CHAPTER I

INTRODUCTION

1.1 Background

Education in the 21st century features globalization and internationalization. The advancement of technology has an essential role in developing and enhancing knowledge, skills, and attitudes among students and teachers. McCoog (2008), (as cited in Boholano, 2017), argued that to acquire 21st century skills, students must be supported to construct new ideas, evaluate, and analyze the information presented, then apply that knowledge to their academic experiences (Boholano, 2017). 21st century skills are qualities that students should have in order to overcome difficulty and achieve success in post-secondary education and the workforce (Ball, Joyce, & Anderson-Butcher, 2016). In a fast-paced modern environment, students in the 21st century grew up and quickly tuned out of the conventional lecture-based classroom (Boholano, 2017). The Partnership for 21st Century Skills explains that there are four main learning and innovation skills in the 21st Century, which are presented as 4Cs of communication, collaboration, creativity, and critical thinking skills (Erdogan, 2019). Based on this statement, communication and creativity are the important skills of learning in the 21st century, which have become the focus of this study.

One of the important 21st century skills is communication. Communication elements include the information provided by the individual to the receiver, the information and feedback by the receiver, and the repetition of these processes that produce the creation of new knowledge. The communication process typically includes four components: the speaker, the receiver, the channel of communication, and feedback. Communication is more successful if the recipient can understand the core skills and practice them (Khambayat, 2017). According to Diloyan (2017), communication is a significant factor in the best pedagogical methods, and both communication and pedagogy are intertwined. Communication has an essential role in the learning level outcome of the students. All forms, including non-verbal

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communication, careful listening, and group communication, play a crucial role in effective communication.

The 21st century offers many opportunities for people to learn and improve their skills at all times. A nation's competitive power can be measured by the creativity of its human resources (Rosyida, Sukarmin, & Sunarno, 2020). Therefore, creativity is also an essential skill that has to be mastered by students in this era. It is a tremendous challenge for any educational institution to increase the creativity of students. Education should inspire creativity among students so that each individual can be prepared to thrive in global competition through the learning process. According to Gunawan, Harjono, Sahidu, & Nisrina (2018), we need creativity to solve issues in life. Creativity comes from new ideas that, if new and valuable, would be considered innovative. Creativity can be strengthened by models and strategies for teaching (Gunawan et al., 2018). In Indonesia, the National Curriculum 2013 supports its education system. The curriculum aims to prepare Indonesians to be creative, innovative, effective, productive, and involved in contributing to the environment, country, and the world (Wandari, Wijaya, & Agustin, 2018).

Aside from preparing the young generation to contribute to the world, for the next years, there will be a continuous increase of the work opportunities in the sectors of informatics, technology, and information. It is crucial to strengthen the educational system to prepare the young generation for employment. As a result, an appropriate education system in this era of technology and information is required, including STEM education (Science, Technology, Engineering, and Mathematics). According to a recent study in the United States, STEM talents have greater employment expectations than abilities in other fields (Badriyah, Anekawati, & Azizah, 2020). Besides, in current mathematics and science education, the appropriate education and teaching strategies have to be prepared to shape the students who can access the information actively instead of being given the information directly (Altun & Serin, 2019). The extension of STEM with the integration of art, namely STEAM, means that the learner can communicate their idea through visualizations, which explains the

concept of science combined with images, texts, or other. STEAM is one of the approaches to address the demands to acquire skills needed in the 21st century (Kartini & Widodo, 2020). The implementation of STEAM in this research followed the Next Generation Science Standards (NGSS) which was to create extensive, clear, and challenging objectives for the students (Bybee, 2013). In the implementation of the STEAM learning approach, there were two practices which were science and engineering practices, which become the novelty of this study. The implementation of STEAM was proven to develop the essential skills of higher-order thinking, information and literacy skills, self-direction, and collaboration skills. The usefulness of STEAM is also to help students by integrating the students' experiences to create new ideas so that their creativity can be enhanced (Ridwan, Rahmawati, & Hadinugrahaningsih, 2017). Through cooperative hands-on activities, students' communication skills can be trained (Kim & Chae, 2016).

The topic covered in the implementation of STEAM learning in this research is sound and waves provided for 8th-grade students and based on the 2013 National Curriculum of Indonesia for Junior High School. It encourages the students to learn by having complex activities to explore, do collaborative projects, and create a product (Adriyawati, Utomo, Rahmawati, & Mardiah, 2020). The project is to answer a given problem. In this research, the problem given to the students is related to environmental issue, focused on recycling waste as an effort to reduce waste. By connecting the environmental dimension into the sound and waves topic, the learning process can be more meaningful. The students apply their knowledge in sound and waves with the product they have made. Research shows that environmental-literate students are cultivated in order to support the country's environmental education. Still, more effort is needed to motivate students and encourage the country's study path (Erhabor & Don, 2016). Hence, besides learning about sound and waves, hopefully, the students can also start contributing to recycling waste as they are aware of the waste issue in the environment. By implementing the STEAM learning

approach, the students can learn sound and waves while producing a physical product that concerns the environmental dimension.

1.2 Research Problem

The research problem of this study can be formulated as follows: "How is students' creativity and communication skills in learning about sound and waves by implementing STEAM learning approach?" The research questions are specified based on the previous research problem, such as:

1) How is the implementation of the STEAM learning approach in sound and waves topic?
2) How is the students' creativity in learning about sound and waves by implementing the STEAM learning approach?
3) How is the students' communication skill in learning about sound and waves by implementing the STEAM learning approach?

1.3 Research Objective

Based on the research questions that have been proposed, the objectives of this research are:

1) To get an overview of the implementation of the STEAM learning approach in sound and waves topic
2) To investigate students' creativity in learning about sound and waves by implementing the STEAM learning approach
3) To investigate students' communication skills in learning about sound and waves by implementing the STEAM learning approach

1.4 Research Benefit

The research is expected to bring benefits both theoretically and practically, especially for the following parties.

1) Students

By realizing the research, hopefully, it will be beneficial for the students as they will be able to understand the relation between Science, Technology, Engineering, Art, and Mathematics in a real-life problem. In addition, it is expected that the students can practice their creativity and communication skills that will be useful for their future.

2) Teachers

This research is expected to be beneficial for teachers as they will be able to apply innovative teaching methods in science topics and make connections between multi-disciplinary science, Technology, Engineering, Art, and Mathematics in the teaching-learning process. This research will also give information on how to investigate students' creativity and communication skills in the STEAM learning approach.

3) Researchers

This research can be beneficial for researchers by providing a reference and additional exploration on the STEAM learning approach as the data, and the result is offered. Therefore, it can be useful in future studies.

1.5 Limitation of Problem

In order to make the research more focused, the problem of this research is limited as follows:

1) Students' creativity is the ability to effectively express thoughts and ideas in different (oral and written) modes and contexts. Creativity puts concern on the process of making and implementing new knowledge (Wandari et al., 2018). The students' creativity examined in this research is the creativity in the products they have made. Therefore, to examine it, a Creative Product Analysis Matrix Rubric (CPAM) was used.

2) According to Khambayat (2017), students' communication skills are classified into four main elements: listening, speaking, reading, and writing abilities. Communication generally includes the sharing of thoughts, views, and knowledge for a particular reason. Communication is divided into several

kinds and can be summed up as WOVEN (Written, Oral, Visual, Electronic, and Non-Verbal). This research focuses more on oral communication.

3) The term STEAM (Science, Technology, Engineering, Art, and Mathematic) in this research is a learning process approach. The addition of art is in the product that the students have made in order to improve the visualization of the product. The STEAM learning approach is implemented in online learning due to the global pandemic that forces the learning activity to be conducted at the students' homes. In this research, the STEAM learning approach is divided into scientific and engineering practice. In scientific practice, the STEAM learning approach is integrated with the Discovery Learning model; meanwhile, in engineering practice, it is integrated with Project-Based Learning (PjBL) Model.

4) The science topic covered in this research is sound and waves based on the 2013 National Curriculum of Indonesia for Junior High School, specifically, on the core competency No. 3 and No. 4 for 8th grade. The subtopics discussed are vibrations, waves, and sound waves. The auditory system is not discussed for this research due to time limitations and preventing students from being overwhelmed.

1.6 Organization of the Paper

This research paper is divided into five chapters with subchapters as follows:

1) Chapter I: Introduction

This chapter consists of the background of the research, the research problem, the research questions, the limitation of the problem, the research objectives, the research benefits, and the organizational structure of the research paper.

2) Chapter II: Literature Review

This chapter includes the literature review of the independent variable, which is the STEAM learning approach, and the other variables, which are students' creativity, students' communication skill, and sound and waves topic and its relevant theories and research related to the variables.

3) Chapter III: Research Methodology

This chapter discusses the details of the methodology conducted in the research starting from the research method, research subject, operational definition, research instruments, data analysis, and research procedure.

4) Chapter IV: Result and Discussion

This chapter provides the result and discussion of the research that consists of investigating students' creativity and communication skills when implementing the STEAM learning approach in sound and waves topic.

5) Chapter V: Conclusion and Suggestion

This chapter provides the conclusion and recommendation based on this research.