CHAPTER I
INTRODUCTION

A. Background

The world is developing and so does education. Camins (2015) stated that the purpose of education has changed from seeking truth into preparing young people for life, work and citizenship. National Education Association (NEA) of America stated that what was considered as a good education 50 years ago is no longer sufficient for success in college, career, and citizenship in the 21st century. They have been discovered that there are four most important specific skills required by students to be prepared. They are known as the "Four Cs" which includes critical thinking, communication, collaboration, and creativity.

In a world in which good design is increasingly used as a means of differentiating objects of mass production, creative design skills are highly desired in the labor force. Appliances to support living, stuff to help working, informational transfer system and other new inventions in 21st century letting creativity as well as innovation to become more important. "The creating mind" is one of the five minds needed in the future. We need an education that provides "exploration, challenging problems, and the tolerance, if not active encouragement, of productive mistakes" to develop creating mind (Gardner, 2007). Similarly, Florida (2005) stated, "I call the age we are entering the creative age because the key factor propelling us forward is the rise of creativity as the primary mover of our economy." Simply says, a lot of experts agree that creativity is important in education to prepare them for life, work and citizenship.

In Indonesia, purpose of secondary education is written on government regulation No. 17 year 2010 subsection 77 regarding Management and Operation of Education. The purpose is to build students who has a faith and fear of God Almighty, noble and sublime personality; knowledgeable, skilled, critical, creative and innovative; healthy, independent and confident; tolerant, sensitive social, democratic and accountable. Here, it is clearly stated that one

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of education purpose is to develop students' creativity. Unfortunately, learning process in school did not provide activity that can maximize students' creativity.

Creativity and Innovation concern to the process of creating and applying new knowledge (Gurteen, 1997). Deep understanding of concept is highly needed to maximize students' creativity. Means, concept mastery is also needed to complete creativity and also other skills. Indonesia's student concept mastery in science concept is still below the average. It is proven by the result of PISA test and TIMSS survey on the 8th grade students. Indonesia gained 385 on PISA test while the average is 501 (OECD, 2014). Not too different with result of PISA test, Provasnik (2012) from National Center for Education Statistics reported that Indonesia gained 406 on TIMSS Survey below the average score which is 500.

STEAM-Based learning is a new innovation that integrates Science, Technology, Engineering, Art and Mathematics. It focuses on the awareness of need for creative thinking for addressing complex world issues (Jackson, 2015). STEAM by Design draws upon the active learning methodologies of design education and tests new ideas on a foundation of learned knowledge. It leads to processes that result in creativity, innovation, and continued growth and exploration of the world (Zhao, 2012) as required by cross-curriculum priorities and Indonesia Curriculum. Presley, Caroll and Gorbet (2016) has proved that STEAM approach increase students' engagement and survey data gained shows that students are increased in a number of positive measures, their ability to connect art and creativity to engineering problem solving, their comfort and confidence with hands-on problem-solving, and their appreciation for the importance of collaboration. Song and Kim (2016) have also proved that STEAM program increase students' creativity.

Sound is something we hear and experience in daily life. The concept relay on our daily life such as principle of guitar, piano and another music instrument; speaker on laptop, hand phone and another electronic devices; and also its application on movie theater, music studio etc. However, students still have a

lot of misconception regarding this concept. As mentioned by Sarıoğlan (2016) students misconceptions are about its propagation in rocks, planes or in sea, sound produced by music instruments different for each people, the environment where the music instruments affect the sound we heard. Things are developed day by day then sound could be a basic concept to construct more valuable product in the future. Therefore, misconception of sound should be avoided. Sound concept consists of science and mathematical explanation, and could be integrated with technology, engineering and art to gain maximum result.

Considering all reasons have been mentioned above, the researcher aimed to see the impact of STEAM-Based Learning on students' creativity and concept mastery in learning sound. This research will analyze two variables which are students' creativity and students' concept mastery. Developing from those variables, this research will also investigate students' impression towards implementation of STEAM-Based Learning.

B. Research Problem

Based on the background above, the research problem of this study is "How is the impact of STEAM-Based Learning on students' creativity and conceptual mastery in learning sound?"

C. Research Question

Elaborating the research problem, the research attempts to explain the following questions:

1. How is the impact of STEAM-Based Learning on students' conceptual mastery in learning sound?
2. How is the impact of STEAM-Based Learning on students' creativity in learning sound?
3. How is students' impression towards STEAM-Based Learning?

D. Research Objectives

General objective of this study is to investigate the impact of STEAM-Based Learning on students' creativity and conceptual mastery in learning sound. The particular objectives of this study are:

1. To investigate the impact of STEAM-Based Learning towards students' conceptual mastery in learning sound.

2. To investigate the impact of STEAM-Based Learning towards students' creativity in learning sound.

3. To investigate students' impression towards STEAM-Based Learning.

E. Research Benefits

This research is expected to give benefits for:

1. Teacher

    Teacher gains a new sight of hands on activity by STEAM-Based Learning approach, way of improving both cognitive mastery and creativity and lead students to create a product.

2. Student

    Students gain new experience to learn sound concept by using STEAM-Based-Learning approach. Students are given a space to express their creativity.

3. Another Researcher

    Result of research can be used as the reference to develop another study regarding STEAM-Based Learning approach especially in Indonesia.

F. Research Paper Structure

Overall, this research paper consists of five chapters and several appendices. Each chapter consists of sub-chapters. The systematic of this research paper is as follows:

1. Chapter I: Introduction

This chapter outlines the background, research problem, research questions, research objectives, limitation of problem, research benefit and research paper structure. All discussion was based on the research problem and questions stated in this chapter.

2. Chapter II: Literature Review

This chapter describes detail information regarding STEAM-based learning, creativity, cognitive mastery, sound and other things correlated to the science issue under the study.

3. Chapter III: Methodology

This chapter describes about methodology used during the research. It consists of research method and design, population and sample of research, assumption, hypothesis, operational definition, research instruments, instrument analysis result, data processing technique and research procedure.

4. Chapter IV: Result and Discussion

This chapter concern with the data gathered in this research. The author analyzes and interpreted it based on the needs of answering research questions determined in chapter one. The data are presented in the form of tables and figures.

5. Chapter V: Conclusion and Recommendation

This chapter explains the conclusion and recommendation of the research.

G. Limitation of Problem

This study is conducted to define the impact of STEAM-Based Learning. The impact itself is referred to the improvement of students' conceptual mastery and profile of students' creativity after implementing STEAM-based learning. To know whether or not the concept mastery is improved significantly, researcher use normalized gain $<g>$ by Hake (Hake, 1998). Students' cognitive mastery is assumed to be improved if the normalized gain is categorized as

medium. The other aspect, students' creativity is profiled from the product they made as project.