C44. KOSIM

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Discovery Learning Model to Practice Students' Science Process Skill in Elasticity and Hooke's Law

Discovery Learning Model to Practice Students' Science Process Skill in Elasticity and Hooke's Law

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Abstract. The science process skills of high school students in the West Lombok Regency are still relatively low. This is indicated by the report on the results of the 2017/2018 national exams on physics, chemistry, and biology subjects included in the low category. This study aims to describe the effectiveness of the discovery learning model to practice the science process skills of class XI students of SMA Negeri 1 Kediri on Elasticity and Hooke's Law. This type of research is a quasi-experiment, with the basic pattern "The One Group Pretest-Posttest Design" and descriptive method. The instrument used in this study was the observation sheet implementation of the discovery learning model and the test results of the science process skills. The results showed that: (1) the percentage of implementation of discovery learning models increased, which means better quality of learning, and (2) the percentage of tests of students' science process skills results in Elasticity and Hooke's Law also increased.

Keywords: science process skills, discovery learning.

Introduction

The report on the National Examination Results for the 2017/2018 Academic Year in West Lombok Regency for sciences study program shows that high school students' scores on physics were still poor. The average score is 36.06 with the lowest of 20.0, and the highest score is 77.5. The number of participants who took the exams was 1281 students from 17 public and private high schools spread across West Lombok Regency. The students' absorption score for the 6 materials tested in physics subject nationally is 53.37, lower than the passing grade of 55. For West Lombok Regency, the lowest absorption score was in the topic of Waves and Light of 27.58, while the highest absorption was in the Measurement and Kinematics, scoring 49.04 [1].

The report shows that the cognitive abilities of students or cognitive levels as expressed by Anderson, et al. [2] are still in the lower level thinking skill category, which is still at the level of C1 (Remembering), C2 (Understanding), and C3 (Application). Therefore, efforts are needed from all parties to improve students' cognitive abilities to a higher level or higher-order thinking skills (HOTS). In physics, HOTS is trained through associating or reasoning activities. It is a higher-level cognitive skill which in the taxonomy of the cognitive domain consists of the ability to analyze, evaluate, and create [3]. In other words, by learning physics students are expected to train their cognitive abilities at the level of C4 (Analyze), C5 (Evaluate), and C6 (Create). Associating or reasoning activities in physics

learning can be done through learning activities that train science process skills such as formulating problems, formulating hypotheses, identifying variables, making operational definitions of variables, interpreting information, and communicating.

One way to practice science process skills is to apply the discovery learning model in physics learning. According to Lidiana, et al. [4], learning with discovery learning models has a positive effect on the physics learning outcomes of high school students. The discovery learning model can improve student learning outcomes in the cognitive domain of C1, C2, and C6. Martaida, et.al. [5] found that student learning outcomes in the cognitive domain using discovery learning models were better than using conventional learning. Nur [6] and Suprihatiningrum [7] stated that the discovery learning model is an important component in a constructivist approach that has a long history in the world of education. This learning idea arose from the desire to give students the pleasure in "discovering" something by themselves.

Discovery learning emphasized the process of finding a final concept, one of which was through an experimental process. Hermansyah et al. [8] stated that the experimental process was very important for students to develop an appropriate understanding of concepts, although not all concepts are ideal for conducting experiments. Gunawan et al. [9] added that process-based learning strongly supports the development of science process skills and concept understanding. It is understood that process-based learning such as discovery learning strongly supports the development of students' thinking skills and mastery of concepts in the form of science process skills. However, some material certainly requires more in-depth research on the application of discovery learning. Specifically, the material elasticity and Hooke's Law because this material is mostly in the experimental process, but of course by providing more recent data about the application of discovery learning can provide a more in-depth understanding.

This study aims to describe the effectiveness of the discovery learning model to train the science process skills for grade XI students of SMA Negeri 1 Kediri on the topic of Elasticity and Hooke's Law. This topic was chosen because it is considered to have the lowest absorption capacity (27.58%) by students in West Lombok Regency [1].

Method

This research was pre-experimental. The research subjects were 35 students in grade XI IPA 1 at SMAN 1 Kediri, Academic Year of 2019/2020. The research design was One Group Pre-test and Post-test Design [10]. The percentage of learning implementation is obtained by dividing the number of aspects applied in learning by the total aspects multiplied by 100%. The percentage of students' science process skills is obtained by dividing the total score by the maximum score multiplied by 100%. Pre-test and post-test scores of science process skills are used to find differences in student skills before and after learning with discovery learning models.

Result and Discussion

The percentage of implementation of discovery learning models increased which shows a better quality of learning. Therefore, the model teacher has mastered how to apply the discovery learning model. There are no significant difficulties in the implementation of the discovery learning model. The operational steps of the discovery learning model as explained by the Education Directorate on High School Education [11] are stimulation, problem statement, data collection, data processing, verification, generalization.

Figure 1 explains that at each meeting the application of discovery learning continues to be improved. At the first learning meeting, implementation was only around 83.3%, at the second meeting it increased to 91.7% and at the last meeting, it reached 95.8%. This shows discovery learning is learning that is effective, efficient, and easy to implement.

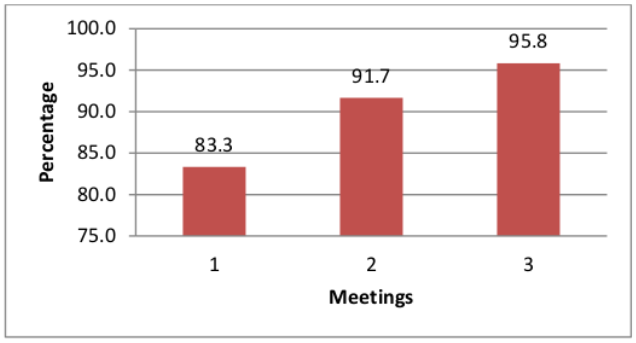

Figure 1. Percentage of Implementation of Discovery Learning

The percentage of science process skills scores increased from pre-test to post-test. The average pre-test score is 29.5 and the post-test is 81.5. The average post-test score is better than the pretest. The science process skills practiced in this study are following those expressed by Trianto [12], Indrawati [13], and Semiawan et.al [14]: 1. Formulating Problems; 2. Formulating Hypothesis; 3. Identifying Manipulation Variables; 4. Making Operational Definitions of Manipulation Variables; 5. Identifying Response Variables; 6. Making Operational Definitions of Response Variables; 7. Identifying Control Variables; 8. Making Operational Definitions of Control Variables; 9. Interpreting Information; 10. Communication.

Students looked enthusiastic throughout the learning process, especially in the activities of identifying response variables and interpreting information that has a score of 85. According to Nur [15], variables are qualitative or quantitative quantities that can vary or change in a particular situation. A response variable is a variable that changes as a result of manipulation activities. Interpreting information/data usually begins with data collection, data analysis, and describing data. Describing data means to present data in an easily understood form, for example, tables or graphs with averaged figures. Data that has been analyzed will only be interpreted as a conclusion or in the form of a statement.

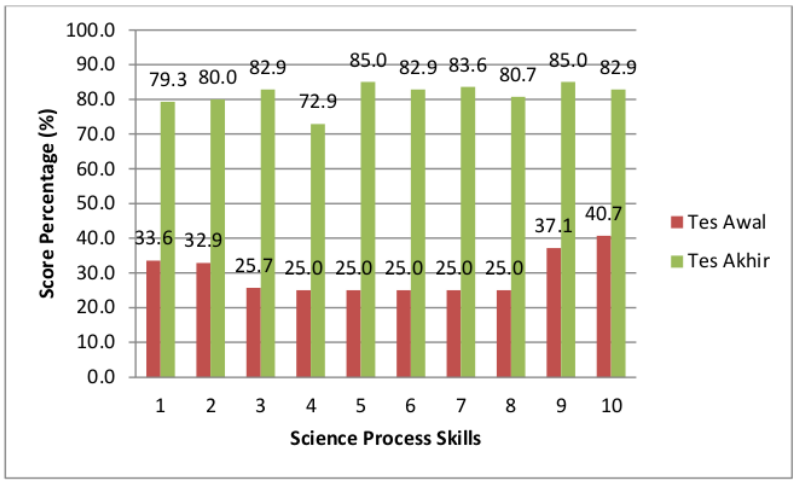

Figure 2. Percentage of Science Process Skills Scores

Students' skills in identifying variables can help them in designing experimental activities and other science process skills, such as formulating hypotheses and communicating the results. This is consistent with the results of research by Pardede et.al [16] which showed that there are significant differences between students 'science process skills taught with the discovery learning model and conventional

learning and concludes that the discovery learning model is better at improving students' science process skills. Based on Ayadiya & Sumarnia's [17] research on discovery learning models, it was found that there was a significant increase in the score of students' science process skills by 17.44% from the first cycle to the second cycle. The application of discovery learning models with a scientific approach can improve secondary school students' science process skills.

Many skills can be supported by experimental and process-based learning. Some of the skills are creativity [18], mastery of concepts [8], and of course science process skills [9]. Discovery learning is experimentation activities support learning and it is very attentive to scientific processes. In this study, each discovery learning indicator was shown to increase dramatically (Figure 2). Each of these indicators is the result of applying experiments in a classroom-based on discovery learning.

Conclusion

The discovery learning model was effective in improving the science process skills of grade XI students of SMAN 1 Kediri on Elasticity and Hooke's Law based on the improvement in students' test results. The effectiveness of discovery learning at each meeting continues to increase, it is understood that improvements and suggestions during learning are well met, thus creating discovery learning that is consistent with the material being taught.

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