CHAPTER ONE
INTRODUCTION

1.1. THE PROBLEM AND IT'S BACKGROUND

Education is an essential tool that could elevate someone's social status and maximize knowledge to achieve sustainable living. This idea is similar to the thoughts expressed by the well-known activist, Nelson Mandela (2003). However, many of us recognize that several economic development trends are not fully sustainable and gradually affect not just education sector but ultimately the quality of life of the local populace. Therefore, embracing the readily available technology and through education to promote public awareness are necessary for the development and nurturing of people in all aspects of life in order to advance society and prevent regression.

Education for Sustainable Development (ESD) refers to a range of educational initiatives designed to help achieve sustainable human development. These initiatives include imparting knowledge and skills about sustainable development (Li et al., 2023). ESD do not just covers Environmental Education (EE), in which it is positioned within a larger framework of sociocultural elements and socio-political concern (Brennan & Sabogal-Paz, 2023), but it also cover issues related to Disaster Education (Cabilao-Valencia et al., 2019). Disaster Risk Reduction (DRR) is one of the theme under ESD, which aims to to equip people to deal with global issues, such as disasters (R. Shaw and Y. Oikawa, 2014). Through ESD, people can develop skills and talents that help reduce the risk of disaster. Both ESD and DRR education emphasize resilience development and sustainable practices, and by that they are closely related. For a comprehensive

approach to increase the level of awareness of the learners towards Disaster events, this study mainly highlights the incorporation of DRR education under the ESD concept onto the subject course (Disaster Readiness and Risk Reduction) learning activities with the use of an electronic module.

Furthermore, the initiatives of multiple countries embracing global programs such as ESD, can be attributed to the prevailing number of disastrous issues in the global arena, which it directed educational institutions around the globe to embrace the UN challenge to integrate and apply sustainable development in the academic curriculum (Brennan & Sabogal-Paz, 2023). In the Philippine context, ESD is a top goal of the Philippine government and has also been undertaken by other nations. The Philippine government has stepped up its efforts through the Philippine Agenda 21 Framework (PA21) in support to the UN Program, Agenda 21, to promote ESD and disaster risk management through disaster risk education in various sectors, which include government agencies especially education institutions.

Disaster risk reduction and education for sustainable development (ESD) are pertinent to the Philippine Agenda 21, especially with regard to community projects and in education. In order to reform educational institutions and encourage environmental conservation and disaster preparedness, the involved Education organizations has made ESD a top priority in its activity plan. Community involvement and curriculum development are used to accomplish this. The fact that ESD is taught at educational institutions, it highlights how important it is to solve pressing problems in the Philippines like disaster and climate change

(Cabilao-Valencia et al., 2019). However, putting disaster management plans effectively into practice is not easy, especially in metropolitan locations where governance systems frequently make it difficult to respond to crises in a coordinated manner (Weena, Gera. 2018). As a result, the Philippine Agenda 21 framework is still essential for improving ESD and disaster management, but its efficacy is dependent on resolving current implementation and also governance issues.

In addition, the country faces numerous challenges including climate change, loss of biodiversity, environmental degradation, solid waste pollution, and deterioration of land and water resources (Cabilao-Valencia et al., 2019; Tagoranao & Gamon, 2019). Consequently, this resulted to various disaster events faced by the local community. In fact, the country ranked first with a very high vulnerability and exposure rate to disasters according to the 2023 World Risk Report (Weller, 2023). Natural disasters like typhoons, floods, landslides, earthquakes and the likes frequently occur not just in the northern part of the island but also in the south, which causes significant regression of the local economy and much like the young people who are the most impacted due to educational systems disturbance, particularly on learners' fundamental access to education (Cabilao-Valencia et al., 2019; Yonson et al., 2018).

The Philippine government initially addressed this dilemma through the integration of ESD concept to the K-12 curriculum in the Philippines specifically in various subject courses such as Grade 10 Social Studies subject, Earth and Life Science and Disaster Readiness and Risk Reduction in senior high school level,

and CWTS in Higher Education Institutions such as universities (Parallag, 2024; Matunhay, 2022). In fact, Republic Act (RA) No. 9512, popularly referred to as the National Environmental Awareness and Education Act of 2008, was passed to support this initiatives. According to this law, all relevant organizations must include environmental education in the curricula of public and private schools at all levels. This includes courses for out-of-school youth (OSY) and *Barangay* day care, preschool, non-formal education, technical vocational training, and professional development (Palakhi Kalita, 2023). The Philippine government also imposed Republic Act (RA) No. 9729, also known as the Climate Change Act of 2009. This law creates the Climate Change Commission (CCC), responsible for integrating the government's policies, programs, and action plans on climate change. It also directs the Department of Education (DepEd) to incorporate climate change into the basic education curricula. The government also enacted Republic Act (RA) No. 10121, or the Philippine Disaster Risk Reduction and Management Act of 2010. This law aims to strengthen the Philippine Disaster Risk Reduction and Management System by providing a national framework and plan for disaster risk reduction and management. It emphasizes a holistic, comprehensive, integrated, and proactive approach to mitigate the socioeconomic and environmental impact of disasters. Additionally, this directive requires the integration of disaster risk reduction (DRR) education into the curricula of secondary and tertiary education levels.

Several scholars also offered various approaches to address this issue. Some of which is the utilization of various Instructional design method, such as the ADDIE (*Analysis, Design, Develop, Implement, and Evaluate*) model and

Rapid Prototyping Design Cycle Model, in order to maximize technology through development of various electronic online instructional design materials. Both the Rapid Prototyping (RP) design cycle and the ADDIE model have advantages and disadvantages in the field of instructional design. The steps of Analysis, Design, Development, Implementation, and Evaluation are all included in the ADDIE paradigm, which is commended for its methodical approach. Its linear structure, however, may be a drawback and cause delivery delays for the course (SANCHEZ-GARCÍA et. al., 2023). The speed and adaptability of rapid prototyping allow for quick iterations and the early identification of design problems (Akib et al. 2024). Nonetheless, it might not have the thorough assessment and organized feedback systems that are part of the ADDIE paradigm, which could result in oversights regarding its efficacy. In conclusion, the decision of the full utilization of both models (ADDIE and RPD) is context-dependent since ADDIE provides a comprehensive and thoughtful procedure, whereas RP excels in agility and reactivity.

Previous studies focuses on several topics utilizing the rapid prototyping design cycle model such as digital fabrication tools for education (Soomro et al., 2021); Participatory design process; Design thinking (Schmidberger & Wippermann, 2024); design for youth development and engagement (Mouchrek, 2020); Building design (Ayer et al., 2019); online course design (Anderson, 2023); game design (Harteveld et al., 2019). Other researchers used ADDIE model to incorporate ESD on various learning resources focusing on various topics including traditional fermented food (Budiarti et al., 2022); ESD (Purnawati &

Ratnasari, 2023); environmental change material (Najwa, 2023); and environmental literacy(Pratiwi et al., 2023).

Whilst, others applied both approach the same with the study held by Dowling (2019), he integrated and applied it in developing an online learning materials. On the study organized by Aji et al. (2022), they focused on science learning aligning with the sustainable development goals. While on the study conducted by Shakeel et al. (2023), the researcher proposed a framework utilizing both method in developing an instructional design material for a blended learning approach. Nevertheless, research touching the combination of the two to develop learning material such as e-module especially tailored to one of the ESD theme focusing on disaster readiness and risk reduction subject and examining its effectiveness were still limited (Venezia & Pizzutilo, 2022).

Fortunately, several studies also demonstrated about the effectiveness of ESD by integrating digital technology to address Sustainable Development (SD), Accordingly, it could potentially foster an environmental culture, and a more thorough, meaningful, inclusive, and successful learning process (Rashid, 2019). The study conducted by So et al. (2019), exposed that the majority of students expressed a desire to have the ability to learn independently using multimedia e-learning materials in the classroom. Students' emotional involvement, cognitive learning, and self-directed learning would all be enhanced to some degree by exposure to multimedia e-learning settings. Thus, this is a great opportunity for the potential stakeholders to address this issue considering the fast shift from traditional to a modern way of learning.

Furthermore, the lack of ESD theme-based instructional resources particularly disaster readiness and risk reduction is not only a concern by specific countries, but also become a global concern (Khadim et al., 2022). Accordingly, some of the challenges that prevent young people from learning about ESD include lack of information, limited means of communication, poverty, and illiteracy (Foley, 2020). These factors make it challenging to implement ESD fairly and prioritize Sustainable Development in less developed countries such as the Philippines.

Thus, after reading relevant studies and considering the aforementioned gap, the researcher proposes the development of a prototype design project, specifically, an ESD-based e-module design. Considering the fact that the majority of the devices used by the learners in several secondary education institutions in the country to access the internet were smart phones and tablets (Salic, 2023). Also, there is a lack of instructional materials tailored to ESD theme in the local level. Moreover, this study will also examine the effectiveness of the e-module tailored to Disaster Readiness and Risk Reduction (DRRR) subject, one of the themes under ESD, in raising disaster awareness among grade twelve senior high school STEM class students.

This study aligns with the overarching goals of sustainable development and the Philippine government's commitment to integrate ESD into its educational curriculum. Therefore, this research focuses on the development of an educational prototype design e-module. The study assume that the developed e-module could

improve disaster awareness of the grade twelve STEM (Science, Technology, Engineering, and Mathematics) class students in the Philippines.

1.2. FORMULATION OF RESEARCH PROBLEM

This study aims to develop an ESD theme - based E-module for disaster awareness of grade twelve senior high school STEM (Science, Technology, Engineering, and Mathematics) class students in the Philippines and to assess the effectiveness of the developed electronic material.

With that, this study seeks to answers the following questions:

1. How the e-module can be created based on Education for sustainable Development through disaster readiness and risk reduction material?
2. What is the level of disaster awareness of the students as revealed by the pre-implementation and post-implementation survey scores with respect to knowledge, attitude, and behavior?
3. Is there a significant difference between the disaster awareness of the students as revealed by the result of the pre-implementation and post-implementation surveys with respects to knowledge, attitude, and behavior.

1.3. RESEARCH OBJECTIVES

The aim of this study is to development an e-module tailored to Education for Sustainable Development particularly disaster readiness and risk reduction to improve disaster awareness of grade twelve senior high STEM class students in the Philippines.

Specifically, this study aims to:

1. Develop an e-module tailored to disaster readiness and risk reduction of Education for Sustainable Development (ESD) to improve disaster awareness of grade twelve senior high school STEM class (Science, Technology, Engineering, and Mathematics) students in the Philippines.
2. Determine the level of disaster awareness of the student as revealed by the pre-implementation and post-implementation survey result.
3. Determine the significant difference on the level of disaster awareness of the students as revealed by the pre-implementation and post-implementation survey result with respect to knowledge, attitude, and behavior.

1.4. RESEARCH HYPOTHESIS

The researcher used the *Wilcoxon sign Ranked Test* in the *SPSS* software to test the hypothesis. The study's hypothesis is stated below.

H_0: $\mu_{before} = \mu_{after:}$ There is no significant difference on the disaster awareness survey scores of the grade twelve senior high school STEM students in the Philippines before and after the intervention.

H_1: $\mu_{before} \neq \mu_{after:}$ There is a significant difference on the disaster awareness survey scores of the grade twelve senior high school STEM students in the Philippines before and after the intervention.

In this study, the null hypothesis will be rejected if the result is $< \alpha$ ($\alpha = 0.05$). Otherwise, if the result is $> \alpha$ ($\alpha = 0.05$), then H_0 is accepted.

1.5. RESEARCH SIGNIFICANCE

1.5.1. Theoretical Significance

The research findings are anticipated to yield theoretical knowledge based on the empirical data examining the effectiveness of the developed prototype e-module design as an electronic learning material. The findings may potentially serve as a source of information for subsequent studies.

1.5.2. Practical Significance

a. **For Learners,** the senior-high school STEM (Science, Technology, Engineering, and Mathematics) students will get higher opportunity to maximize and experience a meaningful learning process through this material. With this, students may also aspire to be a catalyst and a responsible citizen that promotes disaster awareness not just in the school premise, but also in their respective community.

b. **For Teachers**, the result of this study will offer teachers particularly those under senior-high school level an empirical information about the effectiveness of the developed e-module tailored to ESD particularly disaster readiness and risk reduction. Hence, this will encourage them to integrate ESD related topic during the learning process of the students and employ the developed e-module as an effective instructional resource in improving students' disaster awareness.

c. **For School Coordinators**, they may include ESD – based e-module as a learning tool to improve students' disaster awareness. The study will also be a useful guide in formulating effective approaches and instructional materials to effectively shape students' full awareness towards disasters.

d. **Researchers**, the findings of this study will guide future researchers on what methodologies and or instructional resources should be addressed further in order to determine the effectiveness of ESD in academic setting. This will also pave way for more expounded studies on similar field.

1.6. DEFINITION OF TERMS

E-Module: is a self-directed learning material tailored to education for sustainable development that assist learners acquire new knowledge to improve awareness and that it can be assessed quantitatively through user testing survey.

Disaster Awareness: is an extent of common knowledge about disaster and disaster risks and actions that could be taken individually or collectively to address exposure and vulnerability to hazards.

Education for Sustainable Development: an educational concept that uses strategies to foster public awareness particularly disaster awareness among students.

STEM: An educational track focuses on science, technology, engineering, and mathematics (STEM). It uses an inquiry and research-based approach to introduce students to advanced math and science concepts.

Barangay: a small territorial, administrative and political unit forming the most local government level inhabited by local populace.

1.7. Organizational Research Structure

The organizational structures of this manuscript are as follows:

I. An overview of the problem and its background, as well as the organizational structure of this manuscript, is shown in the introduction or ***Chapter One***, along with the formulation of research problems, objectives, hypothesis, and its significance.

II. Review of Literature depicts in the ***Chapter Two*** which contains theoretical studies along with professional opinions with regards to the development of various electronic learning materials such as e-modules, the emergence of ESD in the Philippines, integration of ESD concept to the Philippine curriculum program, impacts of ESD e-module to the learners, through the context of Disaster Readiness and Risk Reduction in the Department of Education's enhanced basic education curriculum (K-12 program).

III. Research design, the selection of the research subject and research site, research instruments, data collection technique, and data analysis are all covered in ***Chapter Three*** or in the Research Methodology section.

IV. The research findings, including data processing and analysis carried out in response to the formulation of the research problem are presented in the ***Chapter IV*** which is the Findings and Discussion. The purpose of this chapter is to address the research questions.

V. In ***Chapter V***, concluding notes and recommendation provide a synopsis of the study. While the recommendation part offers ideas and feedback for further research. This also provide the ultimate findings of the study

VI. All of the sources that were cited and used in this study were listed in the Bibliography or in the ***Reference*** section.

VII. Additional materials that support this research are included in the **Appendices** Section.