, scientific literacy also involves *skills and competencies* related to scientific inquiry and reasoning. These include the ability to interpret data, evaluate evidence, apply scientific methods, and communicate scientific ideas effectively. While scientific literacy includes contexts and knowledge, this study focuses specifically on scientific competencies—the skills that enable learners to engage with, analyze, and reflect on scientific issues meaningfully (OECD, 2019; Zhang, Liu, & Feng, 2023; Kumar & Choudhary, 2024). These skills are essential for fostering critical thinking and informed decision-making, and they align with the instructional goals of English learning reading materials designed to promote analytical engagement with environmental texts.

The necessity for scientific literacy, on the other hand, has become equally pressing in today's era of widespread misinformation and complex environmental challenges. Studies indicate that only small numbers of students can effectively evaluate scientific evidence related to environmental issues (Novak & Treagust, 2022). This gap in scientific literacy skills significantly impacts students' ability to understand and respond to environmental challenges, with research showing that students who lack strong scientific literacy skills are less likely to engage in evidence-based environmental decision-making (Kumar, Choudhary, & Singh, 2024). Researchers have emphasized that fostering scientific literacy should begin at the early stages of formal education, as early engagement with science-related activities allows children to develop foundational understandings of the nature of science (NoS), become aware of scientific process skills, and begin connecting school science with real-life contexts—enabling them to make greater sense of science in their everyday lives (Kähler, Hahn, & Köller, 2020; Murphy, Smith, & Broderick, 2021). The integration of scientific literacy skills has thus

become essential for enabling students to critically evaluate environmental information and develop informed perspectives on ecological issues.

The infusion of green education and scientific literacy skills into mainstream education has emerged as a vital strategy for preparing younger generations to address these challenges effectively (Stevenson et al., 2013). However, current educational practices often treat environmental education, scientific literacy development, and language learning as separate domains, potentially missing valuable opportunities for meaningful integration (Carrejo, & Reinhartz, 2014). This compartmentalization can lead to what educators term "fragmented learning," where students struggle to connect scientific concepts with real-world environmental issues and effectively communicate their understanding (Yang, 2022). In Indonesia's educational context, while English language instruction holds a prominent position in the national curriculum, there remains considerable potential to leverage language learning as a vehicle for developing both environmental knowledge and scientific literacy skills (Nur, Anas, & Pilu, 2022).

A substantial body of research supports the effectiveness of integrated approaches in education. Studies on Content and Language Integrated Learning (CLIL) have consistently demonstrated positive outcomes in both content mastery and language acquisition. Garzón-Díaz (2021) found that using a technology-based CLIL (Content and Language Integrated Learning) project in science classes offers a great way to combine subject content with a foreign language. Implementing CLIL not only brings together science and language learning but also helps develop students' understanding of "scientific citizenship." The results suggest that science teachers who want to use English in CLIL should consider scientific citizenship as a key part of lesson planning. Students were motivated to use English in class and enjoyed looking up information online in both English and Spanish. Using ICT, such as videos, also encouraged students, who reported enjoying both watching and creating videos. Overall, this approach successfully motivated students to use English in science, engage with ICT, work cooperatively, and build their scientific citizenship.

Similarly, Hussain, Parveen, & Mehmood (2024) investigated eco-centric awareness and ecological literacy among English Language Learners (ELLs) by analyzing the integration of environmental content in elementary English Language Textbooks (ELT). They explored how ecological issues and solutions are presented. Findings show that incorporating green content fosters environmental awareness and sustainability among ELLs, effectively promoting

eco-literacy through a contrastive approach that balances ecological threats with protective actions like tree planting. Another research by Lee et. al (2019) proposes a conceptual framework that integrates science and language learning to support all students, particularly English learners (ELs), by aligning with shifts in science education from the *K-12 Science Framework* and Next Generation Science Standards (NGSS) alongside recent second language acquisition approaches. The framework outlines design principles and strategies for developing NGSS-aligned materials that promote both science and language learning in elementary classrooms. Emphasizing collaboration between science and EL education, this framework aims to help students meet rigorous content standards while advancing their English proficiency.

In the Indonesian context, several studies have explored various aspects of integrated learning. Ramadhan, Sukma, & Indriyani (2021) addressed the need for teachers to create relevant, task-based digital teaching materials for distance learning, which are accessible via computers or mobile devices and adaptable even with limited digital resources. Recognizing the importance of environmental education, the study aims to develop digital language materials that incorporate environmental awareness for middle school students. Using the Plomp Model (preliminary research, prototype, and assessment phases) and descriptive data analysis, the results indicate that these materials are highly valid and suitable for student use. Different study by Gayatri et al. (2023) emphasized the essential role of social relations and English as an international language in supporting sustainable global development, particularly in the context of globalization. It argues that Indonesian EFL teachers should integrate sustainability goals into their teaching to help students use English for real-world problem-solving. Through a conceptual approach and library research, the study explores sustainable development integration in EFL instruction using ICT. It proposes a culturally relevant, context-based blended framework for sustainable EFL practices in Indonesia, offering practical recommendations for enhancing sustainability in blended language education in Indonesia and similar contexts.

Despite these encouraging findings, there remains a significant gap in understanding how to effectively combine both green education and scientific literacy skills within English learning reading materials. While previous studies have explored these elements separately, limited research has been conducted on the systematic infusion of both components into English language teaching materials (Micalay-Hurtado & Poole, 2022). This gap is particularly notable in the Indonesian educational context, where environmental challenges are increasingly

pressing and scientific literacy skills are crucial for national development (Ni'mah, 2019; Ministry of Education Indonesia, 2020).

Furthermore, existing research has primarily focused on either environmental awareness or scientific literacy in isolation, rather than examining their potential synergistic effects when combined in language learning materials (Jung & Dos Santos, 2022). The lack of comprehensive frameworks for developing and assessing such infused materials presents a significant challenge for educators and curriculum developers. Additionally, there is limited understanding of how such infusion affects students' motivation and engagement in learning English while developing both environmental awareness and scientific literacy skills (Monroe et al., 2019).

The absence of empirically-validated models for integrating green education and scientific literacy skills into English learning reading materials represents a critical gap in educational research and practice (Ramadhan, Sukma, Indriyani, 2019; Winarni, Hambali, & Purwandari, 2020). This gap becomes particularly significant when considering the unique linguistic and cultural context of Indonesian students, who must develop these crucial competencies while simultaneously mastering English as a foreign language (Mashudi et al., 2022). Moreover, existing materials often fail to address the specific challenges faced by Indonesian students in comprehending scientific concepts through English-medium instruction while developing environmental awareness (Putri, Silvhiany, & Inderawati, 2024).

To address these significant gaps, the purpose of this study is to analyse the existing English learning reading materials, review the process of designing and developing them and eventually design and develop English learning reading materials that systematically incorporate both green education environmental topics and scientific literacy skill components that expected to meet the need of the Indonesian educational context and 8th-grade students' cognitive development levels. Moreover, the product of this research is in the form of multimodal learning reading materials as the primary medium of instruction to promote green education environmental topics and scientific literacy in English language classrooms. This text form supports flexible and learner-centered delivery while also fostering students' technology literacy, as encouraged by the *Kurikulum Merdeka*, which promotes the use of both printed and digital texts to help learners navigate digital information effectively.

Learning reading materials have been selected as the primary medium for infusing green education and scientific literacy skills due to their unique advantages in developing

complex understanding and critical thinking abilities. Research indicates that well-designed learning reading materials can simultaneously develop language skills, content knowledge, and analytical abilities (Ma, Ismail, & Saharuddin, 2023). This is because learning reading materials can provide a rich and diverse range of texts that can be used to explore a variety of topics related to green education and scientific literacy. By engaging with these texts, students can develop their ability to analyze information, evaluate arguments, and think critically about the world around them. Furthermore, learning reading materials can provide opportunities for students to practice and develop their language skills, such as reading comprehension, vocabulary development, and writing. By combining language learning with content learning, reading materials can help students to become more engaged and motivated learners (Hauschild, Poltavtchenko, & Stoller, 2012). Additionally, reading materials provide a flexible platform for incorporating various text types, data representations, and scientific arguments, making them particularly effective for developing both environmental awareness and scientific literacy skills (Heliawati, Rubini, & Firmayanto, 2020).

1.2 Research Questions

Based on the background of this study, the research questions are formulated as follows:

1. To what extent are green education and scientific literacy skills infused in the existing English learning reading materials for 8th graders?
2. How are the procedures of infusing green education and scientific literacy skills into English learning reading materials for 8th graders?
3. How is the design of green education and scientific literacy skills-infused English learning reading materials for 8th graders?
4. What is the readability of the developed English learning reading materials in promoting both green education awareness and scientific literacy skills among 8th graders?

1.3 Research Purposes

Based on the research questions above, the purposes of this study are:

1. To analyze and evaluate the current state of green education and scientific literacy skills infusion in existing English learning reading materials for 8th graders.

2. To identify and establish the key components and criteria necessary for developing English learning reading materials that potentially infuse green education and scientific literacy skills.
3. To design and develop innovative English learning reading materials that systematically infuse green education and scientific literacy skills for 8th-grade students.
4. To find the readability of the developed green education and scientific literacy skills-infused English learning reading materials for 8th graders

1.4 Scope of the Study

This study focuses on the development and integration of green education and scientific literacy skills into English learning reading materials specifically designed for 8th-grade students. The scope encompasses the design, development, and validation of learning reading materials that combine environmental awareness, scientific thinking skills, and English language learning objectives. In terms of content coverage, the green education component includes fundamental environmental concepts, sustainability principles, and ecological awareness on "Climate Science" aspects such as weather and climate, greenhouse gases, carbon cycle, water cycle, pollution and resources conservation, and renewable energy relevant to middle school students' cognitive level and daily life experiences. The scientific literacy skills aspect focuses on developing students' abilities in scientific reasoning, critical thinking, data interpretation, and evidence-based decision-making through English learning reading materials. The study is limited to multimodal learning reading materials as the primary medium of instruction. The research will be conducted within the context of Indonesian middle schools, particularly focusing on 8th-grade English language classrooms, and will align with the national curriculum requirements and educational standards for this grade level.

1.5 Significance of the Study

This research holds both theoretical and practical significance in the educational field. Theoretically, it fills a gap in understanding how green education and scientific literacy can be effectively integrated into English language learning, particularly in the Indonesian context, while providing a framework that addresses interdisciplinary teaching approaches and responds to the global need for strategies that develop environmental awareness alongside language and scientific skills. Practically, it offers teachers ready-to-use materials and pedagogical guidelines

to enhance their teaching effectiveness, while students benefit from an integrated learning approach that develops their English proficiency, scientific thinking, and environmental awareness. For curriculum developers and educational institutions, the study provides a model for designing integrated materials that efficiently meet multiple learning objectives. Additionally, the findings and resources can serve as a reference for future research or similar programs, contributing to the advancement of educational practices internationally.

1.6 Organization of the Thesis

This thesis is organized into five comprehensive chapters. Chapter One introduces the research by presenting the background of the study, research questions, purposes, scope, and significance. It establishes the foundation for understanding the importance of integrating green education and scientific literacy skills into English reading materials. Chapter Two provides a theoretical framework through an extensive literature review covering key concepts in green education, scientific literacy skills, English reading, English learning reading materials, and learning reading materials development, learning reading for eighth graders, design and development research, previous studies, and conceptual framework. Chapter Three details the research methodology, including the research design, data, data source, and instrument, data collection procedures, and data analysis procedures. Chapter Four presents the findings and discussion. It includes results of document analysis and interview, procedure and development of developed English learning reading materials, and readability of the developed English learning reading materials. Finally, Chapter Five concludes the thesis by summarizing the key findings, discussing implications for educational practice, acknowledging limitations, and providing recommendations for future research and implementation of integrated English learning reading materials. This organization ensures a logical flow of information from the conceptual framework to practical implementation and evaluation of the developed materials.