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Using Discovery Learning Method to Improve Students' Learning Outcomes in the Topics of Matrix

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Abstract: The purpose of this study is to describe the implementation of discovery learning in a matrix material. This type of research is a classroom action research study consisting of two cycles with each cycle consisting of four stages: planning, implementation, observation, and reflection. The research subjects were 35 students in grade XI. The research instrument used was the observation sheet and test. Data analysis techniques consist of data reduction, data presentation, and conclusions. The results showed that there was an increase in student learning outcomes after learning discovery learning was applied. It was proven that in the first cycle there were 15 students (42.8%) who were complete and in the second cycle there were 29 students (82.8%) who were complete.

Keywords: discovery learning, classroom action research, matrix.

Abstrak: *Tujuan penelitian ini adalah untuk mendiskripsikan penerapan pembelajaran discovery learning pada materi matriks. Jenis penelitian yang digunakan adalah penelitian tindakan kelas yang terdiri dari dua siklus dengan masing-masing siklus terdiri dari empat tahapan yaitu perencanaan, pelaksanaan, observasi dan refleksi. Subjek penelitian adalah siswa kelas XI yang berjumlah 35 siswa. Instrument penelitian yang digunakan adalah lembar observasi dan tes. Teknik analisis data terdiri dari reduksi data, penyajian data dan kesimpulan. Hasil penelitian menunjukkan bahwa ada peningkatan hasil belajar siswa setelah diterapkan pembeljaran discovery learning. Dibuktikan pada siklus I terdapat 15 siswa (42,8%) yang tuntas dan pada siklus II terdapat 29 siswa (82,8%) yang tuntas.*

Kata kunci: *pembelajaran berbasis penemuan, penelitian tindakan kelas, matriks.*

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▪ INTRODUCTION

Education is a means for students to develop their potential. The teacher as one of the parties directly involved in education is responsible for improving the quality of education (Laelasari, 2013). Efforts to improve the quality of education can be seen from the demands of competency achievement contained in the 2013 curriculum. The 2013 curriculum demands the active role of students in the learning process (Nugrahaeni, Redhana, & Kartawan, 2017). Therefore the selection of strategies in the learning process needs to be considered.

Mathematics learning is a teacher's effort to improve students' skills in mathematics (Sutawidjaja & Afgani, 2015). Mathematics is one of the subjects that students are not very interested in. Indications of lack of student interest can be seen from the results of the interviewer's researchers. Students mentioned that students were not interested in mathematics because they did not know the application of mathematics (National Research Council, 2002). So that in mathematics learning students are not only given theoretical knowledge but are expected to be able to stimulate students to think at a high level and be able to apply in everyday life (Loibl & Rummel, 2014). A special learning strategy is needed in mathematics learning.

Discovery learning is a learning model that emphasizes the organizing process carried out by students themselves in gaining knowledge (Kirschner, Clark, & Sweller, 2006; Gerde, Schachter, & Wasik, 2013). This model is one model that adheres to constructivism (Casad & Jawaharlal, 2012; de Jong & Van Joolingen, 1998). So this model is suggested by the Ministry of Education and Culture because it is principled on the active role of students in the learning process (Haeruman, Rahayu, & Ambarwati, 2017; Widyastuti, 2015; Lin et al., 2012). Discovery Learning provides an opportunity for students to find information on their own without help from the teacher (Saab, Van Joolingen, & Van Hout-Wolters, 2005). The teacher acts as a facilitator to guide students in finding knowledge (Klahr & Nigam, 2004). In addition, the result of this study (Wahjudi, 2015) state that discovery learning can improve student learning outcomes in social studies subjects. So discovery learning is a model designed to make students active, active in designing, organizing and discovering their knowledge (Simamora, Saragih, & Hasratuddin, 2018; Spronken-Smith & Walker, 2010). The steps in discovery learning are as follows: 1) stimulation, 2) problem statements, 3) data collection, 4) data processing, 5) verification, 6) generalization (Hosnan, 2014).

At the stimulation stage students are given problems that can create confusion so students are interested in investigating solutions to problems. The next step is the problem statement, which gives students the opportunity to identify some of the problems related to the material being studied, and then the students determine the hypothesis of the problem. In the data collection step, student activities are collecting data to answer the hypotheses that have been made. Then the data obtained were analyzed at the data processing stage. Verification stage is the examination stage to prove the hypothesis. The last stage is the generalization stage, which is drawing conclusions.

Matrix is one of the material contained in odd semester XI class. Matrix has many applications in everyday life. Suppose the matrix form makes it easy to calculate in economic problems, the data contained in a table. The application of discovery learning in matrix learning is considered suitable by researchers because there are many stimuli that can be used to guide students in discovering the concept of matrices. Providing opportunities for students in the form of technology utilization can also support the

learning process with discovery learning models . So this study aims to find out how the implementation of the discovery learning method in learning matrix material to improve student learning outcomes.

METHOD

This type of research used in this study is a classroom action research which adopts the Kurt Lewin model. This action research consists of two cycles, with each cycle consisting of four stages: plan, implementation, observation, and reflection. The research subjects were 35 students in grade XI-C of SMAN 3 Malang. Data collection techniques using observation, and test. The research instrument used was the observation sheet and test questions. Observation sheet to obtain activity data during the learning process and tests to measure improvement in learning outcomes. The data obtained during the study are data on the results of observations of teacher performance and completeness of student learning outcomes. The success of this study is 75%. The data obtained were analyzed descriptively qualitatively with 3 stages namely data reduction, data presentation and conclusions.

RESULT AND DISCUSSION

This research was conducted during two meetings with each meeting with a duration of 2x45 minutes. Learning activities at each meeting using the discovery learning method with the teacher acting as an observer. The basic competency chosen in this chasing activity is KD 3.3, which is to explain matrices and matrix similarities using contextual problems and perform operations on matrices that include addition, subtraction, scalar multiplication, and multi-matrix and transpose multiplication. The data obtained during the teaching-learning process are the data of the observations of teacher performance and completeness of student learning outcomes.

The results of observations for teacher performance are divided into two activities namely planning activities and activities while learning in class. In the first cycle the percentage obtained 67% for planning activities and increased to 79% in the second cycle because the activities that have not been implemented significantly reduced. At the planning stage the teacher does the stages of drafting the lesson plan by paying attention to KI and KD. Furthermore, the teacher arranges the steps of learning based on discovery learning and determines the right teaching material. In addition the teacher prepares questions and cognitive assessment rubric as a tool to measure the completeness of student learning outcomes. For the results of learning activities the teacher applies the stages in the lesson plan with learning activities consisting of three stages, namely introduction, core activities, and closing. Each has a duration of 15 minutes, 60 minutes and 15 minutes. Researchers open learning activities by giving greetings and asking students to pray in accordance with their respective beliefs. Furthermore, the researcher delivered the material to be studied, namely the matrix material and the learning model used was the discovery learning model with a group method consisting of 4-5 people each group. This learning also uses media in the form of students' worksheets. Before the core activities of the researchers provided motivation in the form of showing a video about a simple example of the application of the matrix in everyday life. The video is about how to record a lot of activities in soccer using a matrix to make it easier to count the many goals scored by players. The video is 5 minutes long. After the motivational activity the researcher conducted an apperception activity about the relationship of the matrix with the system of linear equations of two

variables (SPLDV) that had been taught to students before the matrix material. The researcher emphasizes that the matrix can also be used to resolve SPLDV.

The core stage is the stage of applying discovery learning. There are six stages in the core activities, namely stimulation, problem statements, data collection, data processing, verification, and generalization. At the stimulation stage (giving stimuli) students are given contextual problems related to daily life. The problem given is about the cost of producing a factory that produces two goods. Production results are presented in tabular form. The first table is about the cost of production at factory I (Jakarta) and the second table is about the production costs at factory II (Surabaya). From this table students are asked to form a matrix and investigate the operations contained in the matrix.

At the problem statement stage students are asked to make hypotheses about what operations can be performed on a matrix. The next stage is the data collection stage, where students look for data to determine the truth of the created hiptosis. At this stage students are given freedom in finding data. Data can be searched using internet assistance or package books that have been provided. Students look for data based on the guidelines listed on the worksheet. This is intended so that the search for student information becomes more directed. After searching for further data students are asked to discuss with a group of friends to answer the questions contained in the worksheets through the data processing stage. At this stage the researcher also goes around to monitor the information processing of students. Furthermore, students discuss classically by presenting the results of data processing in front of the class. Each group was given the opportunity to ask questions and use other groups' presentations. This stage is at the verification stage. The last stage is generalization where the researcher together with students concludes what operations are contained in the matrix.

Learning outcomes have also increased in each cycle. This can be seen in Figure 1, the first cycle of 35 students there are 15 students who complete according to or more than the minimum completeness criteria and as many as 29 students completed in the second cycle. In other words there was an increase in learning outcomes from cycle 1 by 42.8% to 82.8% in cycle II. Based on the findings in the second cycle the implementation of learning activities using discovery learning models increased. The teacher makes improvements in accordance with the results of reflection in the previous cycle. The teacher also provides an opportunity for students to use gadgets as one of the learning resources in cycle II.

There are several findings based on observations, namely learning activities using discovery learning models can improve students' mathematical abilities (de Jong & Lazonder, 2014). These mathematical abilities can, among other things, develop critical thinking skills and communicate well. Besides giving freedom to students to find resources using the internet is the right strategy to foster student motivation. Students can learn to collaborate between print and electronic media to find new information. Students also practice to obtain and understand information independently.This is because the use of Information Technology is already a demand (Taleb, Ahmadi, & Musavi, 2015; Muhson, 2010).

CONCLUSION

Learning matrix using discovey learning has been conducted by six stages i.e stimulation, problem statement, data collection, data processing, verification, generalization. At the stimulation stage students are given problems that can be

confusing so that the students are interested to investigate the solution of the problem. The next step is a problem statement that gives students the opportunity to identify some problems related to the material learned for the next students to solve the hypotheses of the problem. In step data collection student activity is collecting data to answer the hypotheses that have been created. Then the obtained data is analyzed at the data processing stage. The verivication stage is the examination phase to prove the hypothesis. The last stage is the generalization phase of draw conclusions. After the class action the teacher's performance has improved from the first cycle obtained 67% percentage for planning activities and increased to 79% in the second cycle because the activities that have not been implemented significantly reduced. Student learning outcomes also increased from cycle 1 by 42.8% to 82.8% in cycle II. Overall the results of this study are in accordance with the research target of 75%.

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