STUDENTS' HIGHER ORDER THINKING SKILLS AND SELF REGULATED LEARNING ON GENERAL BIOLOGY COURSEOF FIRST SCIENCE STUDENTS' OF FMIPA UNIVERSITAS NEGERI MEDAN

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ABSTRACT

The aims of the study are to determine the application of higher order thinking skills and student self-regulated learning in the General Biology Course, Faculty of Mathematics and Natural Sciences, Universitas Negeri Medan. This research was conducted in the departments of Mathematics, Physics, Biology, Chemistry, Science and Computer Science. Sampling was done by random sampling, by taking 6 classes from different majors. The type of this research is descriptive-quantitative research. The number of higher order thinking skills tests was 15 items and self-regulated learning tests were 40 items. The test is validated first before being used as a research instrument, followed by a validity test of the instrument, a reliability test, a test of the level of difficulty and distinguishing power. The results showed that the application of students' higher-order thinking skills in the General Biology course at the Faculty of Mathematics and Natural Sciences was still in the low categoryMeanwhile, Self-Regulated Learning for Students of the Faculty of Mathematics and Natural Sciences in the General Biology course is included in good categories, this is because the application of the KKNI curriculum accustoms students to be able to study independently through the assignment of six compulsory assignments for students.

INTRODUCTION

Education is a conscious and planned effortto create an atmosphere of learning and learning process so that students actively develop their potential to have spiritual spiritual strength, self-control, personality, intelligence, noble character and skills needed by themselves, society, nationand country. Education is the key word any effort to improve the quality of human life within whichit has a role and a purpose for 'humanizing'.

Education is essentialy the process of maturation quality of life. Through the process is expected to be able to understand what is the meaning of man and the essence of life, and for what and how to carry out the task of living and life correctly. That's why the focus of education is directed to the formation of a superior personality with emphasis on the quality of the maturartion process of logic, heart, character, and faith. The higlight was reaching the point of the perfection education quality of life (Hermino, 2016).

Higher Order Thinking Skills (HOTS) is one of the important components for an individual to be able to solve new problems in the 21st century. HOTS also plays an important role in applying, connecting, or manipulating the prior knowledge in order to effectively solve new problems. (In the revised Bloom's taxonomy, HOTS is defined as an incision among the three top levels of ability in the cognitive dimension (analyzing, evaluating, creating), and 3 levels of knowledge dimension (conceptual, procedural, metacognitive) (Retnawati *et.al*, 2018). Students are required not only to have lower order thinking skills (LOTS), but also to higher order thinking skills (HOTS). According to Kratwhwol &Anderson (2001), states that indicators for measuring HOTS include analyzing (C4), evaluating (C5), and creating (C6) (Nuragni, 2018). According to Retnawati *et.al* (2018), HOTS is most easily identified through Bloom's taxonomy. With the Bloom Revision taxonomy proposed by Anderson & Kratwhwol (2001), HOTS indicators can be easily formulated in learning. In the revised Bloom taxonomy, the cognitive process dimension is seen as a verb which serves to describe a particular process, while the knowledge dimension is seen as a noun which functions as the object of the process carried out. The existence of these two components (verb and noun) is the reason whyformulating indicators in Bloom's revised taxonomy is easier.

Cognitive process which is included in the HOTS category, which is analyzing, evaluating and creating, it can be categorized that analyzing and evaluating is part of critical thinking, while creating is part of creative thinking. Analyzing andevaluating is part of critical thinking based on the elaboration of the definition of critical thinking, namely as a process of passing judgment based on evidence (Eggen & Kauchak,2012), based on evidence (Arends & Kilcher, 2010). While creating can be considered as part of creative thinking in accordance with the opinions of experts, that creative thinking is a process to produce products, ideas, something new (Krulik & Rudnick, 1999; Presseisen 1985; Arends & Kilcher, 2010).

Higher Order Thinking skills about general Biology is to minimize the ability to recall information and measure the ability of analysis, evaluation, and creations related to general biology. The aim of general biology courses is for students to understand the basic principles of Biology and overall biological insight and their relationship with other disciplines. Specifically, general biology courses are basic material and therefore, these materials need to receive the most attention because they relate to the problem of mastery of the material, the selection of suitable learning methods, the determination ofstrategies and appropriate learning techniques as provisions for further lectures. Therefore, the researcher wants to analyze the Higher Order Thinking Skills of the Faculty of Mathematics and Natural Sciences, State University of Medan by knowing how HOTS is implemented andaccustoming Students to solving completing HOTS based questions so that learning activities not only focus on the ability to memorize only.

Based on the results of researchers' observations of the UTS and UAS questions on general Biology material given to students. In general, there are questions that have led to HOTS cognitive level with HOTS percentage of 70% and LOTS cognitive level of 30%. It's just that the number of questions for C6 cognitive level is not as much as C4 and C5 cognitive levels.

Based on interviews with FMIPA Lecturers, they said that the UTS and UAS questions had led to HOTS skills that refer to Bloom's Taxonomy at the C4, C5, and C6 levels. It's just that, not all students are able to solve these problems. There are students who can, some who can but are insensitive, and some who cannot atall. This is in line with the results of interviews with students, they say that all UTS and UAS questions are already referring to the HOTS level, although in multiple choices the ability to analyze, evaluate and create already exists in the problem. However,there are some HOTS questions that cannot be answered correctly because of a lack of understanding of the problem. Therefore, researchers want to implement high-level thinking

skills for students to complete HOTS based questions so that learning activities do not focus on low-level thinking skills.

RESEARH METHOD

The research was conducted in Juny until September in Mathematics and Natural Science Faculty (FMIPA) at Universitas Negeri Medan in academic year 2019/2020.The population in this research is all of students academic year 2019/2020 on Faculty of Mathmatics and Natural Science, Universitas Negeri Medan.Sample taken by *random sampling* technique. Every class was randomly sample from each departement. Using *Random Sampling* so that all populations can have the same opportunity to be in research sample.

Many or at least the population so that the sample taken can be said to be representative then in this study determined by using the Slovin formula quoted from Umar (2008: 108) below:

$$n = \frac{N}{1 + N(d)^2}$$

Where:

n = Number of samples
N = Number of Populations
d = Degree of Eror (10% atau 0.1)

With the following results:

$$n = \frac{1225}{1 + 1225\,(0,1)^2}$$
$$n = \frac{1225}{1 + 12.25}$$
$$n = \frac{1225}{13.25}$$
$$n = 92.452$$
$$n = 92 \text{ Students'}$$

According to the summation results above using the Slovin formula, the researchers obtained a sample of 92 students with details of the farm as follows:

N= Number of Students' Departmenx92
Total Number of Students'

Then the number of students in each department is obtained: (1) Mathematics totaling 28 students', (2) Physics totaling 13 students', (3) Biology totaling 20 students', (4) Chemictry 18 students', (5) Natural Science totaling 7 students', and (6) Computer Science totaling 6 students'.

Researchers used a descriptive research method followed by a quantitative research approach that analyzed higher-order thinking skills in the Students of the Faculty of Mathematics and Natural Sciences in the first year of education in the academic year 2019/2020. This research is a descriptive study because it does not need to control a treatment or is not intended to test a hypothesis.

This research was designed by providing multiple choice tests to measure high-levelthinking and providing self-arranged learning questionnaires for all sample classes consisting of thirteen classes. The results of the question answers and also the student questionnaire obtained were analyzed to find out the students' higher-order thinking skills and self-arranged learning.The tests used to measure students' higher order thinking skills are multiple choice questions. Multiple choice test is constructed by one information or notification about an incomplete definition, while in order to complete itcompleted The questions given in this research consist of 15 items covering levels C4, C5 and C6 according to Bloom's taxonomy.

The data in this study were obtained through multiple choice tests and Self Regulated Learning questionnaires. Then the multiple choice test will be distributed directly to students through Google form. All answers and data obtained will beanalyzed to determine students' high-level thinking skills and independent learning.The data collection tool used to collect data from students' higher-order thinking skills is a multiple choice of 15 questions and for Self Regulated Learning 40 items are given questions. Research instruments need to be tested for their validity, reliability, difficulty and discrimination power before they arecarried out.

The questionnaire about Student Self Regulated Learning will be given to Unimed FMIPA Students who are the samples in the study. The form of the scale used in examining student attitudes is a Likert scale. According to Djaali (2008), a Likert scale is a scale that can be used to measure the attitudes, opinions, and perceptions of a person or group of people about an educational phenomenon. Student Self Regulated Learning Questionnaire consists of 40 items arranged in tabular form.Data obtained bystudents will be re analyzed quantitative method. The data is used to determine the percentage of self-regulated learning implementation in students. The questionnaire analysis in this study uses a Likert scale consisting of 4 answer choices given a separate assessment, where theassessment given is 4-1. For answers Always givena value of 4, answers are often given a value of 3, Answers are sometimes given a value of 2, andanswers are never given a value of 1.

RESULT AND DISCUSSION

There are 15 questions used to measure higher order thinking skills. The following is a table that shows the achievement of the higher order thinking skills (HOTS) students on Faculty of Mathematics and Natural Science.

thinking skills of students at the Faculty of Mathematics and Natural Sciences is at a lesser level, because the students' high-order thinking skills from the six classes are averaged, a score of 68.05% is obtained.

Besides from the multiple choice test results, the analysis can be seen from the cognitive level of
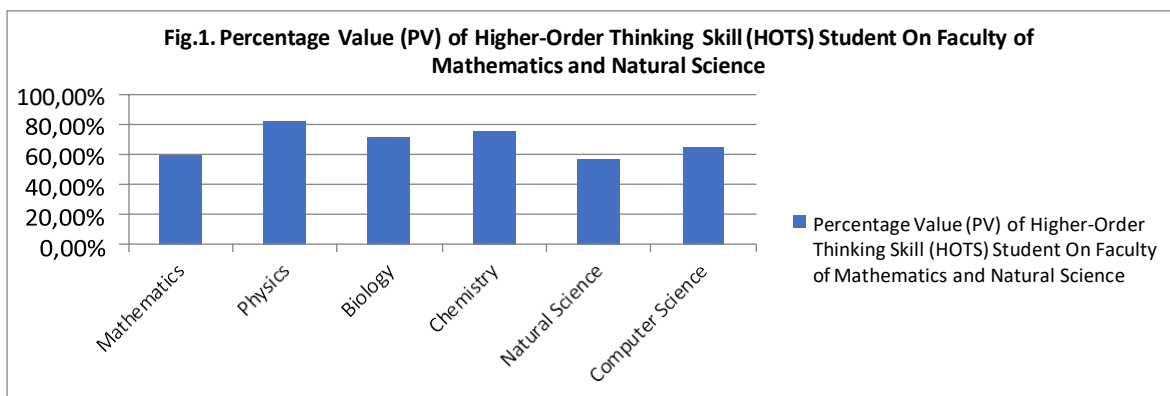

Fig.1. Percentage Value (PV) of Higher-Order Thinking Skill (HOTS) Student On Faculty of Mathematics and Natural Science

Table 4.1. Achievment of HigherOrder Thinking Skills of Student on Faculty of Mathematics and Natural Scence

Class	Percentage Value (PV) of Higher-Order Thinking Skill (HOTS) Student On Faculty of Mathematics and Natural Science	
Mathematics	PV Average (%)	59,5%
Physics	PV Average (%)	81,54%
Biology	PV Average (%)	70,7%
Chemistry	PV Average (%)	75%
Natural Science	PV Average (%)	57,1%
Computer Science	PV Average (%)	64,44%
Average of PV (%)		68,05%

From Table 4.1 above, it can be seen that in general the average percentage of the application of higher order thinking skills of students at the Faculty of Mathematics and Natural Sciences is 68.05%. From the percent value of the representative sample for each class, the Mathematics class gets 59.5%, the Physics class gets 81.54%, the Biology class gets 70.7%, the Chemistry class gets 75%, the Science class gets 57.1%, and the communication science class obtained 64.44%.

From this explanation, it can be seen that the achievement of the application of high-order

each question, such as the C4 cognitive level of the 7 C4 level item tested items with an achievement value (50-69%). The average score obtained by students on the C4 cognitive level questions was (63.43%). The average score indicates that students at the Faculty of Mathematics and Natural Sciences are able to work on questions that require analysis, because the percentageachievement score is in the "poor" category.Questions that are at the C4 level ask students to be able to analyze the data or information on these questions so that they can be used in answering the questions given. So, it can be said that students at the Faculty of Mathematics and Natural Sciences are less capable of analyzing questions.

Then of the 5 items tested, C5 shows the achievement value of the questions (50-69%). The average score obtained by students on the questions at the cognitive level C5 was (59.60%). The average score indicates that students of the Faculty of Mathematics and Natural Sciences are less able to work on questions that require evaluation, because the learning achievement scores are in the "poor" category.

Questions at level C5 ask students to be able to evaluate the data or information available in the questions so that they can be used in answering the questions given. Thus it can be said that students at the Faculty of Mathematics and Natural Sciences are less able to carry out question evaluation activities. And, of the 3 items tested, C6 shows the achievement value (50-69%). The average score obtained by students on the questions that are at the cognitive level of C6 is (63.33%). The average value indicates that

students at the Faculty of Mathematics and Natural Sciences are less able to work on questions that require evaluation, because the learning achievement scores are in the "(poor)" category. Problems at level C6 ask students to be able to make answers based on data or information on the questions so that they can be used in answering the questions given. So, it can be said that students at the Faculty of Mathematics and Natural Sciences are less able to do problem making activities. Based on the data obtained from the students' answers as many as 92 respondents to the Student Self Regulated Learning questionnaire, totaling 40 items regarding planning, organizing, directing, monitoring, and evaluating indicators, the data will be presented in Table 4.4 as follows:

Table 4.2. Student Self Regulated Learning Data in General Biology Subjects

Aspect	Value
Maximum score	4
Minimum Score	1
Average Score	62,63

Based on Table 4.2, it is known that the highest score in filling out the Student Self Regulated Learning questionnaire is 4 and the lowest score is 1. The average score of all students of the Faculty of Mathematics and Natural Sciences is 62.63 and has a standard deviation of. Self Regulated Learning as measured in this study is divided into 5 indicators, each of which will calculate the percentage. The following will be presented in Table 4.3 regarding the percentage of each indicator.

Table 4.3 Percentage of Student Self Regulated Learning Based on Indicators

Indikator	Persentase
Students ability in planning their learning	73,02%
Setting goals in learning	83,2%
Organize yourself in learning	7,17%
Choose an environment that optimize learning	68,38%
Structuring environment that optimizes learning	42,66%
Creating an environment that optimizes learning	80,16%
Self efficiacy	71,19%
Self attribution	80,43%
Intrested in tasks	58,62%
Monitor your self in learning	65,8%
Evaluate in self your learning	58,28%

Based on Table 4.3 presented, it is known that the percentage of the Students ability

indicator in planning their learning is 73.02 %%, the indicator setting goals in learning is 83.2%, the Organize yourself in learning indicator is 7.17%, the Choose an environment indicator that optimize learning is 68.38 %%, the Structuring environment indicator that optimizes learning is 42.66%, the Creating an environment indicator that optimizes learning is 80.16%, the Self efficiacy indicator is 71.19%, the Self attribution indicator is 80,43%, the Intrested in tasks indicator is 58.62%, the Monitor your self in learning indicator is 65.8%, and the Evaluate in self your learning indicator is 58.28%.

In the next table will be presented the percentage of Student Self Regulated Learning categories which fall into 5 categories, namely very good, good, enough, less and very less in Table 4.3 Percentage of Student Self Regulated Learning Categories.

Table 4.4 Percentage of Students' Self Regulated Learning Categories

Rentang Nilai	Kategori	Frekuensi Absolut	Persentase
81-100	Excellent	92	100%
61-80	Good	0	0%
41-60	Enough	0	0 %
21-40	Less	0	0 %
0-20	Very Less	0	0 %
Jumlah		92	100%

Based on the presentation of Table 4.4, it is known that the percentage of the category is very good with a value range of 81-100, there are 92 students, namely 100%. There are no students who have good, enough, less or less good attitudes.

DISCUSSION

Overall, less than half of higher order thinking questions were answered correctly by students at the Faculty of Mathematics and Natural Sciences. This means that students have higher-order thinking skills that are lacking in the General Biology course. For Biology, Chemistry, and Physics class students seem to have higher-order thinking skills that are better than Mathematics, Natural Science and Computer Science class students, it can be seen that almost all students get more grades. From these results it can be seen that there are several questions that are difficult to answer by students, there are 2 kinds of difficult questions, namely questions number 8 and 12. Higher order thinking skills are skills that involve high cognitive levels in Bloom's taxonomy. Bloom's cognitive taxonomy consists of six levels, namely knowledge, understanding, application, analysis, synthesis, and evaluation.

These six cognitive levels were then revised by Anderson &Krathwohl (2001) to remember, understand, and apply, analyze, evaluate, and create.According to (Zuhri et al, 2018) At the level of remembering, understanding, and applying, are low-level thinking skills, while at the level of analyzing, evaluating, and creating are high-level thinking skills.

From the results about the students' Regulated Learning above, the question is, why are Higher Order Thinking Skills and Self Regulated Learning less applied? This is assumed because of the different methods used by the lecturers in teaching general biology material. According to Slameto (2010) the factors that influence student learning outcomes include: internal factors and external factors. Internal factors include physical factors consisting of health factors and disability factors. Psychological factors consist of intelligence, attention, interests, talents, motives, maturity, and readiness.

According to Rifa'i (2009), the factors that play a role in the learning process and outcomes arethe internal and external conditions of students. Internal conditions include physical conditions such as organ health, psychological conditions such as intellectual, emotional abilities, and social conditions, such as the ability to socialize with the environment. No less complex in internal conditions is the external conditions that exist in the student environment. Several external factors such as the variety and level of difficulty of the learning material (stimulus) being studied (responded), the place of learning, the climate, theenvironment, and the learning culture of the community will affect the readiness, process and learning outcomes.

Anni (2004) states that a set of factors that play a role in learning are the internal and external conditions of learning. Internal conditions include physical conditions, such as health of organs. Psychological conditions such as intellectual, emotional and social conditions, such as the ability to socialize with the environment. Perfection in internal conditions owned by students will affect readiness, process and learning outcomes.

CONCLUSION

Based on the research, it can be concluded that: Students' high-level thinking skills in the General Biology course at the Faculty of Mathematics and Natural Sciences are still in the low category. This can be seen from the results of the Mathematics Education class B, as much as 3% is in the perfect category, 28% is in the very good category, 7% is in the good category, and 60% is in the low category. In Physics Education class A, 38% are in the Perfect category, 38% are in the very good category, and 23% are in the low category. In the Biology A education class, 30% are in the perfect category, 5% are in the good category, and 65% are in the low category. In the Non- educational Chemistry class A, 28% were in thePerfect category, 17% were in the very good category, and 50% were in the low category. In IPAB class, 14% are in the perfect category, 28% are inthe very good category, and 57% are in the low category. In computer science class C, 17% are in the perfect category, 33% are in the good category, and 50% are in the low category.

Self Regulated Learning Students of the Faculty of Mathematics and Natural Sciences in General Biology Subjects are included in good characteristics, this is because the application of the KKNI curriculum accustoms students to be ableto study independently through the assignment of six mandatory assignments for students.

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