CHAPTER I
INTRODUCTION

1.1 Background

One of the most important goals in the 21st century, especially in science education learning is to empower critical thinking ability (Glaze, 2018). Furthermore in Indonesia, students' critical thinking ability are considered still in the low category. The low critical thinking ability of students is a severe problem that needs to be resolved immediately since it will be very damaging to many parties if it continues (Syabila, 2021). Most studies reported that increasing the critical thinking ability of students' in junior high school in Indonesia were still at a "moderate" level. This leads to the conclusion that learning efforts are still needed to improve critical thinking. The development of the critical thinking ability in middle-aged children (around 12-15 years) is very important (Billah et al., 2021).

The low critical thinking ability of students' is caused by some factor, for example there are some teachers that still use an old method, which is they still dominate the learning process (teacher centered), so the learning activities have not stimulated students' to take an active role in the class. However the students' critical thinking is the one of the important ability that students' must have in this century, because they need their critical thinking skill to understand about the topic, and also for their future that ability can help them to solve the problems and analyze the information that they confront in their life. So the students' critical thinking ability must be built in their school life, because it is one of the keys for a successful career.

In the 21st century also the development of science and knowledge have a sense of urgency among learners, especially to acquire certain ability that are required in career fields. These ability might include critical thinking ability, problem-solving ability, communication ability, collaboration ability, creativity and innovation (Greenstein, 2012). Critical thinking is an important 21st century learning skill that needs to be learnt and taught in students' academic life (Mbato, 2019). Students' is expected to be an individual who is able to ask, argue, do research, draw proper conclusion from an observation result, think scientifically,

criticize, know the way to get knowledge, be creative, make decision, be responsible, express him/herself, and think critically (Aktamis & Yenice, 2010).

In this day, the educational problems were complex (The poor educational research content, not effective teaching methods, and inappropriate procedures for evaluation) has resulted in increasing importance of curriculum as the only responsibility references for educational problems (Kelly, 2009). Furthermore Fatmawati et al (2019) also stated Critical thinking is a skill that should be developed, practiced and integrated into a school curriculum in order to get students engaged in active learning. Facione (2000) stated if a curriculum is based on the critical thinking ability, it will direct the learners towards dispositions to critical thinking.

However, critical thinking ability are related to academic ability (Dehghani et al., 2011) Some studies have shown that students' academic ability has an effect on their critical thinking ability. Students with higher academic ability develop better critical thinking ability than those with lower academic ability (Mahanal et al., 209). Based on the Taghva et al (2014) reported there is a significant correlation between students' critical thinking ability and their academic abilities. One of the goals in the educational system, especially in higher education is to increase and improve students' critical thinking ability. In this case, students who have critical thinking ability in every learning, they will have better academic ability also, so this is important to learn and to improve in our class.

Critical thinking has been included in many school and university curricula around the world, its definition and elements are not clear as the popularity (Kuhn, 1999). Furthermore, the implementation of critical thinking inside the classrooms in Indonesia is lacking. Part of the problem in the teaching of critical thinking in Indonesia is a lack of clarity of instruction in the curriculum about what critical thinking is, and the unfavorable culture as well as the teaching learning processes inside the classrooms for students' critical thinking to grow (Jobrack, 2013). Teachers have important roles and responsibility in the activities of the learning process in the classroom, so the learning objective can be achieved optimally (Royhana et al., 2021). To apply more critical thinking

ability, students, teacher must work together, and also with a better curriculum to support increased students' critical thinking ability.

Critical thinking ability are still needed to develop an educated society which involves knowledge in terms of the ways in which thinking is used (White et al., 2011). However, the learning activities at school also require students' to learn optimally (Yeni et al., 2017). In this case students' critical thinking skill is more important that students' must have and improve, because if students have better critical thinking they can more easily understand about each subject and also they will have higher academic ability value. The method or approaches learning was promoting active participation of students' in learning are believed to help learners construct knowledge meaningfully (Kalina & Powell, 2009).

Besides that, learning materials are required in every learning activity, for example the media, worksheet and also method for teaching and learning. To reach the learning objective, the learning materials also must be of good quality, some people agree that learning material must be good and have the criteria of validity which are content (construct validity), practicality and effectiveness for teaching and learning (Nieveen, 1999). Learning models have functions to increase the students' activity, ability, motivation, level of understanding the concept and creativity of students in the learning process (Salyani et al., 2020).

In this time students must be able to get 21st century ability, so the learning activity also the model in the educational unit must be interactive, inspirative, fun, challenging, motivating and provide sufficient space for initiative, creativity, physical-psychological talent (Sugiarti et al., 2018), so students able to get their 21th century ability. However in this 21st century there are changes in the process of science learning because of the influences of technology and information (Choowong & Worapun, 2021). Today the time has changed and most individuals are expected to produce or find information rather than consume it (Zeh, 2006). Furthermore, this time modern person attempt to effect changes in the behavior of the individual by applied the learning process by students centered educational rather that a teacher centered (Ulaş et al., 2012), the purpose of students' centered teaching model is help and enable to make students more active and encourage them to think more critically.

It must be another challenge for all the current teachers to find a learning model or approach for the implementation in teaching and learning activity, but not only implementing the approach also must be suitable for current students' situation. However, in this study, the researcher attempts to implement the 5E-learning cycle model for improving students' critical thinking ability. This model is related to the constructivist approach learning. Constructivist learning is the process of creating link between what is already known and the new learning and new information and combine into the existing knowledge (Ulaş et al., 2012) also stated constructivist approach is student-centered, but this does not make it necessary that the teacher should be kept outside the learning process.

One of the examples of teaching learning models based on the constructivist approach that is most commonly used in educational system recently is the learning cycle model. This model was developed in the 1960s by Karplus and Thier (1967) for the *Science Curriculum Improvement Study (SCIS)* (Hanuscin, 2008). This model was developed by Rodger Bybee, and these models consist of five stages which are engagement, exploration, explanation, elaboration, and evaluation. There are many studies that have been conducted about the implementation of the 5E- learning cycle model, but some of them have different variables. In this research there are five stages that are implemented in the 5E learning cycle model, these five stages are the things that must be done when implementing the teaching model 'learning cycle 5E". The 5E learning cycle model is the model that consists of 5 stages of implementation, which are Engagement, Exploration, Explanation, Elaboration, Evaluation. In this study the implementing 5E learning model in the class used an observation sheet, so when this model applied, there was an observer to investigate the researcher when implementing this model in the class, and give the description whether the model was implemented or not.

In addition Suryawati, et al (2018) research about the implementation of the 5E- learning cycle model on the topic structure and function of plants to improve the scientific literacy of the second year students' of a junior high school in Pekanbaru. Another researcher Subiantoro & Mutiarani (2021) also used the 5E-

learning cycle model to analyze the effectiveness of a 5E- learning scenario on nutrition and digestive system topics towards high school students' health literacy. However (Miarti et al., 2021) have implemented the 5E-learning cycle model to improve students' critical thinking in junior high school.

From a previous study, this research author attempts to apply the 5E-learning cycle model in science learning. According to a learning cycle model, students are able to find their own concepts that will be learned, prevent misconceptions, and provide opportunities for students to apply the concepts that have been learned in new situations. Teaching used model learning cycle 5E is one alternative of learning models that can improve student learning outcomes, in this learning model students have the ability to give their opinion and find the concept of the learning based on their own understanding.

According to the 5E-learning cycle model, this can be used to improve students critical thinking ability, because in this teaching and learning activity the teacher giving an example from their real world, after that ask students to give a similar examples and given help students' both researcher to link in the real world experiences with the topic. This learning model can approach students to have an active learningf, includes activities helping students have active roles in their learning (Ergin, 2012).

In this study, the research used the 5E-learning cycle model for biology . The topic of the excretory system in humans is a very suitable topic to be applied because it can help students' improve their critical thinking ability, because this topic is related to activity in their daily life. In the previous study mostly the learning topic used math or chemistry. Furthermore, the learning model that commonly used in previously research to improve students' critical thinking ability is problem based learning, stated by based learning, stated by (Silviariza et al., 2021) the SPBL model provides a reference for teachers to improve critical thinking in solving geographic problems, some of researcher also used STEM learning model to improve students' critical thinking ability.

In this study, the research also attempts to use the different critical thinking ability aspect from previous researcher about science learning to improve students' critical thinking ability. Previous study to improve student' critical

thinking ability examine the critical thinking ability that was developed based on the Ennis' critical thinking skill indicators, which are: identifying questions, proposing hypotheses, determining an action, considering the use of appropriate procedures, recording observation results, interpreting questions, identifying and dealing with irrelevance, and giving definitions (Susilawati et al., 2020). However, different from previous researcher the implementation of 5E-learning cycle model on critical thinking ability that are studied in this research used critical thinking ability aspect abilities that consist of three critical thinking ability abilities which are; ability to deal with conflicting data and reach conclusion, ability to design experiments to resolve flaws in studies, ability to conceptualize other interpretations of the same data based on (White et al., 2011). Furthermore, in this study the researcher goals is to investigate and analyze the effect of the 5E- learning cycle model to improve students' critical thinking ability in excretory system in human topic.

1.2 Research Problem

Based on the background, the research problem of this research is "How is the improvement of students' critical thinking by implementing 5E-learning cycle model in excretory system in human topic?" Based on the stated on the research problem above, this research questions is to answer this following question:

1) How the improvement on students' critical thinking after used the 5E-learning cycle model in learning excretory system in human topic?
2) How do students respond towards the use of the 5E-learning cycle model to improve their critical thinking ability in learning excretory system in humans?

1.3 Limitation of Problem

The research also has a limitation, to make research more detailed, the limitations of the research are:

1) 5E-Learning Cycle Model

In this research used the 5E-learning model, developed by (Bybee et al., 2006). This model is based on the constructivist approach, assumes that an

individual does not start learning with an empty mind, any new piece of knowledge triggers what is inside one's mind, and individuals construct new knowledge on prior knowledge.

2) Student's Critical Thinking Ability

In this study, the critical thinking ability aspect measured by using critical thinking indicators conducted by Brian White adapted to teaching excretory systems in humans topic. Based on the (White et al., 2011). The Assessment of Critical Thinking Ability (ACTA) survey assesses students on three main critical thinking abilities is to evaluation of multiple lines of evidence, as follows: Ability to integrate conflicting data and reach a conclusion, Ability to design an situation or experiments to resolve ambiguities in certain knowledge, and Ability to conceptualize other interpretations of the same data. Critical thinking will be measured by using a rubric and through the test time that related to the excretory in humans topic.

3) Excretory system in Humans Topic

The excretory system in human topic content will be included is limited by the "Excretion in humans" topic into basic competence 3.10 and 4.10 by syllabus of Curriculum 2013, which is limited into several subtopic which are the Structure and Function of the Excretory System in Humans, The disorders of the human excretory system and efforts to prevent or treat the diseases.

1.4 Research Objective

According to the research problems and questions that are stated above, this research aims to investigate several aspects as follow:

1) To investigate the effect of students' critical thinking ability after implementation of 5E-learning cycle model on excretory system in human topic
2) To analyze students' respond towards the used of 5E-learning cycle model for their critical thinking ability in learning excretory system in human topic

1.5 Research Benefit

This research not only give the benefits for the researcher, but it is also to give some benefit for the other following person:

1. **Student**

   Students can experienced another teaching learning activity by implementing 5E-learning cycle model, and it will help to improving students critical thinking ability in excretory in human topic

2. **Teacher**

   Teacher can used for the teaching and learning activity in science learning, so that it becomes more varied and to develop the learning process, and also as a references to improving students critical thinking ability in 5E-learning model

3. **Researcher**

   Researchers can be used as a reference for the research and also to provide other information, which can be used for further reference of the best outcome for a students' critical thinking ability from implementing 5E-learning model in excretory in humans topic.

1.6 Organizational Structure of Research Paper

The organizational structure of the research paper explains all the structure of this research in each chapter. This research paper consists of five chapters, which are Introduction, Literature Review, Research Methodology, Results and Discussion, and Conclusion. The description of each chapter contents explained below:

1) **CHAPTER I: Introduction**

Introduction, this first chapter contains the background, research problem, research question, limitations of problem, research objective, research benefit and the organizational structure of the research paper. This chapter is crucial, because it is the basis chapter for this research and we work based on the research problem and question that is explained in this chapter.

2) **CHAPTER II: Literature Review**

Literature review, this second chapter in line with chapter I. The literature review or the literature theory explains the theory and also relevant topics that are needed by the researcher, to find and analyze the result. In this chapter also there are some literature reviews that support the result analysis in this research and it is based on the journal and books. This literature review in this chapter includes a 5E- learning cycle model, students critical thinking ability, and human excretory system topic.

3) **CHAPTER III: Research Methodology**

This third chapter contains the methodology that was used to carry the research paper. It includes the research method, research design, population and sample, operational definition, assumption, hypothesis, research instrument, instrument analysis, research procedure, and research flowchart.

4) **CHAPTER IV: Results and Discussion**

This fourth chapter includes the result discussion about the research that was already found. It describes the answer to the research problem in the first chapter. This chapter also consists of the data analysis based on the research result, and also the previous finding of other researchers in the second chapter.

5) **CHAPTER V: Conclusion, Implication, Recommendation**

The last chapter Conclusion, in this chapter includes this research paper conclusion, implication and recommendations for the following research and for the next researcher