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Application Inquiry learning to improve metacognitive ability of Biology education students in anatomy of human physiology

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Abstract. This research was aimed to improve students' metacognitive abilities on the concept of Anatomy of Human Physiology of Biology student of Jabal University Ghafur, This research is an experimental research, using quasi experiment method. The research design uses a nonrandomized control group pre-test- and post-test design. Data collection techniques are tested (pre-test and post-test). Metacognitive abilities consist of metacognitive awareness and metacognitive skills. Instruments for measuring metacognitive awareness using metacognitive awareness questionnaires (MAI) consisting of 52 statements. Metacognitive skills are measured using a rubric developed by A.D. Corebima. The result of the research shows the data about the students' early ability in the form of pre-test which was done before the guided inquiry application has the average pretest value is 53,05, while the post-test value is 87,33. After guided inquiry, it showed an increase in metacognitive skills with an average N-Gain score of 73.08. For metacognical awareness assessment showed an increase in the mean value of pre-test value was 65.33 and post-test 77.81.

Keywords: *Inquiry, Metacognitive, Anatomy of Human Physiology*

1. Introduction

Learning or education is essentially a process of interaction between learners with the environment, so that there is a change of behavior in a better direction. In learning, the main task of educators is to condition the environment in order to support the change of behavior for the students, because education is one of the efforts to educate the next generation of the nation to have high knowledge and skills to be able to live in the community. [15] States that education is a deliberate and deliberate effort to develop the intelligence of learners of intellectual, spiritual, emotional, social, and kinesthetic intelligence.

One of the principles of learning that allows students to learn full meaning is the learning process that is expected to encourage students to realize and use their understanding to develop themselves and solve various problems faced in everyday life. Based on the empirical observations, it is inversely prohibited, many obstacles faced by lecturers in implementing science learning especially Biology. The main obstacle shows the metacognitive of students is still low. The main problem is more dominated by lecturers so that students act as learning object. Consequently, there is less experience for students to develop their metacognitive ability. In previous studies, learning by using guided inquiry model gave

better results. In the research of [7] concluded that an inquiry-based science education (IBSE) has been successful as an appropriate educational method that greatly motivates students in learning.
In this study using Guided Inquiry as found by [13] that lecturers play an important role as a motivator and facilitator in the implementation, lecturers play a role in giving guidance and general guidance. From the various opinions that concluded that guided inquiry learning referred to this study is learning that prioritizes the active involvement of students, seek and collect information and provide answers to the problems faced by following the guidelines of activities that have been designed by lecturers in the form of questions that the answer is expected to pertain with empirical problems that lead to the achievement of a learning objective.
Metacognitive ability is the highest level of knowledge in the revision of Bloom's Taxonomy after factual, conceptual, and procedural. Furthermore, there are three aspects of metacognitive knowledge, (1) strategic knowledge, (2) knowledge of cognitive tasks, including contextual and conditional knowledge, and (3) self-knowledge [4]. The students' metacognitive ability with the guided inquiry is very much needed to be developed in learning so that students understand the essence of science (biology) as a process, product, and scientific attitude.

2. Research Methods

This research is an experimental research, with the method used quasi experiment. The research design uses a nonrandomized control group pre-test- and post-test design. Population and sample of research Population in this research is all students of Biology Education Department Jabal Ghafur University in seventh semester Year Teaching 2017/2018. The Sampling used Purposive Sampling Technique. The sample of the study amounted to 21 students. Data collection techniques are tested (pre-test and post-test). Metacognitive abilities consist of metacognitive awareness and metacognitive skills. Instruments for measuring metacognitive awareness using metacognitive awareness questionnaires (MAI) consisting of 52 statements. Metacognitive skills are measured using a rubric developed by A.D. Corebima [2]. Data analysis technique in this research will be conducted that is descriptive quantitative analysis. For data analysis of the metacognitive ability of quantitative data obtained from pre-test score and post-test score, then tested normality and homogeneity. Continued independent test sample t-test.

The standard gain calculation refers to the following equation:

$$\text{Gain Standard} = \frac{\text{Score Posttest} - \text{Score Pretest}}{\text{Score Maximum} - \text{Score Pretest}}$$

A hypothesis test is done by using a significant level of 0.05 with the test criteria as follows: if t-ratio < t-table, then Ho accepted and Ha rejected. Conversely, if t-ratio > t-table, then Ho is rejected and Ha accepted. Questionnaires about students' metacognitive awareness were analyzed descriptively quantitatively. The percentage is obtained based on the calculation of Guttman Scale (Sugiyono, 2010) with the description of the rating scale for the student opinion is "True" with the value of one and "False" with a value of zero.

3. Result and Discussion

Based on the research result of the metacognitive ability of Biology Education Department students at Jabal Ghafur University with the implementation of guided inquiry learning that consist of metacognitive skills and metacognitive awareness. Metacognitive skills measured in this study are illustrated and integrated into the concept mastering test namely the ability of students in exposing answers to the test mastery of the concept of Anatomy of Human Physiology. Data on students 'metacognitive skills on the concept of Anatomy of Human Physiology with the application of guided

inquiry learning includes pre-test, post-test, and N-Gain to find out the improvement of students' metacognitive skills.
Data on initial student ability in the form of pre-test performed before the guided inquiry application has an average pre-test value of 53.05, while the post-test value is 87.33. After guided inquiry, it showed an increase in metacognitive skills with an average N-Gain score of 73.08 (Figure 1). Therefore, the application of guided inquiry is effectively used instead of previous learning. This can be seen also from the significance test results (Table 1). Differences in the difference between the value of the final test and the initial test are the result of achievement which is the influence of the learning activities applied by the lecturer.

3.1 Improvement of Metacognitive Skills
The improvement of metacognitive skills of each student is expressed as the post-test and pre-test score gap obtained then normalized called N-Gain. Figure 1 shows the improvement of students' metacognitive skills.

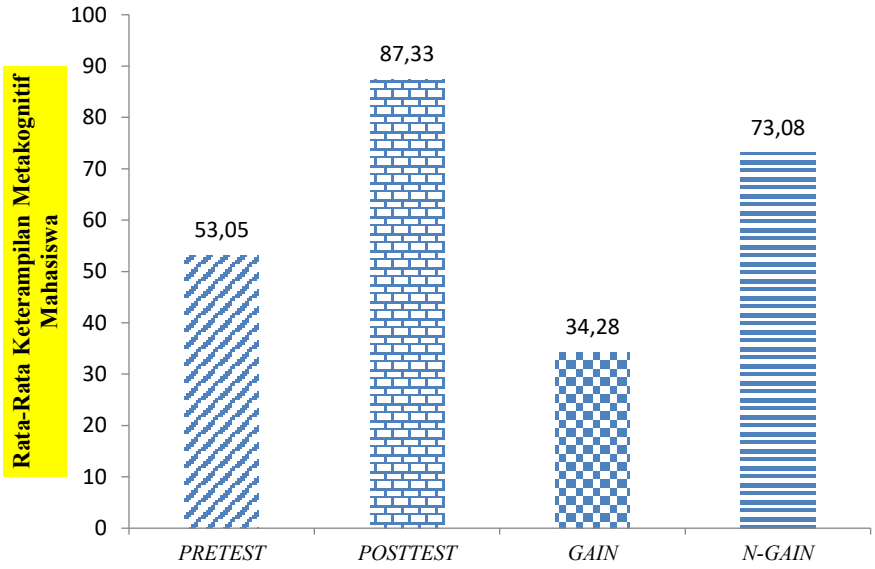

Figure 1. Average Score of Student Metacognitive Skills

In Figure 1 we can see that the posttest score of students' metacognitive skills is higher than the pretest score and the average N-Gain score is 73.08. So in the class tested there is an increase in the average metacognitive skills of students on the concept of Anatomy of Human Physiology due to the implementation of guided inquiry. Table 1 showed the significance level with t test value that is t-count 21.44 is bigger than t-table 2.021 (α 0.05), then the data is significant or different real and Ha accepted. Thus there is a difference in the application of guided inquiry with prior learning to the improvement of students' metacognitive skills.

Table 1. Average Test Results of Student Metacognitive Skills

Average		Normality		Homogeneity	Significance
Pretest	*Posttest*	*Pretest*	*Posttest*		
53,05	87,33	Normal X^2_{hitung} (0,84) < X^2_{tabel}(5,991) α(0,05)	Normal X^2_{hitung} (3,52) < X^2_{tabel}(5,991) α(0,05)	Homogen F_{hit} (1,56) < F_{tabel} (2,12) α(0,05)	Signifikan t_{hit} (21,44) > t_{tabel} (2,021) α(0,05)

[20]; Prayitno (2011) in Setiawan and Herawati (2015: 360) stated that universities need to implement strategies that can develop students' metacognitive skills so that they can measure and manage their thinking development. Metacognitive skills can promote cognitive development. Corebima (2010) in Ganing (2014: 46) states that metacognitive skills are divided into self-assessment or self-cognitive access skills and self-management or skills in managing further cognitive development. Cognitive skills are required to perform certain tasks, whereas metacognitive skills are needed to understand how the task is performed. Thus, metacognitive skills are related to one's strategy of completing a task [20]; Prayitno (2011) in Setiawan and Herawati (2015: 360) stated that universities need to implement strategies that can develop students' metacognitive skills so that they can measure and manage their thinking development. Metacognitive skills can promote cognitive development. Corebima (2010) in Ganing (2014: 46) states that metacognitive skills are divided into self-assessment or self-cognitive access skills and self-management or skills in managing further cognitive development. Cognitive skills are required to perform certain tasks, whereas metacognitive skills are needed to understand how the task is performed. Thus, metacognitive skills are related to one's strategy of completing a task (Christianity, 2015: 115).

Table 2. Average Pretest-Posttest Score of Student Metacognitive Awareness

Average Score	*Pretest*	*Posttest*
Metacognitive Consciousness	65,33	77,81
Metacognitive Skills	53,05	87,33

If students have metacognitive awareness then they will be able to control the purpose, motivation and attention in learning activities so as to encourage self-regulation independently. Moore (2005) in Christianity (2015) states that metacognition is the awareness of one's thinking about the thought process itself both about what is known and what will be done. Metacognition involves a person's awareness to think and act. Thus metacognitive awareness is an individual consciousness of how they learn, how they think and engage in self-reflection (Hennessey 1999; Nelson 1992; Schraw & Dennison 1994 in Hadi, 2014). Metacognitive awareness includes an awareness to monitor and assess a person's cognitive processes associated with further learning (Balcikanli 2011; Schraw, Crippen & Hartley 2006 in Hadi, 2014). When one monitors the progress of his learning, at the same time he will change his strategy when he feels that what he does is not right [6]

Metacognition shows the importance of learners' awareness of their own thinking in order to gain knowledge and regulation of cognitive strategies used in learning and to be able to reflect on one's learning experience and experience (Bransford, Brown & Cocking 2000; Flavell 1979; Pintrich 2002 in Hadi, 2014). Metacognition is related to a person's cognitive abilities because developing metacognition can improve the thinking process in order to control what is thought and done. Metacognitive activity occurs when a person takes advantage of it.

So based on the results of the research indicates that the application of guided inquiry can improve students' metacognitive ability.

4. Conclusion

The application of inquiry learning is guided in the subject of Anatomy of Human Physiology on reproduction system material and digestive system can improve metacognitive ability of students. In connection with the conclusion, it can be suggested that for teachers and lecturers can choose the appropriate learning method to be applied in order to improve the metacognitive ability of students.

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