

# CHAPTER I

## INTRODUCTION

### 1.1. Background

Nowadays, the education in the world needs the improvement of the educational system in case of the information outburst, globalization, and competition to face the challenges of the 21<sup>st</sup> century. In order to produce the thinker resources the education should be managed well. Students must be trained to use the power of argument, thinking skills in education because they will face the challenging and changes in science and technology. In the 21<sup>st</sup> century, thinking skills are crucial to support economic prosperity. In consequence, students deserve Higher Order Thinking Skills (HOTS) education, in order to equip them with the skills and ability how to make decisions and think critically and creatively and teachers need to understand how to teach in the 21<sup>st</sup> century in order to be able to provide the students with skills. HOTS involves high order thinking skills cognitive which are adapted from Bloom's Taxonomy (Sadia *et al.*, 2019).

Higher-order thinking in general means thinking that is taking place in the higher-levels of the hierarchy of cognitive processing (Ramos *et al.*, 2013). HOTS are the implementation of thought processes to complex situations and have many variables. All students can think, but most of the students need impuls and guidance for higher order thinking processes. Higher order thinking skills consist of three cognitive processes, namely analysis (C4), evaluation (C5), and creation(C6). HOTS can be deciphered into three meanings namely, as transfer, as critical thinking skills, and as problem solving (Brookhart, 2010).

Society in the 21<sup>st</sup> century realizes the importance of preparing young people who are creative, flexible, able to think critically, can make the right decisions and are skilled at solving problems. Based on the importance of HOTS, HOTS is very much needed in the orientation of creating jobs, creative thinking which is one of the components of HOTS will be able to bring up new ideas in creating jobs such as one in the world of entrepreneurship, a graduate who already

has HOTS when unable to get jobs will be able to create jobs because they are able to face the challenges of the 21<sup>st</sup> century both in terms of mastering technology and information critically and creatively as well as being able to solve problems and make decisions. (Sani, 2019).

HOTS are one of assessment that used in Indonesia as an effort to be able to improve the development of education at the international level. When students are faced with a problem, they will try to solve it. Problem solving is a condition in the form of a problem where the method of solving is unknown before. Problem solving aim to find the solution, where the student should empower and optimizing the knowledge they have through a process. This process will help student finding new knowledge. College students are said able to solve a problem if the student is able to analyze a problem and is able to use his knowledge in new situations, this ability known as HOTS. When college students doing activity in solving problem, student possible using the different approach and mental activity occurs in him, namely the process of thinking (Rahayuningsih and Jayanti, 2019).

The problems that face by students in real world are complex, unstructured, complicated, new and require more thinking skills than just applying what has been, so HOTS needed in face that problem (Pratama and Retnawati, 2019). This HOTS become a solution to catching up. To catch up someone must survive, where someone should have ability in higher order thinking to solve the problem that faced. The reform of the education system in question is not about changing curriculum content but about changing pedagogy, namely a change in action from simple action to comprehensive action and a shift in the dominance of traditional teaching that is non-algorithmic and emphasizes low-level thinking skills (LOTS or Low Order Thinking Skill) to learning that emphasizes high-order thinking skills (Ningsih, 2018).

HOTS can lead students to success (Tanujaya *et al.*, 2017). Therefore, educators must become facilitators who are able to provide support, access information on appropriate learning resources and direct students to get real learning experiences as an effort to develop HOTS. The urgency of measuring the HOTS profile of students in the STEM (science, technology, engineering and mathematics) fields is important to determine the best strategy for educators to

take. Students' mastery of science content is as important as their ability to process information logically and analytically. Science learning should accommodate students in exploring and understanding natural phenomena scientifically (Purwanti, 2020).

The result from the research showed the level of thinking ability of students in answering HOTS practice questions still needed improvement. Students who have high learning abilities are better at answering HOTS oriented questions compared to students in the medium and low categories (Yuliati dan Lestari, 2018). People who uses thinking skills will find it easier to complete a job compared to people who does not use thinking skills, these thinking skills can start from low level thinking to high level thinking (Ningsih, 2018).

Based on the result of the 2018 PISA (Program for International Students Assessment), the science abilities of students in Indonesia are ranked 71 out of 79 countries (Schleicher, 2019). This indicates that Indonesia is still at level 1a, where students are only able to use basic or everyday content and procedural knowledge to recognize or identify explanations of simple scientific phenomena. Students are only able to identify causal or linkages and interpret graphical and visual data that require lower level cognitive requirements.

The research on the students' higher order thinking skills in Indonesia Researchs show synchronous results. Most of students still have low ability, if it is categories from cognitive aspect knowing, applying, and reasoning. Besides the learning outcomes, the students higher order thinking skills in the teaching and learning process is still low. The students only used the lower order thinking activities. The whole data show that the students' HOTS become a problem which should be addressed seriously in education (Sadia, 2019).

Result of study from The Organization for Economic Cooperation and Development (OECD) in the Programme for International Student Assessment (PISA) in 2003 states that students in Indonesia only able to memory facts, terminology and laws of science but they have a low ability when find a contextual problem that needed problem solving abilities. To decide something that is logical and reflective, students should have higher order thinking skills.. Higher order thinking happen when someone takes new and stored information's

in their memory, interconnected or reorganize them, and extend that information to get the goal or find a possible answer in a confusing situation. Skills that include on higher order thinking skills are critical thinking skills, logic, reflection thinking, metacognitive thinking, and creative thinking skills (Trisnawaty, 2017).

HOTS also become important aspects in teaching and learning. In educational process thinking skills are the fundamental. Someone thought can affect the ability, speed and effectiveness of learning. Therefore, thinking skills is connecting with learning process. Students who are trained to think demonstrate a positive impact on the development of their education. Students with HOTS are able to learn, improve their performance and reduce their weaknesses (Heong *et al.*, 2011).

According to Brookhart (2010), the benefits of HOTS assessment are increasing motivation to learn and increasing the achievement of learning outcomes. HOTS questions aim to measure higher order thinking skills. In conducting the assessment, the teacher can insert several HOTS items. The following describes the role of HOTS questions in improving the quality of assessment according to the Ministry of Education and Culture (2017), namely preparing students' competencies for the 21<sup>st</sup> century, fostering a sense of love and concern for regional progress, increasing student learning motivation and improving the quality of assessments.

It is necessary to repair students' HOTS because developing these skills will diagnose students' higher level thinking, provide feedback to students about their level of thinking and encourage them to think in a better way. These skills also provide lecturers with information to achieve educational goals, conduct studies on how to teach higher order thinking skills (Yuniar dan Saepulroham, 2015).

The Indonesian National Qualification Framework (*KKNI*) is one of the national references to improve the quality and competitiveness of the Indonesian nation in the human resource sector through the achievement of qualifications for Indonesian human resources produced by the national education system and job training system, as well as an assessment system for the equivalence of learning outcomes. Increasing the quality and competitiveness of the nation will

simultaneously strengthen the identity of the Indonesian nation (Dikti, 2010). Along with these references, students are required to have HOTS in this curriculum in order to achieve learning outcomes.

Based on the result of the research “*Analisis Kemampuan Mahasiswa dalam Menyelesaikan Soal IPA Tipe HOTS*” with amount of sample 87, the students' ability in completing HOTS question in general is in moderate levels. (Purwanti, 2020). The other result that relevant with this research is “Higher-Order Thinking Skills (HOTS) Analysis of Students in Solving HOTS Question in Higher Education” shows that student HOTS in high levels namely in good category but students still have weakness in domain cognitive creat (C6) (Yuliat dan Lestari, 2019).

The Animal Physiology course is one of the expertise courses given in the sixth semester at the Biology Education Study Program at the Universitas Negeri Medan with Competency Standards. Students are able to communicate functions and processes in the animal digestive system. The processes in the animal body which are the main content in the Animal Physiology course cannot be understood by students in depth. Students still tend to memorize the material, and do not understand it, so that understanding the concept has not been mastered, the discussion of the problem is still textual, not contextual. Understanding of animal body concepts that require in-depth analysis has not been fully understood by students. The questions given by the lecturer in the test cannot be answered completely by students. Students giving explanations are still at the textual level, and are less able to think critically and logically (Primiani, 2012).

In summary, it can be concluded that learning in animal physiology courses is more emphasized on factual learning with subjects containing facts and events (Anderson & Krathwohl, 2010). Factual learning can direct students to solve problems involving 21<sup>st</sup> century skills, one of which is critical thinking skills, that's the reason having HOTS is very important in this course (Nuraini, 2017).

The role of Animal Physiology course for graduates is to create graduates who are able to master factual and conceptual animal physiology concepts, where graduates will later become teacher candidates so that there will be no mistakes or

misconception in teaching students later. Also this course can also be used by graduates to create jobs, especially in the field of animal husbandry, so that graduates are able to apply the concept of material contextually later. Today's environmental changes will also affect animal physiology mechanisms, so that new phenomena emerge. To solve this problem, the newest information about animal physiology is needed. Thus, it is hoped that solutions to the phenomenon of animal physiology can be identified and developed through this course program.

The difficulties that graduates will experience when they do not have HOTS are not being able to create jobs because they are unable to think creatively and make decisions. Another difficulty faced by graduates is that they will not be able to compete globally in the 21<sup>st</sup> century era, especially for prospective teacher graduates who will be faced with a very fast information explosion, when prospective teachers have low HOTS, prospective teachers will not be able to create new ideas in learning and are not able to filter the information that will be conveyed to students later (Sani, 2019).

Based on the problems above, there is a need for research to find out higher order thinking for prospective biology teacher students in Animal Physiology courses as initial knowledge in an effort to prepare the 21<sup>st</sup> century generation. HOTS also has been widely researched in several subjects like in some research mention above, but in the Biology course especially Animal Physiology, HOTS research has not been conducted. This is one of the reasons for the need to conduct HOTS analysis, especially for Biology study program students of UNIMED.

Based on the background description above, the researcher is interested in conducting research with the title Higher Order Thinking Skills (HOTS) Analysis of Biology FMIPA Students UNIMED 2018 on Animal Physiology Course.

## 1.2. Problem Identification

Based on background above, problems which will be identified are:

1. In the 21<sup>st</sup> century there are many challenges experienced in the world of education like technological development, information outburst, globalization, and competition so that the need for reform in the education system.
2. The students higher-order thinking skills in the teaching and learning process is still low.
3. The *KKNI* curriculum requires students to have HOTS
4. HOTS analysis has been researched in many subjects, but in Animal Physiology HOTS analysis has not been conducted.

## 1.3. Problem Scope

So that research does not deviate from the purpose of research, it is necessary to scope the study problem as follows:

1. Students who are the subject of research are students in Biology Education class 2018 UNIMED who have attended Animal Physiology courses
2. The lecture material to be examined in this research is the digestive system material in the Animal Physiology course
3. HOTS questions that will be tested to determine the high order thinking skills of students.

## 1.4. Problem Formulation

Based on identification and scope of problem which is described above, the problem formulation which will be studied are :

1. How is the level higher order thinking skills of Biology Education 2018 students in the Animal Physiology course when view from the score of the test results?
2. How is the higher order thinking skills of Biology Education 2018 students in the Animal Physiology course when view from the cognitive domain (analyze, evaluate and create)?
3. How do students responds to the difficulties experienced in working on HOTS question?

## **1.5. Research Objectives**

Based on problem formulation which is described above, the purpose of this research are :

1. To know the level higher order thinking skills of Biology Education 2018 students in the Animal Physiology courses when viewed from the score of the test results.
2. To know the higher order thinking skills of Biology Education 2018 students in the Animal Physiology course when viewed from the cognitive domain (analyze, evaluate and create).
3. To know students responds to the difficulties experienced in working on HOTS question

## **1.6. Research Contribution**

### **1.6.1. For Biology Department Lecturers**

This research is expected to be able to provide information to the State University of Medan, especially the Department of Biology, regarding the HOTS of Biology Education students so that the results of this study can be used as a reference and evaluation of the learning system on Animal Physiology material.

### **1.6.2. For Biology Department Students**

This research is expected to provide information about the ability level of Biology Department students regarding higher order thinking skills. Given the importance of higher-order thinking skills for prospective educators, the results of this study are expected to be able to invite prospective teacher students to improve their abilities, especially in higher order thinking.

### **1.6.3. Researcher**

Researcher knows and deepens learning and higher order thinking problems. Researchers also know the difficulties faced by students in higher order thinking.



### 1.7. Operational Definition

Operational definitions are intended to clarify the scope of the research and avoid misunderstanding of terms in the title of the proposal. Then the operational definition needs to be explained, namely: Operational definitions are intended to clarify the scope of the research and avoid misunderstanding of terms in the title of the proposal. Then the operational definition needs to be explained, namely:

1. The analysis referred to in this research is an attempt to analyze HOTS of student in Animal Physiology course or focus of study into parts (decomposition) so that the arrangement of the form of HOTS' data analyzed is clearly visible and therefore its meaning can be more clearly understood or the case can be understood clearly.
2. The Higher Order Thinking referred to in this research is thinking at a higher level than simply remembering facts or retelling something heard. HOTS (Higher Order Thinking Skills) or high-order thinking skills are divided into four groups, namely problem solving, decision making, critical thinking and creative thinking The HOTS question will be made with level analysis (C4), evaluation (C5), and creating (C6).
3. The animal physiology referred to in this research a scientific subject which has characteristics in which it discusses various concepts related to the processes that occur in the animal body and the interrelationships between systems that form a unified system in animals which is the basis for understanding the relationship between animal physiology and its environment. The material presented focus on digestive system the animal physiology will be make in HOTS question.