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DEVELOPING BIOLOGY LEARNING TOOL OF GUIDED DISCOVERY MODEL TO INCREASE JUNIOR HIGH SCHOOL STUDENTS' LEARNING RESULT EXCRETORY SYSTEM MATERIAL

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Abstract: The study aims to develop the feasibility learning material based on guided discovery models on the excretory system to improve student's learning outcomes based on the aspect of validity, practically, and effectiveness. The development of teaching material to follow 4-D model with the trial design was one group pretest posttest design. The teaching material developed in this research were the lesson plan, student book, student worksheet, and achievement test. The teaching material were tested on 30 student of VIII grade. Data were collected using validation, observation, test, and questionnaire methods and analyzed descriptively. The results showed that: (1) the validity of the teaching material developed (lesson plans, student book, student worksheet, and achivement test) were valid category; (2) practicality in term of legability student book and students worksheet were classified good while, student activities indicated that the student learning centered, and student positively responded to the learning process; (3) the effectiveness in terms of student learning outcomes both from the aspect of cognitive, skill, and attitudes of achieve mastery. Based on the above results it could be concluded that the biology teaching material guided discovery models to improve student learning outcomes were valid, practical, and effective, so it was feasible to use in learning process.

Keywords: Guided Discovery, Student Achievement, 4-D models

INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process so that learners actively develop their potential to have spiritual strength, self-control, intelligence, noble character and skills needed by their selves, society, nation and state (Department of National Education 2007) . The purpose of education itself is to develop the learners' potential to become human beings who believe and piety to God Almighty, have a noble character, healthy, knowledgeable, enough, creative, independent and become democratic and responsible citizens.

In line with the development of 2013 curriculum, which is based on character and competence, students are expected to be able to independently improve and use their knowledge, study, and internalize and personalize the values of character and noble character so that they can imply in everyday behavior. In order to realize this, teachers are required to professionally design effective and meaningful learning, choose the right learning approach, determine the learning procedure and the establish the competence effectively (Mulyasa, 2013).

The objectives of 2013 curriculum in accordance with Permendikbud No. 68 Year 2013 is to prepare Indonesian to have the ability to live as individuals and citizens who are faithful, productive, critical, creative, innovative, and effective and able to contribute to social life, nation, state and civilization world. Facing these challenges, the curriculum must be able to equip learners with various competencies.

Thinking skill is similar to procedural skill, which is context-free skill, when students learn to plan, summarize or generalize, or use other thinking skills, students will eventually be able to use these thinking skills in various situations including in the context of daily life. This is what makes thinking skill so important (Kauchak, 2012). According to Ibrahim (2008), critical thinking can be seen from the dubious attitude of all things, encouraging himself to do repetition, checking again, testing the things when they doubt, always considering things in making decisions even if they seem small or insignificant.

According to Setiawan (2005), critical thinking is one of the complex thinking processes under creative thinking. In the process of creative thinking, one focuses on the analysis of a thing. The educational paradigm must be based on a learning system that teaches critical and creative thinking. Critical thinking is a critical assessment of the truth of phenomena, whereas creative thinking is concerned with the ability to interpret phenomena. Critical thinking skill focuses on the learning process rather than simply acquiring knowledge. Critical thinking skill is very important in the teaching and learning process because it provides students with learning through discovery.

One of the high-level thinking processes is the critical thinking process. Paul in Fisher (2009), states critical thinking is a model of thinking about what matter, substance or problem in which the thinker improves the quality of his thinking by handling skillfully the structures inherent in thought and applying intellectual standards to them. While Dewey, in Fisher (2009), argues that critical thinking, called reflective thinking, is an active, persistent and conscientious consideration of a belief or form of knowledge that is taken for granted in terms of the reasons that support it and the follow-up conclusion. The characteristics of critical thinking are the ability to compare, make decisions about similarities or differences.

One of learning methods that provides an opportunity for students to make their own experience and be able to improve critical thinking skills is a method of guided discovery. Carin (1993) states that guided discovery learning is part of discovery learning. The guided discovery method is essentially the same as the inquiry approach, since discovery is an inquiry step.

Guided discovery is a learning method that trains and guides students to learn, gain knowledge, and build concepts they find for themselves (Carin, 1993). Guided discovery emphasizes the importance of learning creativity in facilitating the achievement of concepts in learners. Students are directly involved with student-centered practices (Effiong, 2010). Learners are encouraged to think and analyze themselves so that they can find general principles based on material or data provided by the teacher.

Effective teachers have to be able to choose learning with models that can improve learning and stimulate student motivation (Arends, 2007). Guided discovery learning model is one that effectively encourages student engagement and motivation while helping students gain an in-depth understanding of a topic with specific and clearly identifiable material, both as a concept and as a generalization (Kauchak., 2012). Guided discovery learning model enables students to study science and technology in a solid manner, engaging students in exploratory investigation, constructing the meaning of its findings, proposing tentative and solutive explanations, exploring the concept of return, and then evaluating concepts that refer to the students' own life (Carin, 1993).

Learning about a concept is more than classifying objects and forming various categories. Learning concepts involves processes that can construct knowledge and organize information into a comprehensive and complex structure. Conceptual

knowledge is one of the main types of knowledge that allows students to become aware of the schemes they already have and help students develop new concepts and reformulate existing thinking skills (Arends, 2007).

RESULTS AND DISCUSSION

Based on data analysis of research results conducted, the device has been made with guided discovery model in the form of learning device and learning instrument that has been validated and feasible to be used, for the result of research of development of biology learning tool guided discovery model to improve the result of junior high school students learning with the excretion system material can be seen as follows:

1. Implementation of Lesson Plan

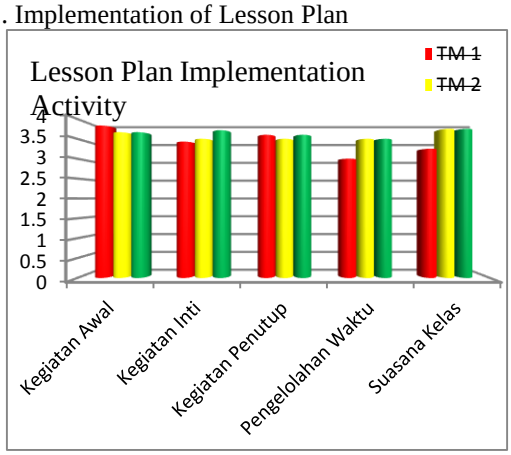

Figure 1 Lesson Plan Implementation Activity

The result of lesson plan implementation observation developed by the researcher as a whole shows the stages of the activities in the lesson plan in the second trial and the validation score of the implementation was 3.5 with good category (Ratumanan dan Laurens, 2011). The average value of reliability for 3 (three) meetings was 96.3%.

The results of the guided discovery learning phase implementation include: 1) preliminary phase is carried out with a validation score of 3.7 with good category (B) and reliability is 97.7%, 2) core activity consists of two phases (B) and reliability is 97.02%, 3) next is closing phase is done with validation score 3.5 with good category (B) and reliability is 98,5% . According to Abrucasto (2010) students are always curious and prospective scientists who need two directions. Students tend to have infinite energy and curiosity, the teacher's job is to ensure that the teacher has provided a learning plan that can unify students' energy and curiosity and encourage students to become active and scientific-thinking observers.

Guided discovery is a method that combines teacher-centered learning and student centered learning (Carin 1993). This merger by Piaget and some proponents of constructivist theory is called as a "mental readiness" to unite the concept of connecting the knowledge that students have previously had about the concept of knowledge they would build upon and their ability to engage in discovery learning.

Eggen & Kauchak (2012) say that guided finding is a teaching approach where teacher gives students examples of specific topics and guides students to understand the topic. Based on the results of trial II shows the implementation of lesson plan with discovery model every phase that is carried out from phase I to phase IV obtained validation score 3.5 with good category (B) and reliability 96,3%. This is because when the learning process takes place, the teacher always guides the students in doing the learning that takes place. Dewey states that learners seek information to solve the problem faced and compile the knowledge to gain a new knowledge. Meanwhile, according to Jerome Bruner suggested that learners should participate actively in learning to gain experience and conduct an investigation to find its own concept.

2. Student Activity Observation Result

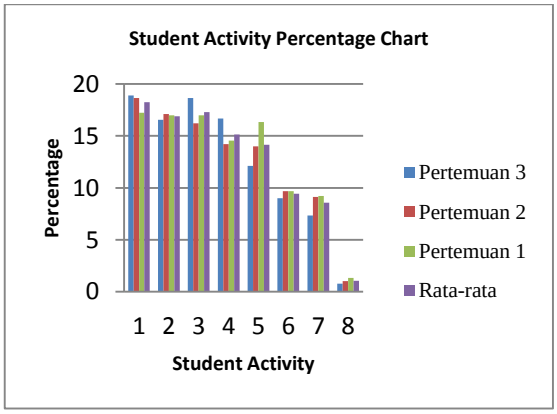

Figure 2 Student Activity Percentage Chart

From the observation, it is clear that in the form of diagrams it is found that observers only find some students who exhibit irrelevant behavior in learning. This shows that the students' enthusiasm to follow the learning is very high and also due to different learning activities with the previous learning activities conducted during this study using guided discovery model that is in accordance with the theory of Pieget is the theory of cognitive development that emphasizes the role active

students in building their own understanding of reality. Decrease in the percentage of activity in the form of actions that are not relevant during the learning caused by the guidance of the teacher continuously on the students can grow the formation of good habits in students. Dimyati & Mujiono (2009) say that learning is an attempt to condition a behavior or response to something, the task of the teacher is to form a habit. By holding a repetition then the ability of students will grow. Observation of student activity carried out during the learning process took place by two observers.

3. Student response

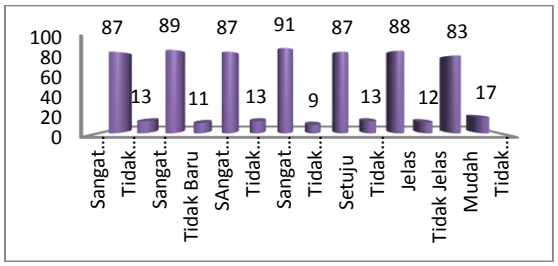

Figure 3 Percentage of Student Response

The result of the research shows the questionnaire of students' responses at points 1 to 7 can be said that the student's response to all the stated components is good. Students tend to respond positively to learning with guided inquiry model. This condition makes the students enthusiast in following the learning activities and students more enthusiast to learn and easy to understand the material of the respiratory system is taught, because basically student learning activities are influenced by student learning motivation that can be seen from the response of students who express very interested, very new, very easy, very interested and agree. Overall, students respond positively to learning, this positive response indicates that students are enthusiast with the learning presented. This can motivate students to improve their attention and get them involved in a fun and meaningful learning experience (Nur, 2008).

4. Test Analysis of Learning Outcomes (Aspects of Knowledge)

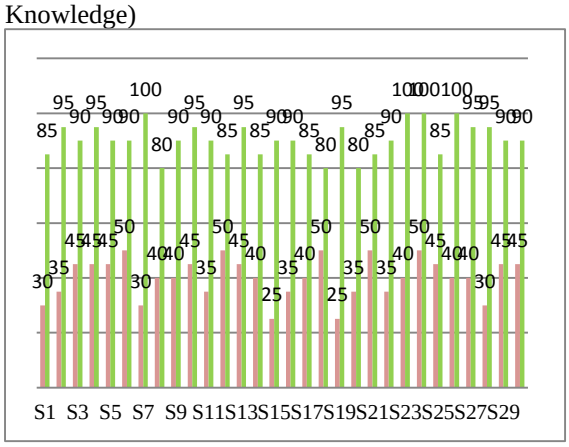

Figure 4. Learning Test Result Diagram

The result of learning test showed that there has been a significant improvement between the students 'knowledge before and after the application of learning which can be seen from the students' pretest and posttest score with the N-gain calculation of each student also support the increasing of high student learning outcomes. In addition, the sensitivity test of THB item of knowledge aspect as presented shows the mean score of sensitivity of the item stated sensitive (Gronlund, 1995). The sensitivity index of a question item is a measure of how well the item distinguishes students' ability before and after learning using the learning tool (Ratumanan, 2011). This result shows that learning with guided inquiry model is effective and has significant effect on students' learning achievement. . These results are supported by Rohmah, Sugiarto, Astriani (2015) study guided discovery model provides more experience for students in learning.

5. Student Critical Thinking Skill Test Analysis

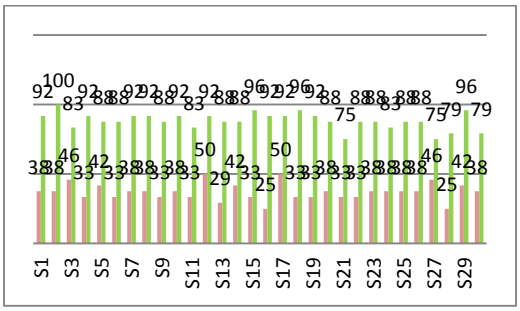

Figure 5 Diagram of Student Critical Thinking Skill Test

Based on the analysis of critical thinking skill test results can be known pretest results of students get a relatively low score with a percentage of 37%, for the overall indicator of critical thinking ability include: (1) provide arguments, (2) determine deduction, (3) determine induction, 4) formulate the problem, (5) evaluation. The low percentage achievement during this pretest is due to the students having never performed critical thinking skills tests as tested and also the students have not followed the learning process of guided discovery models. This may affect the ability of students to do the test.

The students' pretest result is inversely proportional to the students' posttest result at the time of the test, the posttest result of critical thinking ability of the five student indicators increased significantly by 88%. Increased achievement percentage at the time of this posttest because students have followed the learning process guided discovery model and has been taught critical thinking skills.

The result of pretest and posttest critical thinking ability is done by N-gain analysis. This analysis review aims to see how much contribution

of learning guided discovery model on excretory system material to students' critical thinking ability, or in other words the purpose of this analysis to know the difference of mastery of critical thinking ability of students before and after treatment. The result of pretest and posttest N-gain analysis obtained an average score of 0.81 with high category (Hake, 1999). These high N-gain averages relate to the use of guided discovery models and trained critical thinking skills while learning takes place.

The data for N-Gain can be known for the high N-gain average which the indicator gives the argument, determines the deduction, determines the induction, formulates the problem, and evaluates each score of 0.63, 0.68, 0.72, 0.66, 0.73 and 0.66 (Hake , 1999). The results of N-Gain analysis in this study illustrate that guided discovery learning method can trick students' critical thinking skills, because the results obtained in high category with N-Gain averaged 0.81. To get a high category, trained students' critical thinking skills should be done frequently. The results of sensitivity of each item in table 4.11 shows that the problem of no 1 to 6 is between 0.63 to 0.74 means including categories sensitive to the effects of learning.

6. Student Attitude Aspect

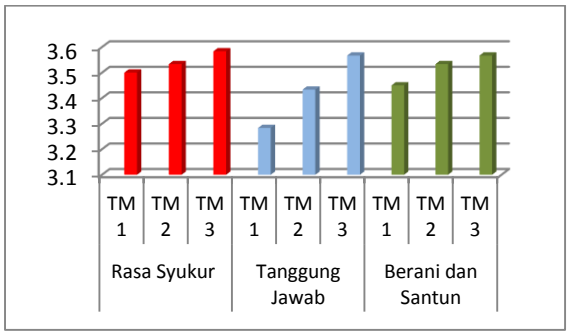

Figure 6 Student Attitude Aspect Diagram

The result of student attitude evaluation is done to know the achievement of student attitude during the learning process and to facilitate the growth of behavior of students' spiritual and social attitude. Data on the result of student attitude evaluation during 3 (three) meetings. Assessment of student attitudes during 3 (three) meetings that include aspects of gratitude gained a score of 4.0 with very good criteria, the aspect of responsibility obtained a score of 3.0 with good criteria, while for brave and polite criteria obtained a score of 4.0 with criteria is very good.

According to G. W. Allport 1935 quoted from Sears, Freedman, & Peplau (1985) attitudes are the mental and nervous states of preparedness that are governed by experiences that provide dynamic or directional influence on the individual response to all objects and situations associated with it. Based on these statements attitude is very influential in the individual response to a thing. During the learning activities took place required a positive response from students in the form of student interaction in learning activities. Similarly, attitudes can affect success in learning, it can be assumed, if a student is negative toward the learning activities he attended at school, then the learning outcomes cannot be achieved maximally, along with the growth of positive attitude students will respond to learning activities well.

7. Performance Aspects

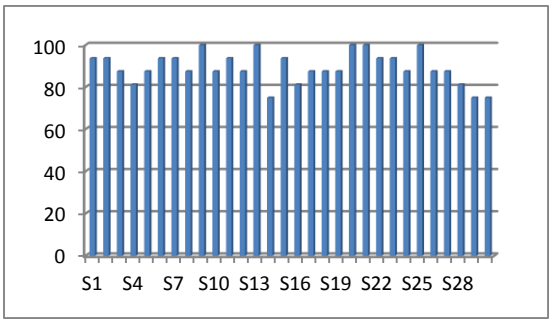

Figure 7 Student Performance Aspects

Psychomotor learning results obtained during the learning process took place. The results obtained that students' attitudes arise when the learning process takes place using a guided discovery model. In the psychomotor aspect data of the four indicators of knowledge of working procedures, selecting materials, observation results, working on LKS, below shows the average of classical completeness from the aspect of student performance by 89% with a good predicate B +, from a trial of 30 students.

The results of this study are supported by the previous studies results (Prahani, et al., 2015; Prahani et al., 2016; Prahani, et al., 2018; Sudiarman et al., 2015; Yasir, et al., 2016) that the media, teaching materials, devices, and learning models of quality and feasible (meet the valid, practical, and effective aspects) can improve student learning outcomes.

Brunner in Nur (2008) states the discovery learning is that students are encouraged to learn largely through the active involvement of their own students with concepts and principles, and teachers encourage students to have experience and experiment that enable students to find principles for self-students itself. Discovery learning emphasizes active experiences and student-centered learning. through the learning activities the students find the students own ideas and gain meaning by the students themselves.

CONCLUSION AND SUGGESTION

A. Conclusion

Based on the results of research that has been done, it can be concluded that the learning device guided discovery model developed feasible for learning and can improve junior high school students learning outcomes.

B. Suggestions

It should be noted that the preparation and management of time for learning have to be more effective and efficient. For further research it is advisable before the lesson to provide an explanation of the guided discovery learning model.

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