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P B E

Increasing Junior High School Student Higher Order Thinking Skills (HOTS) Using Q&A Methods in Genetics Topic

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ABSTRACT

Biology learning in schools has experienced obstacles, namely the low level of Higher Order Thinking Skills (HOTS) students. The purpose of this study is to improve HOTS students through the use of question and answer method (Q & A). The method used in this study is the method of classroom action research, with the stages being traversed as many as 2 cycles. The study was conducted in August 2018 at Tambun Selatan 1 Junior High School, Bekasi. The sample used in this study were 37 grade 9 students who were studying genetic material and inheritance. The results of the study showed that there was an increase in HOTS scores with a low gain score. The complexity of the material that must be delivered makes students who have a low HOTS cannot follow the learning well. The conclusion is that the question and answer method can increase students' HOTS on genetic topics, but the gain score obtained is still low..

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1. INTRODUCTION

21st-century learning has many competencies that must be achieved by students. The demands of the modern era are increasingly high, requiring students to have a variety of skills and abilities, such as critical thinking skills, communication, collaboration, and creative thinking, and high-level thinking skills where these abilities are very necessary for learning (Anagün Assoc & Osmangazi Üniversitesi, 2018; Boholano, 2017; Imam, 2016; Quieng, Lim, & Lucas, 2015; Urbani et al., 2017). one of them is the Ability of Higher Order Thinking Skills (HOTS). This ability has the principle that students are required to have the ability to analyze, evaluate and create (Anderson et al., 2001).

The problem is that HOTS owned by students is still relatively low. HOTS focuses on the ability of students who are not just memorizing but must be able to judge a case. Students are asked to be able to analyze a problem and find solutions to these problems (Aisyah, Salehuddin, Aman, Yasin, & Mimiko, 2018; Djamahar, Ristanto, Sartono, Ichsan, & Muhlisin, 2018; Garcia, 2015; Tanujaya, Mumu, & Margono, 2017). The topic of the discussion of genetics in Biology learning at the junior high school level certainly requires students to start thinking critically and start having to be able to be creative by making a product related to the topic of genetic discussion.

The use of question and answer (Q & A) method is one of the efforts that can be done to increase student HOTS. The Q & A method is a method that can lure students to be more active and discussions will occur (Camacho & Legare, 2015; Khan, Khan, Zia-Ul-Islam, & Khan, 2017; Taga, Unlu, & Ozturk, 2016). Active students will make learning more alive. In the implementation of learning, this Q & A method can be combined with various existing learning media such as a chart, powerpoint, videos and so on.

The purpose of this study is as an effort to improve HOTS students in Biology learning using the Q & A Method. The benefits of this research are as a study material for teachers in Biology learning. Besides that, it is also a source of information for related parties in learning at school.

2. METHOD

This study uses the Classroom action research method with stages of 2 cycles. Implementation steps of Classroom action research, which contains 4 steps (1) planning (2) Implementation (3) Observation (4) Reflection. The study was conducted in August 2018 at Tambun Selatan 1 Junior High School, Bekasi. The sample used in this study were 37 students.

The instrument used in this study is a test question in the form of a description. The indicators measured in this study are composed of 4 aspects, namely analyzing, evaluating, and creating (Anderson et al., 2001). Indicators and aspects of HOTS questions used in cycles 1 and 2 can be seen in the following table.

Table 1. Aspects and Indicators about HOTS

Aspects	Indicators
C4	1. analyze the function of DNA as inheritance
	2. analyze the function of DNA and RNA based on their structure
	3. analyze the events of genetic disorders
	4. analyze the function of DNA in inheriting a characteristic disorder
C5	1. evaluating the location of DNA in the cell nucleus
	2. provide criticism of a statement about DNA and RNA
	3. evaluate a product modified genetically
	4. provide criticism of genetically modified products
C6	1. make a guess (hypothesis) for an event related to inheritance
	2. designing a simple research project about inheritance
	3. make a hypothesis (hypothesis) on the impact of nuclear use on DNA and cells
	4. designing a simple research project on waste management through genetic engineering technology

Data analysis used in this study is to calculate the Gain score. The gain score can be calculated using a formula (Fauziyah & Jailani, 2014). More details can be seen in the formula below.

$$\text{Gain Score} = \frac{\text{Average Score Cycle 2} - \text{Average Score Cycle 1}}{100 - \text{Average Score Cycle 1}}$$

After calculating using a formula, it is categorized. Making a category aims to see the gain score obtained. Determination of gain score categories which are high, medium and low (Puspitorini, Prodjosantoso, Subali, & Jumadi, 2014). More details can be seen in the table below.

Table 2. The gain score category

Gain Score	Category
g ≥ 0,7	High
0,7> g ≥ 0,3	Medium
g < 0,3	Low

3. RESULT AND DISCUSSION

The results showed that the HOTS scores of students were still very low. In cycle 1, the average HOTS score obtained was 13.41 while in cycle 2 it was 34.52. This shows that there is a need for further efforts to improve HOTS students in Biology learning. After the gain of the score is calculated, the gain score category is obtained as follows.

Table 3. Average HOTS and gain score scores

Step	Average HOTS Score	Gain Score	Category
Cycle 1	13.41	0.24	Low
Cycle 2	34.51		

Based on the results of the study, the use of Q & A learning methods can increase students' HOTS, but the gain scores obtained are categorized as low. This indicates that the increase obtained is not too large. This is because learning by using the Q & A method has several disadvantages, namely requiring the active role of students, the need for sufficient initial knowledge, and a conducive classroom situation. The use of this method will succeed if the classroom situation can be properly controlled by the teacher (Ito & Kawazoe, 2015; Tesfaye & Berhanu, 2015).

During the planning process, learning activities are planned to take into account the aspects and indicators to be achieved. The use of the Q & A method is one solution that is expected to increase HOTS. At the stage of implementation, learning using this method runs unfavorably. A large number of students makes the process of questioning and discussion not smooth and effective. This resulted in an increase in the HOTS score obtained not too large. The increase in HOTS indicates that the treatment given has an impact on learning even though it is not so large (Aisyah et al., 2018; Wall, 2015; Yee et al., 2015).

In the stages of observation and reflection, many inputs were obtained for the implementation of the second cycle. The implementation of the second cycle runs better, this is reflected in the HOTS score of students who have increased. At the end of cycle, 2 evaluation and reflection were carried out. The stages of this study were ended only until the second cycle due to time constraints and the results obtained were sufficient to describe the efforts made using this method. Stages of reflection are important because good learning must receive input from students (Sha, Schunn, & Bathgate, 2015; Tesfaye & Berhanu, 2015).

Class conditions greatly affect the smooth use of the Q & A method. This is because if the class conditions are not conducive, the questions raised by the teacher will not be heard clearly to students. These questions will become increasingly confusing for students. In addition, too many students will interfere with the learning process using this method. The ideal number of students may range from 15-20 people. Too many students will make it difficult for teachers to control all students in the class. Control of class is needed by the teacher in carrying out learning (Ichsan & Mulyani, 2018; Sukiniarti, 2016; Yang, Lee, Hong, & Lin, 2016).

Basically, this Q & A method can increase HOTS because this method will stimulate students' critical power. Students' ability to answer questions with critical answers is something that is expected in learning. This indicates that the critical power of these students has begun to grow. Of course, this will affect HOTS students. HOTS students can grow when given questions that stimulate students' critical power, students

will be able to analyze and assess the problems posed by the teacher (Demiral, 2018; Grant & Smith, 2018; Santos, 2017).

The process of discussion is expected to occur using this method. In addition, using this method is also expected to occur in the process of exchanging information between groups. Of course, this is very good at learning. Active students will more easily capture learning. This is in accordance with the 2013 curriculum learning which promotes student center-based learning. In addition, active students will make interactions between teachers and students occur, as well as interactions between students that have an impact on better learning (Camacho & Legare, 2015; Owens, Sadler, Barlow, & Smith-Walters, 2017; Uzun, 2012).

This Q & A method can actually be combined with various learning media, such as using digital media based online. Online-based learning is very helpful for teachers in conducting a question and answer questions to students. The teacher can provide various questions to students through various media such as videos, websites, applications that can be accessed by students anywhere (Fatih, 2016; Ichsan, Rusdi, & Sartono, 2017; Unal & Karakuş, 2016). Technological developments make learning no longer fixated in the classroom, but students can carry out learning anywhere. Students and teachers can take advantage of the various technological advancements available for learning (Blaschke, 2014; Jiang et al., 2017; Reyna, Hanham, & Meier, 2018; Said & Syarif, 2016).

4. CONCLUSION

Based on the results of the study it can be concluded that the use of the question and answer method (Q & A) can increase HOTS students. HOTS score that increases is not too large, this is based on the calculation of the gain score. The use of the Q & A method can increase HOTS students because it stimulates students' critical power, but this method has disadvantages, namely class conditions are required to be conducive and the number of students is better only a little. This is so that learning takes place more effectively.

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