

CHAPTER I

INTRODUCTION

1.1. Background

Education's most important goal is to transform generations into moral people who are capable of contributing their knowledge to the advancement of society and the preservation of the environment in order to achieve a sustainable future. To achieve this aim, educational institutions must be established on the foundation of long-term tradition. Sustainable development is generally accepted as a disciplinary heritage in various areas of research and development around the world. In 2002, the World Summit on Sustainability Education was held in Johannesburg, South Africa, to commit to a vital action to tackle the challenges of promoting sustainable development and strengthening the capacity of people to deal with environmental and developmental concerns. Meanwhile, "ecoversity" was developed as a strategic program in the United Kingdom with the goal of integrating sustainable development.

Some events related to sustainable developments also exist in Indonesia but there is a lack of an integrated massive campaign due to the diversity that makes it impossible to adopt the concept from overseas (Tresnawati et al., 2021) . Fundamentally, Indonesia as a multicultural country should be well considered in creating a collaboration among curriculum, campuses and communities. The cultural, environmental, health, peace, social justice, scientific, and technological perspectives may all be seen in the context of sustainability education (Brundiars et al., 2010).

When considering human activities from the perspective of sustainability, it can be shown that a strong conceptual border surrounding the system lowers comprehension and perspective. Furthermore, sustainability calls into question the national tradition that is mirrored in the disciplinary foundation of many higher education structures. When it comes to real-world concerns, such as environmental or global climate issues, disciplinary reduction is very hard to

handle (Brundiers et al., 2010). The United Nations Educational, Scientific and Cultural Organization (UNESCO) states that to demonstrate a range of key features refers to educational institution should be concerned in interdisciplinary and holistic, and so embedded across the entire curriculum, built around critical thinking and problem solving, as well as confidence building in the face of dilemmas and sustainability challenges (Sterling, 2010). Essentially, sustainability is about raising awareness of the world and developing understandings of complex economic, social, and environmental systems in post-secondary education (Sterling, 2010). It follows that the educational institution should incorporate it into the pedagogy, curriculum, and student activities that allow students to develop their skills, values, and knowledge in order to contribute to the advancement of sustainable development.

Identifying and reaching out to populations with promising ways of achieving the catalytic effect is critical to achieving the objective of long-term sustainability. The position of the teacher as an educator in the classroom and as an influencer in society can help to bring about positive change. When an educator/lecturer/teacher approaches the subject of sustainability literacy from a cross-disciplinary and experiential learning perspective, sustainability literacy may be accomplished (Opoku et al., 2019). In order to adequately prepare teachers to carry out this responsibility, education and training are key components that must be addressed, assessed, and improved on a regular basis. Sustainability literacy, along with other literacy such as math literacy and language literacy, should be incorporated in teacher professional development programs. Essential literacy and larger profession-specific abilities, such as classroom management, serve to summarize and represent the characteristics that teachers must possess in order to be successful in their jobs. Teachers who gain sustainability literacy gain the ability to (a) approach society critically; (b) teach sustainability topics and ways of thinking to their students; (c) make informed decisions; and (d) contribute to rethinking intrapersonal, interpersonal, intragroup, and intergroup conceptions of society and the environment (Bertschy et al., 2013). Sustainable living literacy

should be integrated into everyday education and across the curriculum, alongside other critical literacy, according to the National Council of Teachers of Sustainability (Means et al., 2017).

Following the education for Sustainable Development Goals (SDGs), it was said that fostering sustainable development necessitates a critical examination of environmental concerns. (Opoku et al., 2019) stated that the environment could have a significant impact on the achievement of a number of SDGs, including goal 7 (affordable and clean energy), goal 9 (infrastructure and innovation), goal 11 (sustainable cities and communities), goal 13 (climate change), and goal 15 (biodiversity). It appears that multidisciplinary research may be found everywhere and nowhere, according to the Natural Environmental Research Council (NERC, 2009). It may be found in science, society, and the economy. As the importance of sustainability concerns rises in the public consciousness, the systematic relationship between energy use, climate change, biodiversity loss, and poverty becomes more apparent, and the issues become more widely acknowledged.

According to Ajaps & McLellan (2015), environmental education is "the process of identifying values and ideas in order to build the abilities and attitudes required to comprehend and respect the links between culture and the biophysical environment." In order to apply ESD in the education unit, it is important to build an ESD development team tasked with bringing together professors and students, as well as securing funding to meet facility requirements. ESD implementation must also be reviewed in order to determine its success. It is essential that a culture of environmental stewardship be fostered within the realm of education, without the need for a distinct subject, but rather via the presentation of pertinent subjects throughout all courses.

Mochizuki (2010) said that the education for sustainable development (ESD) program, which includes an element of environmental education, is crucial to the achievement of the SDG's program.

Mochizuki (2010) remarked that one component is the notion that education for sustainable development (ESD) enhances ongoing global education initiatives of EFA and the UN Literacy Decade (UNLD). Other issues associated with

UNESCO's environmental initiatives include environmental views, natural resources (water, energy, agriculture, biodiversity), climate change, rural transformation, sustainable urbanization, and disaster mitigation and prevention.

ESD is included into the curriculum of formal education, including early childhood education, primary and secondary school, vocational and technical education, training, and higher education. This curricular integration must be taught to teachers in order for them to successfully implement the notion in the classroom. Education is a vehicle of change that may offer the educational response required to assist the government's efforts in accomplishing its sustainability objectives.

Faced with this global dilemma, educators are expected to possess the skills necessary to restructure the educational process in the direction of sustainability. In the process of adopting it in daily life with students, instructors are instructed to execute continuous education in the classroom in terms of both content and learning medium.

According to prior studies, if environmental education is combined with science, technology, engineering, and mathematics (STEM), it is feasible to achieve success. As a feature of sustainable literacy, the integration will be more successful in terms of increasing motivation, creativity, and abilities in the twenty-first century. Furthermore, STEM research has been investigated in order to improve the characteristics of students that are relevant to sustainability literacy. Integration of science, technology, engineering, and mathematics (STEM) was deemed to be an effective method of developing 21st century competencies. From the perspective of pre-service teachers, the incorporation of three pillars of sustainable development into learning activities was found to be advantageous in that it increased motivation, increased creativity, and improved sustainability literacy. In addition, another study reveals hopeful findings that, following the adoption of STEM education combined with collaborative learning assistance, students' problem-solving skills in the context of addressing environmental, social, and economic issues would improve.

STEM education is currently being adopted in a number of nations, and it is

quickly becoming one of the most important components of global education. It was only recently that learning curricula in Taiwan began to be linked with the STEM curriculum and that pre-service teachers were placed at the heart of learning activities (Lou et al., 2017) . Malaysia Education Blueprint (2013) recommends a STEM-education reform that begins with improving the quality of STEM-education through curriculum development, teacher training, and the use of integrated learning methodologies, as outlined in the following paragraph. It was adopted in 2015 as part of a national strategy for the development of STEM education in schools from 2016 to 2026 (National STEM School Education Strategy), which outlines five key objectives: increasing the abilities, involvement, and interest of pre-service teachers in STEM; increasing teacher capacity and quality of STEM subject teaching; supporting opportunities for STEM-education in schools; and establishing a national STEM school education strategy to support the development of STEM education in schools (Education Council, 2015).

The primary difference in the Kurikulum 2013 is the transition from a single scientific/mono disciplinary perspective to a multidisciplinary approach when it comes to learning science. To put this into practice, science, technology, engineering, and mathematics (STEM) education that promotes integration in a multi- and trans-disciplinary way, as well as critical, creative, and innovative thinking and problem-solving abilities will be required to execute the Kurikulum 2013 (Firman et al., 2016). There are a variety of approaches that may be utilized in practice to integrate STEM disciplines, and the degree to which they are integrated is dependent on a variety of circumstances

This century has seen the values of indigenous Indonesian culture undergo radical transformation as a result of globalization and technological advancement. It is inversely proportional to the importance placed on foreign culture, which is becoming increasingly apparent in people's lives on a daily basis. The richness and diversity of Indonesian society may be seen in the country's cultural traditions. Aspects of national culture are always concerned with questions of national identity, and Indonesian national identity is perceived as being a synthesis of the cultures of Nusantara's various ethnic groups, with Indonesians representing the

pinnacle expression of positively valued cultural characteristics that can be found across the country's diverse communities. In many aspects of human expression, such as lifestyle, social patterns, perspectives, and orientations, one may find evidence of regional or local knowledge. Among the countries having a large number of technologies based on indigenous knowledge is Indonesia. Our local wisdom should be enlisted in this case study in order to strengthen our ability to make the invention.

Most new teachers graduate with limited understanding, capacity and confidence to implement environmental and sustainability education (Miles et al., 2006). A research that was conducted by Effeney and Davis (2013) found that preservice teachers who introduced to a core course in sustainability felt confident to teach sustainability but they lacked content knowledge of sustainable education.

Based on the explanation described above, a learning model should be developed for pre-service teachers who need to be equipped with sustainability literacy as an effort to overcome the problems faced in everyday life and the participation of pre-service teachers. A suitable course program to facilitate these skills is the Environmental Education Course. The subject of the Environmental Education Course aims to apply environmental awareness, social and economic skills that can be utilized in daily life as an effort to overcome the problems and also has a strong relationship with SDGs and 21st century skills. One of the expected learning outcomes from the Environmental Education Course is sustainability literacy in the application and development related to pillars of sustainable education. Therefore, developing a learning model through this course program is very suitable when using the STEM approach because it integrates and applies various disciplines. Putting Indonesia's multiculturalism into consideration as an important key aspect to achieve the most important goal of education, this study will develop a learning model through an environmental education course program based on Ethno-STEM learning model to enhance pre-service teachers' sustainability literacy.

1.2. Research Problems

The main problem in this research is "How effective is Ethno-STEM learning model of environmental education course to enhance preservice teachers' sustainability literacy?" The formulation of the problem is described in the research questions as follows:

- 1) What are the components and characteristics of Ethno-STEM learning model based environmental education course to enhance preservice teachers' sustainability literacy?
- 2) How is the implementation process of Ethno-STEM learning model based environmental education course to enhance preservice teachers' sustainability literacy?
- 3) How is the effectiveness of Ethno-STEM learning model based environmental education course to enhance preservice teachers' sustainability literacy ?

1.3. Aims of This Study

The purposes of this study are to identify the characteristics of a learning model to enhance pre-service teachers' sustainability literacy, creating, developing, and validating the learning model, testing the learning model of an environmental education course based on Ethno-STEM learning model, and evaluate the learning model.

1.4. Significance of Research

The results of this study are expected to have benefits both theoretically and practically. The theoretical benefits of this research are the acquisition of concepts, theories about the development of pre-service teachers' sustainability literacy. The practical benefits for pre-service teachers who are trained to improve sustainability literacy and produce an invention as a form of the application of environmental issues for sustainable development based on ethno-STEM learning model.

- 1) Provide the characteristics of local wisdom (ethno) principles and practical activities which can be integrated with the STEM approach.

- 2) Contribute to innovation in developing a learning model to enhance sustainability literacy.
- 3) Motivate pre-service teachers to enhance awareness about sustainable development goals.