

CHAPTER I

CHAPTER INTRODUCTION

2.1 Background

Nowadays, the term 21st-century skills have been one of the critical concepts in education. Problem-solving, creativity, computer and information literacy, cooperation, and critical thinking are all examples of 21st-century skills. (Greiff & Kyllonen, 2016). 21st-century skills are usually provided on many assessments; The Program for International Student Assessment is one of the most prominent systems used to assess educational attainment throughout the world(PISA).(Argina et al., 2017). Every three years, PISA is suggested to examine the evaluation of scientific literacy across three skills, including process, content, and circumstance. Indonesian children performed worse than the OECD average in reading, mathematics, and science, according to the PISA results (OECD, 2019).

The ability to think critically is an important thing, but in reality, in the field is not as expected. Indonesian junior high school students still have a poor ability to think critically. A study by Muhlisin (2012) found that 80.9% of biology students had inadequate critical thinking skills, which revealed 80,9% of students belonged to a low category (Bustami et al., 2018). The four-year International Trends in International Mathematics and Science Study (TIMSS) was conducted on junior high school students with the characteristics of high-level cognitive questions that can measure students' critical thinking skills, revealing that Indonesian students consistently rank at the bottom. (Ratna Purwati, Hobri, 2014).

Less than optimal learning strategy, models, method, and process resulted in low critical thinking among biology students (Bustami et al., 2018). The Programme for International Student Assessment (PISA) score shows that the common condition needs to be improved by seeking the core of components tested on PISA. After that, they find solutions for those problems. Solutions that have been implemented in Indonesia to improve PISA score is applying critical thinking skills in national exam questions since 2015, which tested to queries in the form of Higher Order Thinking Skills (HOTS); The structure of the question correlates to a cognitive

level ranging from 10-15% for reasoning, 50-60% for applications, and 25-30% for knowledge and understanding (Argina et al., 2017).

One of the curriculum components tested on PISA is categorized into two types: the ability to re-reveal information, develop interpretations, and reflect and evaluate texts. From these components, there are similarities to the principles of critical thinking expressed by Facione, which include performance, analysis, evaluation, self-regulation, and inference (P. a. Facione, 2011). The ability to think critically can change students from passive become active, and students can do activities such as reading, analysis, and writing to improve critical thinking (Eales-Reynolds et al., 2017).

Science subject is a critical way to exercise students' critical thinking skills. Biology is the subject chosen in this research because biology is mainly based on textbooks; therefore, many students are still passive in learning this material (Prasetyo et al., 2019). The biology teaching-learning process is still teacher-centered. According to the study, 45.83 percent of students are used to learning via the lecture learning style, which changes depending on the teacher, and 58.33 percent of students still think of biology as rote learning. Furthermore, 62.50 percent of students believe the teacher's learning paradigm is less appealing, and 58.33 percent of students are not used to being taught higher-order thinking abilities. (Novitasari et al., 2020).

Biology education should provide students with more than just information and facts; it should also provide practical applications in their daily lives (Erlianti et al., 2017). The human reproductive system is chosen because the concept of the human reproductive system is highly related to daily life. Some points are often applied in contextual approaches such as menstrual cycle abnormal or sexually infectious diseases related to sex education (Erlianti et al., 2017). One example is AIDS. AIDS is spread by free and unprotected sex. In addition, free sex can also ruin the morale of a good human being. Therefore, in addition to the intended enhancement of critical thinking skills, it is also required to exercise students' critical thinking skills after the learning.

The number of cases of violence against women throughout 2020 was 299,911 cases. The case consisting of cases handled by District Courts/Religious Courts

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totaling 291,677 cases, Komnas Perempuan's partner service agencies totaled 8,234 cases, and Komnas Perempuan's Service and Referral Unit (UPR) totaled 2,389 cases, with a record 2,134 cases were gender-based cases and 255 points of which were not gender-based or provided information. Moreover, the growth of the actors of Lesbian, Gay, Bisexual, Transgender (LGBT) in Indonesia highly increases. The increase also follows the escalating access to the internet, pornography, drugs, and the number of LGBT communities. Despite the biological factor, the influence of immediate environment, particularly family, friends, sexual violence, the contents of pornography and drugs are alerted as to the cause of LGBT (Yudiyanto, 2016).

Phenomena of free sex are also caused married by accident, which also is a big problem in Indonesia. The lack of sex education today is a highly complex problem. Meanwhile, at the same time, good sex education helps us prevent the risk of sexual harassment to infectious diseases. Sex education also being a taboo thing at home. Therefore parents rarely talk to their children.

Meanwhile, the student explores sex education on the internet, and those are so many contents that are not in line with the norm in Indonesia and religion. Junior high school is usually around 11 years old until 15 years old. At this age, the student becomes a teenager. Teenagers grow in an immense curiosity. They are easily influenced by lousy influence on media because it is easy for them to access information, which opens up various possibilities for the absorption of thoughts that deviate from religious teachings. Harmful content that absorbs children's memories and generates suggestions, the data absorbed can develop into an ideology that will become a child's identity.

Sex education is an aspect that has not been widely researched in several developing countries, such as Southeast Asian countries, including Indonesia. From September 2020, the Department of Education will make obligatory relationship education for elementary students and relationships and sex education (RSE) for secondary students. All schools will be required to provide health education. (Lavie-ajayi, 2020).

Sex education is broad, and it can be related to health, sexuality, security, norms, gender, identity, respect, kindness, self-expression, and not just about sex. Sex education also teaches variations in the human body, how our bodies work, and our

rights over our bodies. Discussions about sex education make us have to respect our bodies. All treatment of our bodies must be approved by ourselves and must not be forced. Sex education also makes us learn to choose to behave and be responsible for our actions. Thus, we can know the consequences of being sexually active. Therefore integrating human reproduction and sex education with students' critical thinking since the contextual issue is essential.

When COVID-19 swept the country in March 2020, schools swiftly looked to social and emotional learning (SEL) for direction on how to help all members of the school community succeed (Cipriano & Brackett, 2020). School closures necessitated a rapid shift to online learning in the face of huge and unequal losses, which exacerbated existing educational disparities. School closures have been a typical technique in the fight against COVID-19 in pandemic scenarios. Students made little or no improvement when studying at home, according to the study. Learning loss was especially noticeable among kids from low-income families. (Engzell et al., 2021). One factor is that the teacher rarely gives a clear explanation, or the media is irrelevant to the students. Therefore, tools are needed to overcome these problems; one of them is using technology to support the teaching-learning process (A. C. Putra, 2018).

There are several ways to help students learn from home and improve students critical thinking skills. One of them is through android games application. Educational games are now seen as a new field in which serious games may be used. Game-based learning will take into account either motivating but also involving the student (cognitive viewpoint) or ways that give the rich contextual information and interactions required for 21st-century learning. Academic topics may become more student-centered, engaging, fun, and intriguing when games are built to integrate educational goals and subject content. (Anastasiadis et al., 2018). By android-based games, students can access the material, and game-based learning will resolve the lower score of students when they learn biology topics.

Some research concerns an android application for biology teaching-learning. The study from Pahlifi and Nurcahyo (2019) showed the Android-based biology learning media as a pictorial biology dictionary on students' motivation on the topic of invertebrates. The method used in the research is a quasi-experiment. The result

shows that the Android-based illustrated biology dictionary can significantly improve students' learning motivation (Pahlifi & Nurcahyo, 2019). The technique used in this research is developmental research using the DDD-E model and about the human reproductive system and sex education for junior high school.

Another study was conducted by Ayu Nofitasari, Lisdiana, Aditya Marianti (2021). They provide instructional tools for schools that are based on the My Android Biology App. The information may stimulate the learner and the learning outcome, especially in the food digestion system. The findings demonstrate that students' motivation and learning results in the food digestive system content may be improved by studying the media My Biology App. (Nofitasari et al., 2021). The idea of developing Android applications in biology subject is the same. However, the apps, methods, and biology are different.

Research concerns critical thinking skills for biology teaching-learning—research from Cengiz Gunay, Anca Doloc, and Thomas Gluick (2019). About project-based learning improves critical thinking, they measure a significant increase of essential skills of thinking in senior-level undergraduate software development (Günay et al., 2019). There is also research about the control of ventilation during exercise: a lesson in critical thinking from Richard. M. Bruce (2017). The study discusses teaching strategies by which science students can simultaneously develop their understanding of respiratory control mechanisms and learn to analyze evidence thoroughly (Bruce, 2017) critically. There is some research about enhancing critical thinking skills, such as carrying out problem-based learning in teaching literature (Rahman et al., 2016), by a short story that viewed from identity theory (Yamin et al., 2021), implement contextual learning (Bustami et al., 2018b), etc.

There was some study done on media creation in order to improve critical thinking. Septiani and Kholiq (2021) investigated the validity of Prest, which was established in the Momentum and Impulse material, in improving high school students' critical thinking abilities (Critical Thinking). (Septarini & Kholiq, 2021). Meanwhile, Aufa's (2021) research aims to determine the effect of the web module science integrated local batik potential toward the thinking ability of seventh-grade students of junior high school. The research method used was a quasi-experimental

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design with a posttest-only design. The instrument used is about thinking skills. (Aufa et al., 2021).

However, there is no research on exercising critical thinking in the human reproductive system and sex education. Therefore, an android application, especially a game, was needed to exercise students' critical thinking on human reproductive system topics integrated with sex education. The lack of digital media which can be easily accessed through android game application to assist junior high students in learning human reproductive system topic integrated with sex education need to be more developed. Therefore, this study aims to develop an Android game application named "HUPROSED" to exercise students' critical thinking on human reproductive system topics integrated with sex education.

This research is essential because in the development of globalization, with the ease of accessing content that is not fully compatible with or even contradicts Indonesian culture, solutions are needed to deal with such information transmission. However, no research explains the human reproductive system integrated with sex education to exercise critical thinking skills, primarily through android game-based learning. From the previous explanation, concluded that media needed to support learning on human reproductive system and sex education material, it is necessary to develop media to improve students' human reproductive system and sex education teaching through games, therefore "HUPROSED" was created to exercise critical thinking on the topic of biology on human reproductive system and sex education material with the game-based learning method that will give students new fun experience and additional material for students.

2.2 Research Problem

Based on the background stated, the research problem for this research is, "how is the development of "HUPROSED" in human reproductive system topic to as android application to exercise students' critical thinking skills.

2.3 Research Question

Based on the research problem above, the research attempts to explore the research question, and there are:

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- 1) How are the stages of development of "HUPROSED" as a learning media in human reproductive system topics exercise students' critical thinking skills?
- 2) How do experts' responses on content, language, and media of developing "HUPROSED" as a learning media in human reproductive system topics exercise students' critical thinking skills?
- 3) How do the teachers respond to developing "HUPROSED" as a learning media in human reproductive system topics to exercise students' critical thinking skills
- 4) How do students respond to developing "HUPROSED" as a learning media in human reproductive system topics to exercise students' critical thinking skills?

2.4 Research Objective

Based on the research question that has been made, the research objectives are specified as follow:

- 1) To describe the stages "HUPROSED" as a learning media in human reproductive system topics to enhance students' critical thinking skills.
- 2) To analyze experts' responses on content, language, and media of development of "HUPROSED" as a learning media in human reproductive system topics to enhance students' critical thinking skills.
- 3) To analyze teachers' response to game-based learning using "HUPROSED" as a learning media in human reproductive system topics to exercise students' critical thinking skills.
- 4) To analyze students' responses to game-based learning using "HUPROSED" as a learning media in human reproductive system topics to exercise students' critical thinking skills.

2.5 Research Benefit

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

- 1) For students, this research can give a new experience of learning and can enhance students' critical thinking through games.

- 2) For a teacher, this research about developing the human reproductive system topic to enhance students' critical thinking skills can be used as a teaching media in the learning process.
- 3) For society, this research about sex education is helpful as media for introducing comprehensive sex education from toddler until adult.
- 4) Another researcher, this research can be used as a reference. It can be used as one alternative in developing research, and deficiency and excess in this study can be evaluated.

2.6 Limitation of Research

The research also has a limitation, to make the study more detailed, the limit of the study is:

- 1) HUPROSED (Human Reproductive System and Sex Education) Android Application

HUPROSED is an abbreviation of "Human Reproductive System and Sex Education," which is a media to support learning on the human reproductive system and sex education material. The game's concept is adopted from critical thinking subskills based on Facione. The human reproductive system is the focus of this study, which is restricted by basic competences 3.1 and 4.1 and aligned with sex education. These basic competencies are part of Indonesia's Junior High School national curriculum since 2013. There are many kinds of games developer software, such as Construct, App Builder, Unity, etc. The game developer software used in this research is Unity. Storyboard created using Balsamiq wireframes and games built using Unity 2019. Then, after the game project is finished, the project is exported to the Android platform to run the application file on a smartphone—the rubric assessed by the experts, including mechanical, information structure, documentation, and alignment.

- 2) Student's Critical Thinking

Critical thinking skills adapted from Facione are six capabilities of critical thinking emerging in the learning process through the ability. The six indicators are interpretation, analysis, inference, evaluation, explanation, and self-regulation. In implementing critical thinking skills in this game, only five

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indicators are interpretation, analysis, inference, evaluation, and resolution. This research's critical thinking skills are included in the quiz question in line with HOTS (High order thinking skills), which usually have cognitive skills above C4, applying, analyzing, evaluating, and creating. In this game, students will answer quiz questions inserted into the games.

2.7 The Organization of Research Paper

This research consists of five chapters. The organizational structure of this research are described below:

- 1) Chapter I, the introduction, consists of background, research problem, research question, limitation of problem, research objective, research benefit, and the structure of this research paper.
- 2) Chapter II, the literature review, consists of literary theory and information on research variables. The explanation of the literature of this research is based on trusted sources, such as books and journals.
- 3) Chapter III, the research methodology, explains the methods used in this research. It consists of the research method, research design, research subject, operational definition, instrument analysis, a technique to analyze the data, and research procedure.
- 4) Chapter IV, the result and discussion, consists of the deciding stage, design stage, development stage, and evaluation stage, based on the research methodology explained in chapter 3.
- 5) Chapter V, the conclusion and recommendation, explains the summary of the research result, and the recommendations are for another researcher and society.

