CHAPTER I
INTRODUCTION

1.1. Background

Environmental pollution in Indonesia has become a very serious and complex problem. The increasing population density, especially in urban areas, has affected the quality of cities and generated waste and environmental pollution. Indonesia has a population of more than 250 million as of today, and it is continuously rising, particularly in urban areas (Sani et al., 2022). In recent years, Indonesia has experienced a significant increase in environmental pollution, resulting in poorer air, water, and soil quality. This environmental pollution not only impacts on public health but also the economy and society. Air pollution in Indonesia has increased since 2000, with air quality getting worse in some major cities such as Jakarta, Surabaya, and Bandung (IQAir, 2024). Water pollution is also a serious problem, with some rivers and lakes polluted by industrial and domestic waste. Soil pollution is also a significant problem, with some areas polluted by agricultural and industrial waste. Environmental pollution occurs because of human activities themselves who cannot process and utilize the environment properly so it has an impact on human health and safety (Sompotan & Sinaga, 2022)

One effort to correct the problem is to invite an entire generation of young people to participate starting with school studies. It is not enough for students to be armchair critics, they need to get their hands dirty and learn how to take action (Russell & Hodson, 2002). Students can directly help solve the problem of environmental pollution through various ways related to sustainable development education and SDGs. ESD focuses on empowering learners to become individuals who can make appropriate and responsible decisions and actions because the basic aim of the education system for sustainable development is ‘the man of a sustainable type of thinking’, a man who is capable of solving global tasks facing by the mankind and of promoting the forming of a sustainable society (Eba, 2023). By doing so, students can realize that their actions can affect current and future environmental, social, and economic conditions.

ESD can be used to help students achieve the SDGs goals because environmental pollution itself is directly related to several United Nations Sustainable Development Goals, such as ESD empowers communities by raising awareness about health issues and promoting community health initiatives (Goal 3), integrating water and sanitation topics into school curriculums to ensures that young people understand the importance of these issues from an early age (Goal 6) and ESD raises awareness about climate change, its causes, impacts, and the importance of mitigation and adaptation strategies (Goal 13) and other goals (UNESCO, 2017).

One of the behaviors that students are supposed to have is sustainable actions. Action competence illustrates an ability to critically assess alternative solutions in action to achieve sustainable future targets (Sass et al., 2019). While behavior may be habitual, actions require intentional decision-making (De Vreede et al., 2014). Students' sustainability action competencies play a vital role in addressing environmental pollution in Indonesia by empowering them to engage actively in environmental initiatives. Through educational frameworks such as Education for Sustainable Development (ESD), students can develop a strong understanding of environmental issues and the skills necessary to implement sustainable practices. Students should take action on sustainability as this plays an important role in creating awareness and positive action towards the environment. By increasing knowledge on sustainability issues, students can understand the impact of their daily behavior on the environment, such as pollution and unsustainable use of natural resources.

However, student action toward SDGs goals in Indonesia is relatively low, this was explained in research conducted in Riau, the results showed that student practice in sustainable development action was not yet visible, only 75.78% of students applied sustainable action of 180 participants (Ruslindawati et al., 2022). One of the causes of low student practice in sustainable development action is the lack of environmental projects organized in schools, which makes students lack the understanding and awareness needed to act responsibly. Another cause is that there are not many student reading resources that focus on action, student textbooks are still focused on environmental content, not oriented toward environmental action

(Eliyawati et al., 2022). Action-oriented textbooks are crucial because they will support students in adopting a sustainable lifestyle and changing their behavior. By modeling it, applying it to address new problems, and applying it to needs and concerns that get more complicated over time, students can learn about sustainable action.

To overcome environmental and social challenges, students need to have creativity. Creativity refers to generating original and useful ideas (Ritter et al., 2020). Creativity allows students to think outside the box and find innovative solutions that can help address environmental and social challenges faced by society. With creativity, students can develop innovative and effective ideas to deal with sustainability issues, such as waste management, renewable energy use, and sustainable community development (Kemmis, S., & McTaggart, R., 2005). Students require innovation to meet the challenges of the twenty-first century. Creativity is required for students to adapt to a rapidly changing world and become inventive in a variety of disciplines. The ability to think creatively is crucial in life since creativity is a general ability to produce something new, as well as the ability to generate fresh ideas for issue resolution (Munandar in Kusuma et al., 2024). Students with creative thinking skills can devise novel solutions to complicated environmental concerns like water and air pollution. Students are better prepared to contribute to sustainable practices and policies that battle pollution and encourage responsibility for the environment if they are taught to think creatively.

Learning outcomes for Indonesian students are rather poor, particularly when it comes to creativity. The findings of the study show that Indonesia is still listed as having a low creativity index (0.037) confirming this (Richard et al., 2015). The statement also supported by 2015 Global Creativity Index stated that the level of creative thinking in Indonesia still ranked 115th out of 139 countries, lower than some of other countries in Southeast Asia (Megawan & Istiyono, 2019). Students' creativity is influenced by numerous things. Both internal and external variables may be present. The students' beginning knowledge from prior learning, experiences, and cognitive talents are internal factors that influence creative thinking (Rahayuningsih et al., 2023). Regarding the external elements, the environment, friends, and the learning process all have an impact on students'

creative thinking. Other factors, including curriculum, teacher teaching methods, strategies, models, learning methods used, and student characteristics, contribute to Indonesian students' low creativity (Al-Abdali & Al-Balushi, 2016).

The use of technology to create student projects is one example of how creativity is used in the educational process. When students design a PowerPoint with data, video clips, pictures, text, and animation on the slide, they become more enthusiastic about the project (Hanif et al., 2019). Combining STEM with ESD has the potential to improve the quality of education, and has a chance to have a positive impact on sustainability action and creativity because students will develop their ideas to create products related to their actions toward environmental issues. This statement is in line with the previous research that analyzed the impact of STEM-ESD programs on student self-efficacy and engagement. The findings indicate that STEM-ESD learning supports student engagement and self-efficacy, which can contribute to improved sustainability action and creativity (Fathurohman et al., 2023a).

Another study found that STEM PBL significantly improved students' creativity in learning topics such as light and optics. This approach emphasizes active learning, where students take part in meaningful activities, promoting higher engagement and better retention of knowledge (Hanif et al., 2019). Furthermore, the previous study that aims to improve students' creativity through STEM in science learning shows that science learning with the STEM approach can train students 'creative abilities in linking the four fields of exact science so that they have deep insights and can enhance students' creativity (Herak & Lamanepa, 2019). The use of STEM-based project model learning can also increase students' sustainability actions, especially on point 6 of the SDGs, namely clean water and sanitation (Septiana et al., 2023).

Based on the explanation above, there is still a lack of studies that use STEM ESD-based learning to enhance students' sustainable actions and creativity in achieving SDGs point 3 which is good health and well-being. As a result, the title of this study is "The Impact of Working on Preventing Environmental Pollution Project to Enhance Students' Sustainability Action and Creativity in Learning Environmental Pollution"

1.2. Research problem

Based on the provided context, the research problem of this study is “How does preventing environmental pollution project in learning environmental pollution enhance the students’ sustainability action and creativity?”.

1.3. Research question

Derived from the research problem, the study attempts to investigate the following questions:

a. How does students’ involvement in the Preventing Environmental Pollution project enhance students’ sustainability action?
b. How does students’ involvement in the Preventing Environmental Pollution project impact students’ creativity?

1.4. Research objectives

The following are the aims of this research based on the problem that has been proposed:

a. To investigate the improvement of students' sustainability action through the Preventing Environmental Pollution project in learning environmental pollution
b. To investigate the students' creativity through the Preventing Environmental Pollution project in learning environmental pollution

1.5. Limitation of problem

a. The measured sustainability actions are not observed directly but are seen from the action plans that students do.
b. The creativity assessed in this study is limited to product creativity. Indicators used are novelty, resolution, and elaboration.
c. The creativity measured is group creativity, not individual, the researcher does not know whether the division of the group is balanced between creative individual students or not.
d. Students do STEM-ESD projects outside the classroom, outside of school hours, researchers do not know the process of activities in making products, only the final product.

1.6. Research benefit

The results of this study are highly beneficial for students because they foster their sustainable action and creativity. Students have a fresh and worthwhile opportunity for experiential learning by participating in the project. Additionally, this research offers educators a different way to teach STEM ESD-based environmental pollution lessons that will encourage students' sustainability action and creativity. The construction of an environment-based educational environment is further supported by integrating Education for Sustainable Development (ESD) into the curriculum. The results of this study provide more resources and data, making it an invaluable resource for scholars with related interests. Additionally, the results of this study are expected to be useful in developing project learning models with STEM ESD approaches to increasing students' sustainability action and creativity. It is crucial to critically assess the research's advantages and disadvantages to maximize outcomes in this field.

1.7. Organization structure of research paper

The title of this research is "The Impact of Working on Preventing Environmental Pollution Project to Enhance Students' Sustainability Actions and Creativity in Learning Environmental Pollution". All research activities are reported and accounted for in a written thesis, following the guidelines of Scientific Writing at UPI in 2021. The organizational structure of this thesis is as follows:

1. Chapter I: Introduction

The context for the research is provided in this section, which is STEM ESD-based learning in environmental pollution topics to enhance students' sustainability action and creativity. To direct the investigation, the underlying issues are distilled into 2 research questions, "How does students' involvement in the Preventing Environmental Pollution project enhance students' sustainability action and creativity". Chapter 1, contains an explanation of the problems found at the level of students' sustainability action at the SDGs good health and well-being and product creativity.

2. Chapter II: Literature Review

Chapter II of this research discusses STEM ESD-based Learning through the Environmental Pollution Project, Sustainability Action, and Creativity. Discussed how STEM-ESD project learning on environmental pollution can build good health and well-being through sustainability actions and student creativity products.

3. Chapter III: Research Methodology

The framework and technical features of the study are covered in this chapter, including the population that is junior high school students in Bandung private school with 68 students as a sample, instruments used in the study which are sustainability action questionnaire and creativity product analysis matrix rubric, instrument testing process using SPSS software, data analysis, and the research procedure.

4. Chapter IV: Findings and Discussion

A detailed elaboration of the research variable with each indicator, which are past, present, and future indicators, competencies indicator for sustainability action, and novelty, resolution, and elaboration indicator for creativity, follows the presentation of the research data in this section in the form of tables, diagrams, and figures.

5. Chapter V: Conclusion, Implications, and Recommendations

The major conclusions derived from all areas of the study were presented in this chapter to address the 2 research questions. In conclusion, STEM-ESD project learning did not significantly improve students' sustainability Actions good health, and well-being. However, the researcher recommends this learning method if the reader wants to know the level of students' sustainability action and creativity by paying attention to other things that the researcher did not pay attention to, such as measuring the creativity of each student at the beginning of learning so that the distribution of groups can be balanced.