CHAPTER I INTRODUCTION

1.1 Background

Learning physics needs great understanding in both theoretical and application in daily life, but to understand both of them students get some difficulties while learning physics. Aykutlua, Bezen, & Bayrak (2015) stated Physics has such an essential role in the universe, the importance of physics courses, which are taught and applied effectively at schools, has increased significantly. Especially to adjust to the condition that teachers should become a facilitator in the learning process. Some of the reasons that make students had difficulties in learning in physics curriculum were because of misconceptions of the past learning experience, lack of motivation, an inappropriate level of teaching, and abstract concept (Wosilait, Heron, Shaffer, & McDermott, 1999).

The misconception happened because of experience that was created by the teacher affects how the students get a science concept in science learning in the class. Teachers gave the conventional way because the teacher itself got difficulties in delivering physics material (Arkün & Akkoyunlu, 2008). The example of misconception or missing conception is when student learns about plane mirror and formation of an image. There is research shown that students misconception about image formation is caused by schooling years related scientific concept that formal concept cannot connect with real-world phenomena (Lin, 2002).

In Indonesia, the curriculum of education for junior high school stated that there is change given from the previous curriculum to become a student-centered learning process. Learning process used in curriculum 2013 that students no longer given material directly by the teacher, but the students will be the one who seeks for the knowledge. Additional to that, physics concept given by teachers in class especially in labs, it is dedicated to experimental design rather than physics concept itself (Lin, 2002). Thus the experimental thinking is being shaped, but the physics concept is left behind.

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To learn physics and decrease misconception, there should be an instruction that can help to give a supplement to learn it. Chang (2001) stated that computer-assisted instruction (CAI) plays an essential role in contemporary teaching and learning of science concepts. Computer use in an educational setting is most popular and well known. It also stated that there is a Computer-assisted instruction (CAI) that can play an essential role in teaching science concept. Computers can speed up and extend people's ability to collect, store, compile, and analyze data, prepare research reports, and share data and ideas with investigators all over the world. Computer-based and internet as new technologies help teachers by providing exciting tools that can be used to improve the teaching-learning process.

CAI as one of the instruction will also help in giving virtual experience. Arif (in Wahyudin, Sutikno, & Isa, 2010) mentioned that listening experience contributes 11%, virtual experience contributes 83%, remembering to contribute 20% listening, and seeing contribute 50% to the learning. While among these technologies, the use of computers is the most popular and well known in educational settings.

To maximize the features and create an attractive platform for the students, the gamification elements applied in this research. The integration between gamification and computer-assisted instruction theory will create innovation in science teaching-learning that will be adjusted to the current modern condition. Gamification, from the English "gamification," is the concept of applying game principles and mechanics in non-gaming activities, particularly in education (Kirillov, Vinichenko. Melnichuk, Melnichuk. & Vinogradova, 2016). Gamification will be handy to enhance students learning motivation. Thus, willingness is also impacting how students understand the materials. Also, there are many ways to create a gamification concept in education which will help both many stakeholders especially teachers to deliver their teaching method. Gamification is the use of game design elements, game thinking and game mechanics to enhance non-game contexts and the primary function that gamification could provide enhancing a situation through the use of gaming mechanics, the benefits which include increased engagement, higher motivation levels,

increased interaction with the user, and greater loyalty (Shapiro, SalenTekinbaş, Schwartz, & Darvasi, 2015).

Buckley & Doyle (2016) stated that using games not only offers engaging opportunities for young students to acquire critical academic skills, it also teachers those students to associate screens with refined cognitive skills. Sung & Hwang (2013) also stated that gamification impacts students with different types of motivation differently. The results demonstrate that it is particularly useful for students who are intrinsically motivated, mainly either by a motivation to know or a motivation towards stimulation. The effect on students who are extrinsically motivated appears to be confined to students who are motivated by identification.

Thus, this research will be about developing computer-assisted instruction by using gamification elements into tools in physics topics about mirror image and reflection in junior high school. To solve problems of delivering physics content in useful ways by virtual experience and student-centered learning. The game will give several advantages such as motivation, joy, convenience, addiction, while also give students first perception in the mirror reflection.

1.2 Research Problem

Based on the background stated, the research problem of this study is "How is the development of computer-assisted instruction by using gamification elements on mirror reflection topics in Junior High School?"

1.3 Research Questions

From the research problem, several questions that arise are as follow:

- 1) How is the design and development of computer-assisted instruction by using gamification elements in learning mirror reflection in Junior High School?
- 2) How do experts respond towards content and media of computerassisted instruction development by using gamification elements in learning mirror reflection in Junior High School?

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3) How do students respond towards gamification elements and gamification effect on learning mirror reflection in Junior High School?

1.4 Research Objective

This research is conducted with the objective:

- 1) To design and development of computer-assisted instruction by using gamification elements in learning mirror reflection in Junior High School?
- 2) To collect experts' respond towards content and media of computer-assisted instruction development by using gamification elements in learning mirror reflection in Junior High School?
- 3) To collect students' respond towards gamification elements and gamification effect on learning mirror reflection in Junior High School?

1.5 Research Benefit

The result of this study is expected to provide the following benefits:

- For a teacher, by this research teacher can use this game based on a computer-assisted instruction by using gamification in physics class as a teaching media. To solve the problem of boredom caused in physics class while physics need a high understanding concept that is not only given by hands-on but to give the first perception to students. This game is also one of the alternative learning for mirror reflection.
- 2) For students, by this research student can quickly learn at home and can get used to technology to be implemented. Students can use this to prevent misconception by using this media as one of the learning parts of blended learning for the first time. This game has great empowerment through the effect created by gamification and CAI. Learning will be much fun and makes students motivated and engaged.
- 3) Another researcher, this research can be used as a reference and can be one of the ways to develop another research in the future. The resulting strength and weakness of the game can be taken as a new idea to do another research.

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1.6 Organizational Structure of Research Paper

This section explains the sequence of details for each chapter in this study. This study consists of five as follows:

1) Chapter I Introduction

This chapter contains about how conventional physics learning is delivered currently. This chapter also explains how learning that is happening currently in classroom physics learning. The thing that can help to solve the problem is to use computer-assisted instruction and gamification while delivering the material. Mirror reflection choice was also explained in this chapter. How gamification and CAI can help to answer the problem. This chapter also explains the research objective which is how does the development happen in computer-assisted instruction and how this research will give impact to all of the people related.

2) Chapter II Literature Review

This chapter consists of the definition, advantage, and disadvantage of using computer-assisted instruction. The aspects of gamification that should be in the game. Each mirror reflection in flat, convex, and concave mirror definition. All of the definitions and theories were taken from literature journal and book. This chapter also contains the relevant research about computer-assisted instruction, gamification, and learning media application that has significant relevancy to this research.

3) Chapter III Methodology

This chapter explains the method used for taking and analyzing data by using the descriptive method. This chapter explains the validator of research that was taken from 9 grade in one of junior high school. Besides, the definition of computer-assisted instruction gamification and mirror reflection is explained by technical definition. The research instrument from all of science, media, and teacher as expert and level of agreement from students were also explained. Last explanation in this chapter is about the technique to analyze data which is using scale and ratings by the survey.

4) Chapter IV Result and Discussion

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After data are all collected from an expert in science, media, teacher, and students, data is interpreted it based on three research questions and objective which is the development of computer-assisted instruction by using gamification in the mirror reflection. One by one development of computer-assisted instruction, creating a storyboard, and game creation by construct two is explained. Based on chapter 3, this chapter explains about the detail of result number scale and ratings from experts and students, the result of how they agree, satisfied, and creating a good performance by using the game as the learning media. The relevancy is also being related one by one to the fact of the result that creates the good result of gamification aspects.

5) Chapter V Conclusion and Recommendation

This chapter describes the conclusion of the research, consist of the strength and weakness of game creation. The recommendation of how to make it better in the next research about gamification and CAI

1.7 Limitation of Research

In order to make the research more focused, the problem is limited as follow:

- 1. Computer-assisted instruction is the use of a computer for students learning in junior high school. Storyboard and the game were created in the computer. The game creation was using software construct 2 for educational purpose. The computer needed for this research is the computer with the capacity of Windows and can operate EXE. The computer will be used once by the students in the computer laboratory. The rubrics assessed from the experts including mechanical, information structure, documentation, and curriculum alignment. The survey taken from the students are the screen, language, and navigation.
- 2. Gamification creation for this game depends on the gamification aspects which are clear goals, level or challenges, difficulties, content understanding. While gamification effects to the learning are motivation, attractiveness, give first perception, addiction, convenience, and joy. Gamification aspects that are available in

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this game is the story/theme which is using the star wars theme. Other aspects are the score and time for students to feel more challenged.

3. Mirror reflection in this study is related to secondary grade eight in Indonesia. The materials that that is used are plan, convex, and concave mirror image characteristics. The basic competence from Indonesian Curriculum 2013 is 3.12 *Menganalisis sifat-sifat cahaya, pembentukan bayangan pada bidang datar dan lengkung, serta penerapannya untuk menjelaskan proses penglihatan manusia, mata serangga, dan prinsip kerja alat optik* [Analyzing light characteristics, image formation in flat and spherical surface, also the application in process of seeing in human, insects, and principle of optical work] (Ministry Education and Culture, 2017).