CHAPTER I

INTRODUCTION

1.1 Background

The rapid distribution of information and technology development are the characters of 21st century. In this era human are required to masters some 21st century era skills that divided into four, way of thinking, way of working, tool of work, and living in the world (Binkley, et al., 2011). 21st century skills has many aspects since it involved broader scopes, including communication, information management, collaborative, creativity, critical thinking, problem solving, flexibility, self direction, as well as ethical and cultural awareness (Laar, van Deursen, van Dijk, & Haan, 2019). The main focus of having these skills are for human being to compete in the working life (Pukelis & Pileicikiene, 2010).

There is this one skill that need to be developed, namely critical thinking skill, it is important because critical thinking skill is the essential basic skill in life. The main focus of having these skill is for human being to compete in the working life (Pukelis & Pileicikiene, 2010). To develop critical thinking skill is important for junior high school students, according to Putri & Prodjosantoso (2020) it is said that critical thinking is important in order to help them to make a decision and to determine good attitude in daily life. In science learning, students are expected to solve problem, and to have problem solving ability, students' can be trained to have critical thinking skills (Haseli, 2013). Critical thinking skill is important and needed in learning science, since understanding science need more reasoning (Bao, Hogg, & Zollman, 2002).

Critical thinking is one of thinking skills that are approved in the 21st century for students to have to assist them to be successful in global market, however Indonesia's students profile in critical thinking skills was still in the low category (Hidayati & Sinaga, 2019). The results of the Program for International Student Assessment (PISA) study in 2009, Indonesia positioned at 57th out of 65 participant countries in a scientific literacy test, test that considered relate to higher order thinking skills (OECD, 2010).Then after that in 2012 positioned 64th out of 65 countries and still below the OECD average (OECD, 2014). This results indicate

that Indonesian students is still low in higher order thinking skill, and (Hidayati & Sinaga, 2019), this result means that higher order thinking skill have not been taught for junior high school students in Indonesia.

However latest assessment, The PISA assessment in 2019, measured students' awareness, students' critical thinking, students' collaboration, and students' abilities in reading, science, social, and mathematic (OECD, 2019). From this assessment shown that the mean score of 15-year-olds students towards science topic in Indonesia are 396 points, compared to the mean score in other OECD countries which are 489 points (OECD, 2019). Based on that fact, it showed that Indonesian students' critical thinking abilities are still below the average. It indicates that students are tend to remember and memorize rather than implement the scientific skills to solve problems in daily life.

According to Nur'azizah, Utami, & Hastuti (2021) there is a correlation between students' motivation in learning, critical thinking, and learning achievement. Achievement of learning is achievement that are influenced by some factors, like learning interest, family, environment that are supporting, motivation in learning, and also learning models. In improving students achievement, motivation take an important part, it is because students are encourage to struggle with their capability in excellence standards achieving (Lastri , Kartikowati, & Sumarno, 2020). When students are interested in the material that being taught and have access to the materials that interest them, it will improve their learning, effort, and motivation (Hidi, 1991). As motivation take an important part in students' achievement, we can conclude that students' achievement in learning depend on students motivation in learning. Motivation take a role in encouraging students to concentrate and learn effectively (Borah, 2021).

According to Skehan (1989). There are four most significant factors for motivation in learning, 1) Activities in the teaching learning process, 2) Final result, 3) Internal Motivation, 4) Extrinsic motivation. Students may motivated to learn if they interest in the content or the material or they enjoy the process of learning and the activities in the teaching learning process (Brophy, 2004). There is a research said that students' home life, pressure from friends or peers, and influence they got

from their parents are some individual factor that can influence students motivation in learning (Singh, Granville, & Dika, 2010). However, those factors are difficult to fix or to change since those factors didn't come from teacher or class environment. The teachers' quality is an important thing, since teacher have a big role in managing education system (Sulaiman & Ismail, 2020). This statement said that teacher hold a crucial role in the development of education.

According to Kennedy (2006) there is this one education international trend, where teaching and learning style shift from teaching centered learning to students centered learning. This phenomenon supported by the the facts of pre-research in the field on PPLSP activities carried out by researcher in one of junior high school in Bandung that science teaching and learning occurred in the classes has been trying to applied students centered learning instead of relying on teacher-centered learning such as lecturing and learning that is only fixated on textbooks so students will quickly feel bored when sciences studies learning takes place. Teacher centered learning is a learning model where in the teaching learning process teacher provide all the material, students only take a role as a receiver of the knowledge or information, where then lead them into passive learners, where they only act as a receiver (Kurniati & Surya, 2017). Furthermore, they stated that Indonesia already started to receive the trend of shifting teacher centered learning to students centered learning since the first appearing of applying the K-13 curriculum implemented in 2013 (Kurniati & Surya, 2017).

This shift of learning style, implies that learning should be oriented to the process instead of the result. It is important that teaching is aimed at fostering learning processes characterized by active knowledge construction (Simons, Linden , & Duffy, 2000). In the teaching learning process, where delivering and receiving knowledge occur, learning media plays an important role. Learning media is everything with the ability to deliver the information from the source systematically to create a conducive learning environment so the receiver can study efficiently and effectively (Munadi, 2010). Learning media might not be separated from the learning process in the classroom, since using learning media in learning process can increase students' motivation (Puspitarini & Hanif, 2019). A good

learning media is a media that able to facilitate students in understanding the material easily and stimulate their interest n learning (Putri & Prodjosantoso, 2020)

A learning media will considered good if the learning media is able to facilitate the students' in understanding the given materials. In the same time, a good learning media should be able to facilitate the students in retrieving and understand the given materials easily and enjoyably. In the era of the 21st century with advanced technology, an interesting and innovative learning process is certainly an aspect that is considered. Technology integration has long been one of a key concern in education (Groff, 2013). Many learning environments shift in adapting technology in the teaching and learning environment, it is then shown that the more advance technology it will trigger to newer environment of learning, as the teaching learning process are following the development of technology and take a role as a catalyst to trigger transformation and innovation. Furthermore, Groff (2013) stated that as the rapid changes and transformation, considerable development have been made in the learning sciences, it is then lead to demand educators to adapt and reconsider the teaching environment, but this events creates a challenge and opportunity to re-imagine and re-design the effective and interesting teaching and learning environment.

This rapid change in technology demanded educators continue to innovate in order to create interesting teaching and learning environment in the classroom. Learning tools know as learning media has a great role in supporting the teaching and learning process, and the use of learning media in learning can increase students interest in learning the material (Maharani, et al., 2019). Students' interest in learning can increase with digital comic media (Harmawati, Hasanah, Belwawin, & Hidayat, 2019). Comic is a learning media that can support teaching and learning process in the classroom (Sagri, Sofos, & Mouzaki, 2018). Furthermore, students provided a great responses to digital comic media in learning science (Sagri, Sofos, & Mouzaki, 2018).

The features in the comic, narration, flow of the story, humor, and visual aspect benefits not only for the cognitive aspect, but also affective aspect (Lin & Lin, 2016). Some studies have found that multiple representations like verbal and

visual for presenting learning materials contribute to constructing a mental model and promote students' concept learning (Eilam & Poyas, 2019). The conversational language in comics was able to transform rigid science into simple words that can make science easier to understand (Lin, Lin, & Wu, 2013) .A science comic also can be applied in learning science in improving students critical thinking skills and scientific attitudes (Putri & Prodjosantoso, 2020).

Based on the explanation above, the researcher wants to conduct a study "The Development of Science Comic to Facilitate Students' Critical Thinking on Water Pollution Topic". This study aims to develop a science comic as a learning media in learning science, especially in facilitating students' critical thinking skill on water pollution topic.

The previous research is already developed a digital comic to help students learn science. A research developed comics of temperature and heat material, the study found that the comic feasibility is great, that the comic can be used as a learning media in learning physic (Siswoyo , Mustokoweni, & Muliyati, 2020). However, it is different with this study, this research discusses pollution topic, instead of temperature and heat topic. Another research developed a science comic as a learning media during online learning on the topic of the human digestive system (Udayani, Wibawa, & Rati, 2021). This research used ADDIE model but only carried out the analysis, design, and development stage, due to the pandemic of COVID-19 the implementation and evaluation stage cannot be carried out. The result of the research found that the e-comic learning media on the human digestive system are valid with a very good qualification. However, this research different with this research, which the science topic taken in this research is water pollution topic. Another study developed problem-based learning media (PBL) using comic-book to improve students' critical thinking ability (Yonanda, Yuliati, & Saputra, 2019). The result in this research found that the product was declared very valid and very practical based on the experts and practicality test. However this research is different, this research uses digital comic, where the comic can be delivered online using any devices, meanwhile the research mentioned before is a comic-book problem-based learning media (PBL), the sample of this research is also different,

where the sample taken from one of junior high school in Bandung instead of elementary school students.

A research showed the development of comic learning media in the form of ToonDoo Applications in the subject of circular motion (Maharani, et al., 2019). The result of this research showed that the result of using comic book physics by ToonDoo application based on contextual approach is cery interesting based on students and teachers experience in testing the comic. However, it showed that this research is different, where the comic developed in the research is digital comic instead of comic-book and the material provided in the comic is pollution instead of circular motion. Another research used caricature and comic based on gender towards concept understanding on environmental pollution (Baga, Aqil, & Rosaline, 2022). This study aims to prove the influence of learning media, which are caricatures and comics and gender on understanding environmental pollution in a secondary high school in Jakarta. The result showed that this study proven comics and caricatures as a various media to accommodate gender differences and enhance conceptual understanding. However, this research is different. The previous research is not development research, and although the topic of the material provided in the media is almost the same which is about environmental pollution, this research is provided a specific topic about water pollution instead of the overall topic about environmental pollution, another difference is that the previous research used gender as another factor or variable and aim to enhance conceptual understanding, but this research is not using gender and aim to facilitate students critical thinking skill in the classroom.

According to explanation above, there are many research of Science comic based media with different findings, sample, and topic material. The differences from previous study become novelty of this research. Hence, this study aims to examine how Science Comic facilitate students' critical thinking skill on water pollution topic.

1.2 Research Problem

Based on the background which already stated, this study research problem is "How to develop comic that can facilitate Students' Critical

Thinking Skill on Water Polution Topic?" As an explanation of the research problem, the research aims to investigate the following questions:

1) How are the steps of development in making comic to facilitate students' critical thinking on water pollution topic?
2) How are the content, language, and design of the comic based on experts judgment?
3) How are the appropriateness of the content provided in the comic to facilitate students' critical thinking skills based on students and teachers evaluation?

1.3 Operational Definition

Operational definitions are defined in this research. Those terminology are describe as follows:

1) Comic based Media

   Comic based media is a kind of learning media in the form of comic. The characters of comic learning media in each stages according to ADDIE model: analysis, design, development, implementation, and evaluation. The comic that use is in this research is digital comic where the comic is presented and operated using devices, commonly smartphone or PC, so it will be easier to use since readers can operate it anytime and anywhere.

   Developing a science comic is creating a comic, specifically a science comic, with several steps of making comic. Begin with identify individual aspects of comic making, designing the flowchart, storyline, and storyboard of the comic before sketch the comic using application from sketch to completion. These are general steps of making comic. In this research the science comic develop using application namely procreate, this application is equipped with various brushes and tools for sketching and drawing. The science comic assessed by the rubric of expert judgment, teachers' questionnaire, and students' questionnaire

2) Critical Thinking Skill

   Critical thinking is a one of a skill that important for students to master in 21st century. It is the kind of thinking involved in solving problems,

formulating inferences, calculating likelihoods, and making decisions. Based on (Facione, 2015) There are six cognitive lists included in critical thinking skills. Namely, interpretation, analysis, evaluation, inference, explanation, and self-regulation, the measure of critical thinking skills in this science comic following the critical thinking skills by (Facione, 2015) that consist of 6 cognitive skills. The critical thinking was measured by rubric for experts judgment and questionnaire for teachers and students responses.

3) Expert Judgment

Experts judgment are used to measure the validity of water pollution science comic. After the science comic are made from designing the storyline to the completion of the science comic, the expert can then read the science comic and give a result through the rubric for the water pollution science comic. There are two rubrics used in this research provided by the researcher, rubric media for the design of the water pollution science comic, and rubric material for the concept including critical thinking skill and language in the water pollution science comic.

4) Teacher Response

Teachers responses are responses regarding the water pollution science comic from teachers point of view. After the science comic are made from designing storyline to the completion of designing the science comic, science teachers can then read the water pollution science comic and give responses through questionnaire regarding the water pollution science comic. The questionnaires are in the form of 10 questions about the learning language and design, the learning experience, and the critical thinking of the science comic. The questionnaire provided by the researcher has a scale of 1-4 (strongly disagree-strongly agree).

5) Students Response

Students responses are responses that come from students regarding the water pollution science comic. After the researcher completed the science comic through some revision from experts judgment, students can then read

the water pollution science comic, and give responses regarding the water pollution science comic through questionnaire. The questionnaire provided by the researcher has 10 questions about the language and design, the learning experience, and the critical thinking skills of the science comic with a scale of 1- 4 (strongly agree-strongly disagree).

1.4 Limitation of Problem

This research has some limitation, the limitation of this research are described below:

1) Science Comic

The kind of comics that will be implemented is science comics, this comic is a type on oneshot comic or a comic that will be provided in a single episode, and this comic can be accessed by any devices connected to the internet, since it is a digital comic that will be provided through social media or instagram. All the information put into the comics is real and related to current curriculum and instruction.

2) Water Pollution

These topic material used in this research is water pollution topic and it is proposed for 7th grade students. However, the topic of water pollution provided in the comic are the definition of water pollution, the impact and causes of water pollution, and how to avoid water pollution.

3) Critical Thinking

There are six sub-skills of critical thinking skills used in this research first is interpretations as to clarify meaning, analysis as to identify meaning and claims, inference as to draw logically conclusion, evaluation as to asses credibility of claims, explanation as to present arguments, and self regulation as to self-monitor. This six list of cognitive are based on (Facione P. A., 2015).

1.5 Research Objectives

This research has some objectives, the objectives of this research are described below:

1) To decide and design the steps of making comic in facilitating students' critical thinking of water pollution topic.
2) To investigate the content, language and design of the comic determined by experts
3) To analyze the teachers' and students responses of the science comic in facilitating students' critical thinking of water pollution topic.

1.6 Research Benefit

The result of this study is expected to have benefits as follow:

1) For teachers

   The teacher will be able to use it as learning media to help teaching water pollution topic. Especially in stimulating students critical thinking on water pollution topic.

2) For students

   The benefit of this research for students is they can learn science in a unique way. Through science comic, student will get used learning by reading comic, students are expected to be able to learn concepts of water pollution and how to overcome it while explore their critical thinking skill at the same time.

3) For other researchers

   The study can be used as reference to develop comic as a learning media. The design of the comic can be evaluated in term of strength and weakness. It also can be evaluate to prove whether the comic can help students develop their critical thinking skill.

1.7 Organization of Research Paper

1) Chapter I : Introduction

   This topic contains the background of the research, research problem, research questions, operational definition, limitation of research, research objectives, research benefits, and organization of research paper.

2) Chapter II : Literaturere review

   This chapter consists of literature review on research variables. The explanation of the literature of this research is based on journals, articles, and books.

3) Chapter III : Research Method

This chapter explain the methodology used in this research. This chapter consists of research method, research design, population and sample of research, research instrument, data analysis, and research procedure.

4) Chapter IV : Result and Discussion

This chapter consists of data analysis and the results of experts, teachers, and students evaluation.

5) Chapter V : Conclusion, Implication, and Recommendation

This chapter explains the summary of the result in the research, and some recommendation for future research.