

ENHANCE MATHEMATICAL UNDERSTANDING BY DISCOVERY LEARNING

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Abstract

This research is motivated by the low ability of understanding vocational students. This study will examine the improvement of students' mathematical understanding ability (MUA) using *discovery learning* (DL) with the usual approach. The method used is the experimental method with the design of pretest-posttest control groups, namely designs that involve at least two groups and random sampling of classes. At the beginning and end of the study both classes are given a test. The population in this sample are all vocational high school students whose characteristics have low MUA. Of all vocational schools randomly selected and selected Cimahi IT Development Vocational Schools representing the characteristics of the population. The sample was chosen randomly, where class XI RPL C became the experimental class, and class XI TEI B became the control class. Collecting data in this study using a description test that has been tested beforehand, then the scores of students' MUA were analyzed with descriptive and inferential statistics using two average difference tests. Based on the results of the study, both data analysis and hypothesis testing, with $\alpha = 0.05$, it was found that the improvement of students' MUA using DL was better than students who used the usual approach, as well as the achievement of better MUA.

Keywords: understanding, discovery learning.

Abstrak

Penelitian ini dilatarbelakangi oleh rendahnya kemampuan pemahaman siswa SMK. Penelitian ini akan menelaah peningkatan kemampuan pemahaman matematik siswa yang menggunakan *discovery learning* dengan pendekatan biasa. Metode yang digunakan adalah metode eksperimen dengan disain kelompok kontrol pretest-postes, yaitu disain yang melibatkan paling tidak dua kelompok dan pengambilan sampel secara acak kelas. Pada awal dan akhir pembelajaran kedua kelas diberi tes. Populasi dalam sampel ini adalah seluruh siswa SMK yang karakteristiknya memiliki kemampuan pemahaman matematik yang rendah. Dari seluruh SMK dipilih secara acak dan terpilih SMK TI Pembangunan Cimahi yang mewakili karakteristik populasi. Sampel dipilih secara acak, di mana kelas XI RPL C menjadi kelas eksperimen, dan kelas XI TEI B menjadi kelas kontrol. Pengumpulan data dalam penelitian ini menggunakan tes uraian yang telah diujicobakan terlebih dahulu, kemudian skor kemampuan pemahaman matematik siswa dianalisis dengan statistik deskriptif dan inferensial menggunakan uji perbedaan dua rata-rata. Berdasarkan hasil penelitian, baik analisis data maupun pengujian hipotesis, dengan $\alpha = 0,05$ ternyata peningkatan kemampuan pemahaman matematik siswa yang menggunakan *discovery learning* lebih baik daripada siswa yang menggunakan pendekatan biasa, begitu pula pencapaian kemampuan pemahaman lebih baik.

Keywords: pemahaman, discovery learning.

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INTRODUCTION

The role of mathematics as having an essential value that can be applied in various fields of life. Hendriana, and Sumarmo (2014) suggested that one of the visions of learning mathematics is directing mathematics learning to understanding mathematical concepts and ideas which are then needed to solve mathematical problems. Based on this vision, the ability of mathematical understanding is the

basic ability that students must possess. This ability is the main requirement for other mathematical abilities. Knowledge learned with understanding will provide a basis for the formation of new knowledge so that it can be used in solving new problems, after the formation of an understanding of the concept, students can give opinions, explain a concept. For this reason the teacher needs to prepare and organize strategies for delivering mathematics material to students. This is done in addition to preparing guidelines for teachers in the delivery of material, also so that every step of the activity of achieving competencies for students so that they can be carried out in stages, so that the results of optimal mathematics learning can be obtained.

Mathematical Understanding Ability (MUA)

The ability to understand mathematics is the ability to associate one concept / principle with another concept / principle, to do mathematical activities consciously and estimate a truth without hesitation. Some experts (Polya, Pollatsek, Skemp, and Copeland) argue that the level of MUA (Sumarmo, 2014):

- a. Mechanical /understanding *computational/ instrumental / knowing how to* : remember and apply formulas routinely and calculate in a simple (low level)
- b. inductive understanding : apply a formula or concept in a simple or similar case (low level)
- c. Intuitive /understanding*rational*: estimate and prove the truth of a formula or theorem (high level)
- d. Functionalunderstanding/ *knowing/ relational*: associating a concept / principle with other concepts and realizing the process done (high level)

According to Sumarmo (2014) MUA generally has indicators: knowing, understanding, and applying mathematical concepts, procedures, principles and ideas.

Discovery Learning (DL)

Discovery learning (DL) means learning by finding. Students become subjects of active learning. Ruseffendi (2006) said that learning through discovery centers on children. Discovery learning (DL) is a learning that maximally encourages students' abilities in a systematic, critical, and logical manner so that students find their own knowledge, attitudes, and skills.

Ministry of Education and Culture (Kemendikbud, 2013) suggests method discovery learning (DL) because the learning process in discovery learning requires students to organize their own knowledge, the lessons are presented not in the final form. Learning strategies in discovery learning (DL) have the same principles as inquiry (*inquiry*) and problem solving. But discovery learning (DL) places more emphasis on the discovery of concepts or principles that were previously unknown. The difference is that in discovery learning (DL) problems given to students are problems that have been engineered by the teacher.

Learning steps in discovery learning (Syah, 2004) describes the stages of *discovery learning* as follows: a) stimulation / giving stimulation, b) statement / problem identification, c) Data Collection, d) Data Processing, e) Proofing, f) draw conclusions / generalizations.

METHOD

Method used in this study is an experimental method that involves two classes, namely the experimental class and the control class of different classes but one level. All classes are given *pre-* and *testpost-test*. The experimental class obtained mathematics learning with discovery learning (DL) as a treatment and the control class obtained mathematics learning with learning as usual as a treatment. The design of this study is described as follows Ruseffendi (2005):

AOX O
AO O

Remarks:

- A : The sample was selected by random class
- O : *Pretest = posttest* MUA
- X : Learning mathematics by using DL

RESULTS AND DISCUSSION

Results

Pretest and posttest were given to each class, then scoring was done to be analyzed using *software IBM SPSS Statistics 21*. Here are the results of *output* statistical testing data description pretest and posttest experimental class and control class.

Table 1. Description of Research Data

No	Data Statistics	Class Experiment (DL)			Control Class		
		Pretest	Posttest	N Gain	Pretest	Posttest	NGain
1	Number of Students	27	27	27	24	24	24
2	Score Minimum	0	9	0.42	0	7	0.35
3	Score Maximum	1	15	0.75	1	15	0.75
4	Average Score	0.15	12.15	0.60	0.17	10.42	0.52
5	Percentage *)	0.77%	60.77%	60.44%	0.38%	52,917%	52,44%
6	Standard deviation	0,46	1,71	0,09	0,38	2,62	0,13

Table 2. Statistical Test Results MUA

Class	Significance			
	Normality	Test Homogeneity	Test Difference Test Two Average average	Non-parametric Test (Mann Whitney)
Pretest Experiment	0.000			0.652
Control	0.000			
Postes Experimental	0.090	0.058	0.012	
Control	0.065			
N-Gain Experimental	0.185	0.044	0.007	
Control	0.068			

Discussion

Based on the results of data processing pretest, concluded there was no difference in the ability of early mathematical understanding vocational students whose learning using discovery learning better than those who use ordinary learning. The results of the posttest data analysis of the experimental class and control class showed the achievement of posttest scores on the mathematical understanding ability of vocational students who learned using discovery learning better than those who used ordinary learning. While the results of the N-Gain data analysis of the experimental class and control class showed an increase in the MUA of vocational students whose learning uses discovery learning better than those using ordinary learning.

Research on the enhancement of MUA was also carried out by Hutajulu (2010), in his research entitled, "Improving the Understanding Ability and Mathematical Students of High School Students through Guided Inquiry Learning Models", (Bani, 2011). "Improving the Understanding Ability and Mathematical Reasoning of Junior High School Students through Guided Discovery Learning", *Journal of Education*. Vol. 1, 12-20, and by Karim (2011). "Application of Guided Discovery in Mathematics Learning to Improve Understanding of Critical Thinking Concepts and Abilities of Primary School Students", *Journal of Education*. Vol. 1, 21-32. The three researchers revealed that the discovery method has a strong influence on students' MUA.

In this research, it can be found the advantages of the discovery learning such as:

1. Helps students to improve and enhance cognitive skills and processes. Discovery efforts are key in this process, a person depends on how to learn.
2. Allows students to develop quickly and at their own pace. It causes students to direct their own learning activities by involving their own reason and motivation.
3. Play an active role in sharing ideas. Students are the center of the learning.
4. Students will understand the basic concepts and ideas better.
5. Encourage students to think and work on their own initiative; encourage students to think intuition and formulate their own hypotheses;
6. Can develop individual talents and skills.

CONCLUSION

Based on data analysis and discussion in the previous chapters, it was concluded:

1. Achieving the ability of mathematical understanding of vocational high school students who use *discovery learning* is better than students who use ordinary learning.
2. Increasing the ability of mathematical understanding of vocational high school students who use *discovery learning* is better than students who use ordinary learning.

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