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The Need of Science Learning to Empower High Order Thinking Skills in 21st Century

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Abstract. One of the characteristics of 21st century learning is the need to empower higher order thinking skills, especially in science learning. This research is a survey research that aims to determine how the learning process in the field and the desire of students to learn science in empowering higher order thinking skills. Respondents in this study were 102 students of the Faculty of Mathematics and Natural Sciences, The State University of Makassar for the academic year 2019/2020. The instrument used in the instrument sheet was a questionnaire to measure student needs and a deep interview sheet. The results showed that students considered the learning process still negative in its application process. In addition, students also need an innovative learning process that can activate students in the learning process, train critical and creative thinking skills facilitate students to always learn collaboratively, and be able to apply their knowledge in everyday life. Therefore, a solution is needed, namely the development of appropriate learning models in science learning in empowering higher order thinking skills during the learning process.

Keywords: Higher order thinking skills, science learning, learning models.

1. Introduction

21st century education is very important to consider in developing the quality of human resources (HR). In addition, education is also said to be important in ensuring that students have learning and innovation skills, skills in using technology and information media, and can work, and survive by using skills for life [1], [2]. According to Afriyanti [3], education through 21st century learning has a learning paradigm that emphasizes the ability to connect knowledge with the real world, master information technology, communicate and collaborate. In addition, learning by producing higher-order thinking outcomes is also an important goal in today's education world.

Higher order thinking skills are the ability of students to synthesize, evaluate, create and criticize and produce a product [4]. According to Tiruneh, Verburch & Elen [5], higher-order thinking skills are a big asset in producing a problem-solving process that aims to increase one's knowledge. Students who are equipped with high-order thinking skills can become competent problem solvers, and are able to compete



in the global market, especially in getting the world of work [6]. Higher order thinking skills are very important, especially in science learning.

One of the real forms of 21st century learning in producing higher order thinking skills in the 21st century in science learning is emphasizing the learning process [7]. Students who are active during science learning can build their knowledge through a series of activities so that the learning process becomes meaningful for students [8]. According to Bustami, & Corebima [9], the process of learning science by using a process skills approach is able to make students discover facts, build their own scientific concepts, theories and attitudes which in the end can have a positive effect on the quality of educational products.

But in fact, students are still classified as weak in learning science in producing higher order thinking skills in the 21st century, even though the development of higher order thinking skills in science learning is very necessary for the development of knowledge, skills and attitudes of students [4]. According to Rosba, Zubaidah, Mahanal & Sulisetijono [10], the low level of high-order thinking skills in Indonesian students' science learning is closely related to the gap between applied science learning and the demands of 21st century learning. In addition, science learning produces higher order thinking skills, the learning and teaching process is merely memorizing facts, principles and theories [11]. The learning process that does not have characteristics in empowering thinking skills can be said to not provide meaningful learning for students [12]. Learning is not enough just by explaining and listening, but students must be more active, easy to understand the material and concepts that exist with the activity of finding the concept itself through the learning process [13]. One of the causes of the low quality of high-order thinking skills in science learning is the learning process factor that is applied.

The learning process is a process in which there is an interaction between students and educators in building care and processes in stimulating the ecosystem by interacting with its components. The learning process is the basis for educators and students in implementing classroom learning, because there is a systematic process through the design, implementation and evaluation stages [14]. According to Arends [15], the learning process is a process or pattern that is comprehensive to help students learn certain types of knowledge, attitudes or skills. Important elements in the learning design process are students, objectives, methods and evaluation, if the four points have been planned properly; the learning process plays a very important role in producing quality output for students.

Therefore, the existing problems should be resolved from an early age by finding out what learning process is used and how the learning process is applied in the field to empower higher-order thinking skills in science learning. The existence of good thinking skills is able to overcome learning problems, especially in learning outcomes. In addition, having skills in thinking can be said to be the main key to the success of education in the 21st century today [16]. It can be concluded, that someone who has high-level thinking skills and is able to carry it out responsibly, the quality of education in Indonesia is able to achieve the goals of Indonesian education, namely "educating the nation's life" equally.

Based on the observation of the importance of high-order thinking skills in science learning in the 21st century, the problems that occur in Indonesian students, especially in higher-order thinking skills, need to be conducted a study. This study aims to determine how the application of the learning process and the desires of students in learning science in empowering higher order thinking skills in one of the tertiary institutions in South Sulawesi, The State University of Makassar.

2. Methods

The design of this study was a survey to record data on the application of the learning process that took place in the field, and the desire of students to learn science in empowering higher-order thinking skills at the Faculty of Mathematics and Natural Sciences, The State University of Makassar. This research was conducted in April 2020. The population is all students of the Faculty of Mathematics and Natural Sciences for the academic year 2019/2020. A sample of 102 students were randomly selected from five departments and two study programs (biology department, chemistry department, mathematics

department, geography department, physics department, science education study program and statistics study program) in the Faculty of Mathematics and Natural Sciences.

The data collection technique uses an instrument sheet in the form of a questionnaire in measuring student responses to the learning process carried out during the learning process in the 21st century in empowering higher order thinking skills in science learning. Questionnaire indicators consist of: 1) the use of learning models, 2), student activeness, 3) empowerment of thinking skills 4) the role of educators in learning, 5) technology in learning, and 6) follow-up activity in learning. The data obtained were analyzed descriptively. If the number of students who give positive or very positive responses is greater than or equal to 80% of the number of subjects studied, the learning process has a very good application in improving thinking skills in science learning [17]. In addition, students are also given deep interviews which consist of: 1) the learning model that is usually used, and 2) what kind of lectures the students want.

3. Results

The results of research from a needs questionnaire regarding the application of the learning process at the Faculty of Mathematics and Natural Sciences, The State University of Makassar are presented in Table 1.

Table 1 The results of the analysis of student needs for the learning process.

No	Indicators	Frequency average %			
		Highly positive	positive	negative	Highly negative
1	The use of learning models	0.00	7.25	88.63	4.12
2	Student activeness	0.00	13.53	81.96	4.51
3	Empowerment of thinking skills	0.00	2.16	91.96	5.88
4	The role of educators in learning	10.00	14.12	72.94	2.94
5	Technology in learning	12.35	20.20	64.31	3.14
6	Follow up activity in learning	10.59	22.94	62.94	3.53
	Total	5.49	13.37	77.12	4.02

Table 1 shows that the students' response to the learning process as a whole is negative with a mean value of 81.14% (mean negative and very negative). Indicators on the use of learning models, student activeness in empowering thinking skills, the role of educators in learning, technology in learning and follow-up in learning are all in the poor category because they are considered negative by students. These results indicate that the learning process in the field of science learning is very poor category.

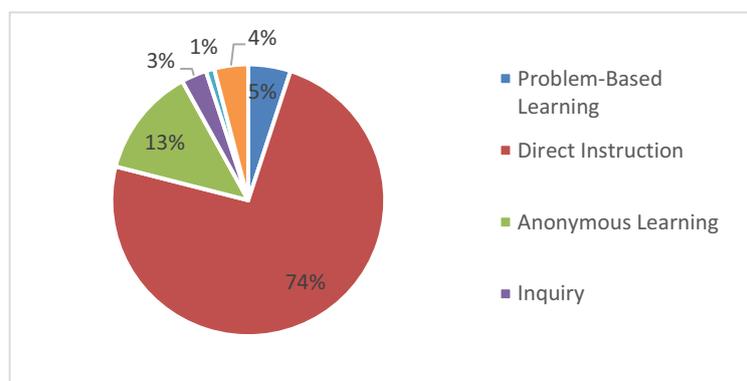


Figure 1. The learning model that is commonly used during the learning process

In the results of deep interviews, data was also obtained that during the learning process, the learning model that is always or often used is a learning model that is not able to maximize the science learning process. The learning model used during the learning process can be seen in Figure 1.

The results of deep interviews also found out what the students wanted the recovery process. The lecture process that students want is a good and effective learning process during the learning and teaching process. The coding results from deep interviews in the learning process are presented in Table 2.

Table 2. The lecture process that students want

No	Coding
1	The learning process focuses more on students
2	The use of technology during the learning process
3	There is an LKM that can always activate students in learning
4	Learning that promote critical and creative thinking processes
5	Enabling students to work collaboratively in a structured manner
6	Easy learning to do
7	Learning syntax that makes students not bored in learning
8	Educators who are able to provide good guidance during learning
9	The learning process can be applied to students

There are nine important points from the coding results in the deep interview about the lecture process that students want. The nine points are the basis for producing a learning process that is able to empower students in learning science, especially in higher-order thinking skills in the 21st century.

4. Discussions

The results showed that in general the learning process that took place at the Faculty of Mathematics and Natural Sciences, The State University of Makassar had not achieved positive results, which were classified as negative. It can be seen that the results of the analysis of student needs towards the science learning process in empowering thinking skills have not received sufficient attention. This can be seen from the student response that the use of learning models, student activeness, empowerment of thinking skills, the role of educators in learning, the presence of technology and the follow-up of the learning process have not been implemented properly. The use of learning models that are often used during the learning process also does not use learning models that can empower thinking skills. In addition, the results of the deep review also found that students' desire for a quality learning process has not been achieved, so that it has an impact on the empowerment of thinking skills, especially in higher-order thinking skills in science learning.

Higher order thinking skills are skills in more complex thinking during learning [18]. These skills can appear if the learning process provides activity to students [19]. According to Tiruneh, et al. [5], learning that activates students can provide them with a more meaningful learning experience. In addition, the role of educators in carrying out the scaffolding process for students slowly and significantly can also strengthen and empower students' thinking skills. According to Adora [20], the role of educators is absolute during the learning process in straightening and evaluating the results of student thinking. In addition, the learning process that forms critical, creative, collaborative, and unsaturated thinking processes during the learning process and applicative after learning is the learning process that students want.

The lack of critical and creative thinking processes of students during the learning process is due to the learning models used are not diverse and less innovative so that students tend to be passive during lectures. Another factor is because students have not felt encouragement and support from the environment in the form of tools, appreciation, support, giving awards, praise and factors that can give self-confidence to students [21]. This is in accordance with Duran & Dokme [22] and Listiana & Bahri [23], that it takes a certain climate and encouragement so that someone can come up with ideas. The desired climate is a climate in which students feel able to be creative, and feel encouraged and appreciated in stimulating students to empower thinking skills such as critical and creative.

The results also show that the ongoing lecture process has not been able to activate students in structured collaborative learning. Students feel that the lecture process is still thick with individualism, dominated by educators and the nuances of learning are only one way, even though collaborative learning is able to strengthen students' thinking skills in obtaining factual knowledge. This is in line with research by Gokhale [24] which states that collaborative learning through discussion, clarification of ideas, and evaluations from others can strengthen critical thinking and be effective in gaining factual knowledge. In addition, according to Al-Rahmi & Zeki [25], collaborative learning can build the capacity to tolerate or resolve differences and build opinions in a study group which has an impact on good and quality learning outcomes.

In addition, students argue that the results of the learning process cannot be implemented in everyday life because the learning strategies used only focus on the stages of knowing or understanding the material and have not reached at the application or application stage of a concept or material yet, even though applied learning uses new concepts in practice or situations can provide more meaningful learning for students. This is in line with Simonton's research [26] on applicative, namely a person's ability to apply or use general ideas, methods, principles, formulas, theories and so on in everyday life that can provide additional value to someone. In other words, the applicative ability of students can construct their knowledge, so that they can link past knowledge with the knowledge they have just received [7].

Based on the research results that have been reviewed, it appears that students need a learning process that is able to activate them in learning both physically and mentally. Learning will be more meaningful if a learning process is applied that can train thinking skills such as critical and creative thinking and can collaborate in creating a warmer social system during the learning process. In addition, the applicative abilities of students obtained from the learning process can be applied in real life, it is also important to present. Therefore, it is necessary to develop a solution, namely a learning model that can cover all the desires of students in order to produce a quality science learning process in empowering students' higher order thinking skills in the 21st century.

5. Conclusion

The learning process at the Faculty of Mathematics and Natural Sciences, The State University of Makassar is still negatively applied to students. Students need an active learning process that can practice thinking skills such as critical and creative thinking. Collaborative learning is what students want in science learning. In addition, students also need a learning process that is able to facilitate students to be able to apply the knowledge gained during the learning process into their daily life. With the solution, namely the right and quality learning model, learning will be more meaningful.

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