

IMPROVING STUDENT'S COGNITIVE LEARNING OUTCOME THROUGH DISCOVERY LEARNING MODEL IN STRUCTURE AND FUNCTION OF PLANT TISSUES SUBJECT

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ABSTRACT

Discovery learning model encourages learners to find new knowledge and to look for the solution of problems or odd situations. The model provides an opportunity for students to actively participate in building knowledge that they would gain during learning. The research aims to improve student's cognitive learning outcome and activities through discovery learning model in the subject of the Structure and Function of Plant Tissues in SMP Negeri (Public Junior High School) 4 Ternate. The research is a classroom action research in the academic year of 2018/2019. The action research is conducted in two cycles. The research result indicates that the application of discovery learning model could improve the cognitive learning outcome and learning activities among students at class VIII-4 of SMP Negeri 4 Kota Ternate in the subject of the Structure and Function of Plant Tissues.

Keywords: Discovery Learning, Cognitive Learning Outcome

INTRODUCTION

One objective of the study is to achieve an excellent learning achievement consists of cognitive (include knowledge and fact), affective (include attitude), and psychomotor (include action skill) domains. These three learning outcome domains are one whole unit. From the three domains, cognitive domain is the most dominating and outstanding domain since it is related to student's ability to mastering the subject and it is often used as a benchmark of students achievement (Sudjana, 2010). Someone is the success in learning if he/she is able to indicate some changes in her/himself, in terms of thinking ability, skill, or attitude towards an object, or in solving problems he/she faced.

The learning outcome is an illustration of a student's ability obtained from the assessment result of his/her learning process in achieving learning objectives. The learning outcome gives

birth to some changes in learners' attitude and behavior after learning (Anderson and Kratwohl, 2010). The cognitive learning outcome is a behavioral change occurred in cognitive ability that consists of activities started from the acceptance of external stimulus by sensory, it is storing and processing in the brain into information up to the information retrieving when needed to solve a problem. Cognitive learning outcome consists of remembering, understanding, applying, analyzing, evaluating, and creating.

The objectives of natural sciences (IPA) learning in junior high school include students have the abilities in: (1) developing understanding on various natural symptoms, natural science concepts and principles that are beneficial and applicable in the daily life, (2) developing curiosity, positive attitude, and awareness on the mutual relationship between IPA, environment, technology, and community, and (3) raising learners'

awareness to play role in maintaining, protecting, and preserving environment and the natural resources.

The 2013 Curriculum Development Guidelines states that IPA learning in junior high school is conducted based on integration. The IPA learning in junior high school is developed as an integrative science subject; it is applicative oriented and develops thinking ability, learning ability, curiosity, as well as awareness and responsibility towards the natural and social environment (Susilowati, 2014). Therefore, in the junior high school, several subjects and field of study (such as physics, chemistry, biology, earth, and the universe) are bundled into IPA as one of the subjects. IPA-Biology learning is an inseparable part in IPA subject in junior high school.

In IPA-Biology learning, learning outcome gained by the students is significantly influenced by a learning model factor applied by the teacher in the learning. The application of passive learning will inhibit a student's creativity to understand a concept. Therefore, students are required to be active in the Biology learning process; hence they will have a better memory on what they have learned. A good teaching and learning process of IPA-Biology requires a teacher to be able to create an atmosphere that brings enthusiasm among the students to solve the problems they faced. Teachers need to apply learning that could help activate the students to be creative and to think. Biology subject can be used as a vehicle to improve knowledge and skill and build learners' positive attitude (Bahtiar, 2011).

Based on the initial observation result, it can be seen that IPA-Biology teachers in SMP Negeri 4 Kota Ternate were generally used conventional lecture method in the learning process and interspersed with discussion. The

discussion was less effective given that not all students were active in stating their opinion. Only several students had an active contribution to the discussion, while others tended to be passive. The method had less meaning for student's learning outcome; therefore, students' intellectual, mental, and social abilities were less developed. In addition, some of students' Biology cognitive learning outcome in certain subjects, including the Structure and Function of Plant Tissue, was below the standard score from the pre-determined Minimum Completeness Criteria (KKM)

Efforts to overcome the problem include the application of learning that could support the improvement of cognitive ability in IPA-Biology field, for example, the application of Discovery Learning Model, which is part of student-centered learning. Through the application of student-centered learning, students are expected to be more active and independent in their learning process, to be responsible and initiative to recognize their learning requirements, to find information sources that could fulfill their learning requirements by themselves, to develop and interpret their knowledge based on the need and the learning sources they found; thus, it has the potential to improve student's cognitive learning outcome and activities in learning.

Discovery learning is a teaching method that involves students in a mental activity process through opinion discussion, seminar, self-reading, and self-trial so that students could learn independently. An active student finds their own concepts in learning with sufficient instruction from the teacher. The finding process can be done in various ways. Kolb (2015) stated that knowledge is continuously obtained from experiences and testing by an individual. Discovery learning allows a more

meaningful learning process and outcome and it is well embedded (De Jong & Joolingen, 2008).

METHOD

The type of research was Classroom Action Research. The research type aimed to improve students' cognitive learning outcome through the application of Discovery Learning model. The action research was conducted at SMP Negeri 4 Kota Ternate in Class VIII-4 with the number of students of 25 students. The research was conducted using discovery learning model in the Structure and Function of Plant Tissue subject. The research period was during the odd semester of the 2018/2019 academic year.

The series of classroom action research consisted of four stages in every cycle, namely: (1) action planning, (2) action implementation, (3) observation, and (4) reflection. Steps in the discovery learning consisted of stimulation, problem statement, data collection, data processing, verification, and generalization. Data on students' cognitive learning outcome was selected using an instrument of ability test questions in form of written essay and it was conducted at the end of each cycle. The average score of cognitive learning outcome was calculated using the following formula.

$$X = \frac{\sum Y}{n}$$

x = average score, $\sum y$ = total score of all students, and n = total number of student.

The completeness of cognitive learning outcome was classically calculated using the following formula.

$$a = \frac{b}{c} \times 100\%$$

a = completeness, b = number of student completed, c = total number of student.

RESULT AND DISCUSSION

The research results indicated that the average score of students' cognitive learning outcome in cycle I was 74.40 and it was 80.40 in cycle II. It indicated that there was an increase in the average score of students' cognitive learning outcome from cycle I to cycle II of 6.00 (range of score 0 to 100). The detail on the average score can be seen in Figure 1.

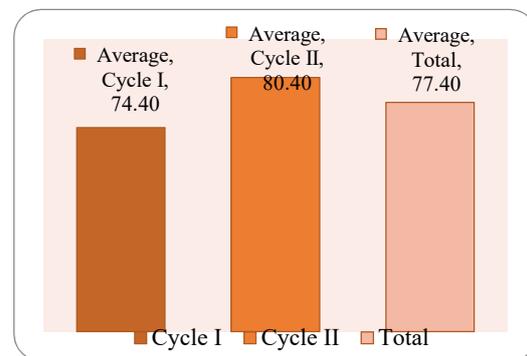


Figure 1. The average score of cognitive learning outcome in cycle I and II

The result of data analysis for the cycle I indicated that 76% (19 students) obtained a cognitive learning outcome score in the category of completed (achieve the minimum completeness criteria of ≥ 75). About 24% (6 students) were within a category of not completed (did not achieve the minimum completeness criteria ≥ 75). The research result for cycle II indicated that students who were completed in the learning outcome reached 92% (23 students), whereas those who did not complete was only 8% (2 students). The detail on the completeness of students' learning outcome in cycle I and II can be seen in Figure 2.

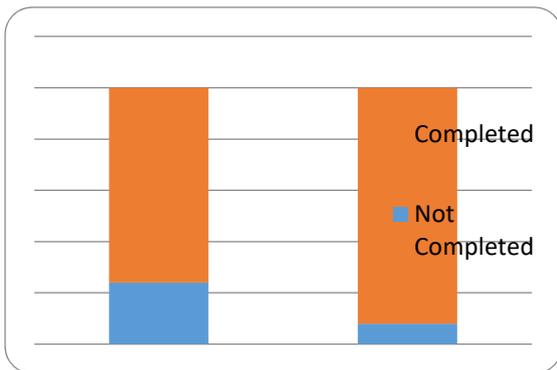


Figure 2. Completeness of Students' Cognitive Learning Outcome in Cycle I and II

The research results indicated that there was an increase in the number of students who were categorized as completed their learning outcome (in the Structure and Function of Plant Tissue subject) from cycle I to cycle II, which was 16%. It was related to the improvement and development in the learning process conducted in cycle II learning.

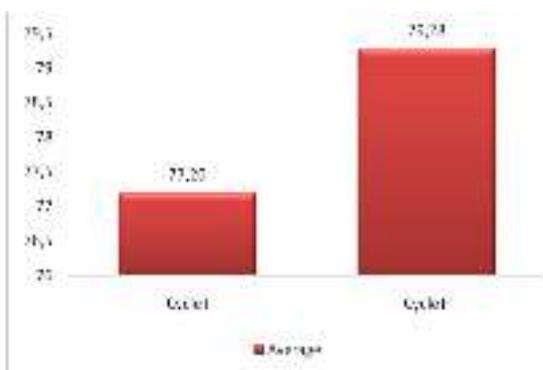


Figure 3. Average Score of Student Activities in Cycle I and II

The average student activities during the learning in cycle I was 77.20 and it was 79.28 in cycle II. It indicated that there was an increase in student activities during the learning from cycle I to cycle II. The assessment on student activities in psychomotor aspect included active in discussion, active in looking for new sources, time utilization effectiveness, participation in a group, presentation activity, answering the

question between groups, activities to ask a question and to state idea, and drawing a conclusion.

The application of the discovery learning model in the Structure and Function of Plant Tissue subject, as a whole, gave a positive impact on the improvement of cognitive learning outcome for students in Class VIII-4. It was indicated by data obtained from the implementation of cycle I and II learning. After the implementation of the action for two cycles, the research target achieved, which was classical learning outcome completeness reached $>85\%$. As well as an increase in the average score of students' learning activities. In the cycle, I the average score of students' learning activities was 77.20, whereas in cycle II it was 79.28 (the range of score was 0 to 100). Therefore, the classical learning outcome completeness had achieved in cycle II. According to Suryosubroto (2009), students could continue the learning to the next subject if the previous learning outcome has achieved 85% of the KKM.

In the planning stage, teachers compiled syllabus, lesson plan (RPP), student worksheet (LKS), questions and assessment rubric and conducted subject and teaching material selection. In the implementation stage, teachers implemented learning according to the lesson plan with the following steps: (1) stimulation, (2) problem statement (problem identification), data collection, data processing, verification, and generalization (conclusion drawing).

Based on the result of observation and reflection in cycle II, several weaknesses were found in the learning in cycle I thus students' cognitive learning outcome and activities were not maximal. Those weaknesses were, among others: (1) students motivation in the learning was not maximal; (2) stimulation was not going well, and (3) time allocation for

data collection and data processing was short, and (4) students were not familiar with the learning model applied. The result of reflection for cycle I recommended two aspects that should be improved in the learning in cycle II, namely: (1) a more attractive stimulating stage to improve students' motivation in the learning, and (2) increased time allocation for data collection and data processing and reduced time for generalization (conclusion drawing)

The change and improvement in the learning process in cycle II brought an impact on the improvement of students' cognitive learning outcome and learning activities during the learning. The 20 minutes period for data collection and 20 minutes for data processing seemed to be too short for the students; thus, they seemed to be hastily in the implementation. As a consequence, students' cognitive and psychomotor activities had not developed as expected. In addition, it resulted in a less maximum cognitive learning outcome. In cycle II, time allocation for both activities was 30 minutes each. The proportional time arrangement in every learning step was a determinant for the effectiveness of discovery learning model implementation.

Learning steps in discovery learning model were arranged in such a way that it could direct students to strive in finding a concept and idea as a result of learning thus their cognitive ability could develop well. Discovery learning model is a teaching model that tries to lay a foundation and develop a scientific way of thinking; students are set as a learning subject, whereas teacher plays a role as a learning guide and facilitator. Another advantage of the learning model includes its ability to cultivate students' learning motivation and raise students' curiosity on theme learned and concept and ideas obtained from the learning outcome will

be remembered for a longer time (Prasetyana, Sajidan, & Maridi, 2015).

Through the implementation of discovery learning model, students are expected to be able to find their own concepts and ideas (Setiawan & Istiqomah, 2018). A result of research (Nurfatihah, Mustami, dan Wiharto, 2018) indicated that the application of discovery learning model by utilizing the environment as a source of learning was able to improve students' learning outcome. The model also improved learners' performance to be more effective and superior (Oghenevwe, 2010), and students' mathematics analogy ability was developed well (Rahman & Maarif, 2014). In addition, the model was also able to build students' knowledge inductively from experiences explored during the learning process (Anam, 2015). Students participation in directing their own action in learning made them more active and better-off and it allowed information exchange between students, student and the teacher, and student and its learning environment.

CONCLUSION

Based on the research result, a conclusion could be drawn that the application of discovery learning model could improve the learning outcome and learning activities among students in Class VIII-4 of SMP Negeri 4 Kota Ternate in the Structure and Function of Plant Tissue's subject.

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