CHAPTER I

INTRODUCTION

1.1 Background

The 21st Century marked with a lot of technology used in every daily activity in our generation nowadays. Technology is increasing rapidly, today's information and communications technologies can be applied to science education (Nugraha et al., 2020). Regardless of the medium, whether it is an Ipad from 2017 or a color television from the late 1990s, we cannot dispute fact that technology is growing, changing, and part of our students' lives than ever (Martyniuk, 2018). Following the new technological opportunities created by the new digital era (high-end graphic game consoles, mobile computing, the Internet), the popularity of computer games has risen (Tsekleves et al., 2016). Many forms of technology are available and used in this era such as Computers, Laptops, cell phones, media and networks, software applications, and the internet (Anderson & Horn, 2012). The plan emphasized using technology to transform learning experiences, provide greater equity and accessibility for students, close achievement gaps, and remove barriers for students (Anderson & Putman, 2020). The introduction of new technologies in this era has created a need for interactive contents that make the most of the potential that technological advances offer.

Following the new technological era, one of the example technological advance that cannot be separated from the millennial generation is games. The popularity of computer games has risen in and out of school settings, gaming is a core activity with children. Video game use among youth aged 8–18 years old has increased from an average of 26 minutes per day in 1999, to 49 minutes per day in 2004, to 1 hour and 13 minutes in 2009 (Rideout et al., 2010). Playing games is very fun for students, especially in this modern era playing games has become a hobby and even has become a habit for students. Over the past decade, games have become an increasingly popular activity for today's youth, nearly all of whom both boys (99%) and girls (94%) play computer-based games as a free-

choice activity (Lenhart, 2012).

Playing games certainly has positive and negative values, one of the negative values is making students addicted to playing the game and forgetting the time to do other things such as studying and doing homework. This enthusiasm has been driven in part by the overwhelming popularity of video games play among youth-studies suggest as many as 97% of American teens play video games with many playing as much as an hour or more each day (Lenhart et al., 2008). Game addiction, which is defined as divergent and obstinate behavior as a result of video gaming, is considered to be a kind of technology addiction Playing game addiction as playing excessively and obsessively although it yields to social and emotional problems; and as the individual's failure to control this excessive situation (Hazar, 2018). Playing games is also able to make students happier and enjoy the activity. Games significantly improve academic performance and satisfaction; however, students tend to rely too much on scaffolding tools during gameplay. On the whole, the use of games in learning has a positive impact on learners' motivation and enthusiasm (Chen et al., 2019). Therefore, it becomes an innovation if a game is integrated with the learning process of students in the millennial era which refers to the development of technology.

The idea of implementing games for facilitating teaching is not a new concept as educators, researchers, policymakers and the popular press have been discussing games for learning in formal education since the 1960s (Cardinot & Fairfield, 2019). The use of games in instruction is anchored on the need to make learning meaningful to the learners, create learning culture that goes in line with the interest of the learners and promote activity based learning (Okanlawon et al., 2017). Educators have developed games to achieve three goals, including (i) students can learn from playing the game, (ii) the game components can support learning, and (iii) students are motivated to learn by playing the game (Jackson & McNamara, 2011). Gameplay and feedback also encourage exploratory thinking and vibrant discussion, and further encourage otherwise reticent students

to participate and engage with the course material (Brynen, 2015). Further argue that games increase student motivation and interest in the subject, along with improved retention (Raymond & Sorensen, 2008).

Learning with games seems to pose a challenge even to learns with a high level of expertise in the learning topic, and more so novices. Because of that, Games could be particularly useful in learning and understanding abstract concept. One of the abstract concepts in education is science (Tanel & Önder, 2020). Science content is very wide and difficult. Evidence abound in the literature that students and teachers held misconception and alternative conceptions on a wide range of biology concepts, and the nature of science (Adegboye, 2017). If it is seen in a big frame, one common problem encountered by the students in the biological sciences is difficulty in understanding biological concepts. Biology can be regarded as a branch of science involving social, environmental and health issues, agriculture, animal husbandry, nutrition, disease, marriage, family relations, learning, memory, and environment (Durdukoca & Önel, 2020). The complex concepts and vocabulary of biology classes discourage many students.

One of the biology concepts that students may have difficulty is the human circulatory system. Learning of human circulatory system is important in biology. Not least because it is a key human physiological system, it is also important because understanding the system is a key to the learning of other important biological concepts, for example, the transport and exchange of materials in the human body, gaseous exchange, and the lymphatic system (Cheng & Gilbert, 2015). Learning the human circulatory system is very challenging. At the system level, students would have to appreciate the major functions of the whole system, that is, to facilitate the transport and exchange of materials. At the organ level, students would have to relate the structures and functions of individual organs.

Previous studies revealed that students' understanding of the human circulatory system could be problematic, because the abstract of the topic itself.

For example, it was found that, based on students' thinking, some of them might have believed that blood circulation involves a drop of blood circulating around the whole body before going back to the heart (Zafeiropoulos et al., 2014). A reason for the difficulty is that learning the system involves an integrated understanding of different representations of the system. They include media representing, for example, the four-chamber heart, the system of blood vessels in the human body, the blood flow in the pulmonary and systematic circulations, relative lumen size of arteries, veins, and capillaries. Human Circulatory System concepts are not only represented by words (like the description in the above paragraph) in printed or on-screen media. They are also represented visually, for example, in the form of media such as figure, media, and game.

Therefore, the media is needed to be able to present material on the topic of the human circulatory system. In previous research, there was a game called Code Fred. Code Fred: Survival Mode (hereafter Code Fred) is an online, casual educational game released in 2013. In the game, the player controls a character trying to survive in the woods while being pursued by a wolf. It consists of a series of 12 mini game-based around multiple crises that develop during the chase. The content in the games is a human circulatory system topic (Price et al., 2014). This research also plans to develop media to facilitate and overcome students' difficulties in learning abstract human circulatory system topics. The game on this research is bloodventure game.

Therefore, the purpose of this research is to develop a bloodventure game using a computer as an instruction in the delivery of learning materials in the human circulatory system topic with gamification elements. To solve problems or delivering biology content in good ways by virtual experience and student-centered learning. The game will give several advantages such as motivation, joy, convenience, addiction, while also improving students understanding in the human circulatory topic. This research will be conducted by creating and producing bloodventure game, and bloodventure game will be assessed to the

experts and teacher. After that, it will be applied to the students in junior high school to get perceptions to respond towards the use of the game.

1.2 Research Problem

According to the background which already stated, the problem on this research is "How does the development of bloodventure game using computer-assisted instruction for science learning on human circulatory system?"

1.3 Research Question

Elaborating the research problem, several question that arise are as follow:

1) How is the design and development of developing bloodventure game using computer-assisted instruction for science learning on human circulatory system?
2) How does the respond of expert on content and media of developing bloodventure game using computer-assisted instruction for science learning on human circulatory system?
3) How do students respond to gamification elements and gamification effect on learning human circulatory system topic?

1.4 Limitation of Research

In order to make the research become more focused, the problem is limited follows:

1) Bloodventure Game

   Bloodventure game is a game platform that contains learning material of human circulatory systems. Bloodventure game is adapted from the super Mario Bross game that is played by individuals to complete certain missions. This game tells about red blood cells that travel to get keys and carry oxygen and carbon dioxide at each level. In addition, the keys contain important

information and learning material for users to use at the last level. The last level is a quiz of the circulatory system topic.

2) Gamification

Gamification elements applied to this game are design, points, leaderboards, achievement, levels, story/theme, clear goals, feedback, rewards, progress, and challenge. The gamification content created based on the human circulatory concept of circulatory system organs, mechanism of blood circulation in human body, and circulatory system disease.

3) Computer-assisted instruction

Computer assisted-instruction is a learning media for bloodventure game. As in this research, the tool used is a computer that is available in junior high school for student to learn about biology material given.

4) Human circulatory system topic

The topic in this research is the Human Circulatory system topic that limited by core competence 3 and 4 and basic competence 3.7 at are attached in the 2013 national curriculum of Indonesia in Junior High School. The sub topic of human circulatory system are human circulatory organ, mechanism of blood circulation in human Body, and human circulatory system disease

1.5 Research Objective

Elaborating from the research questions, the research objectives are specified as follow:

1) To design and develop a bloodventure game using computer-assisted instruction for science learning on human circulatory system topic.
2) To analyze experts responds on content, and media of a bloodventure game using computer-assisted instruction for science learning on human circulatory system topic.
3) To analyze teacher's respond on content, and media of bloodventure game

using computer-assisted instruction for science learning on human circulatory system topic.

4) To analyze student's respond on bloodventure game using computer-assisted instruction for science learning on human circulatory system topic.

1.6 Research Benefit

The result of this research is expected to give a good input as follow:

1) Students

   Through this research, students can easily learn at home and can get used to technology to be implemented. Students can understand the abstract concept with high empowerment through the bloodventure game. will be much fun and makes students motivated to learn.

2) Teacher

   Through this research, the teacher can use bloodventure game in biology class as a teaching media. To solve the problem of boredom caused in biology.

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 weaknesses of the game can be taken as a new idea to do another research. Through this research, the teacher can use a bloodventure game in biology class as a teaching media. To solve the problem of boredom caused in biology.