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EFFECTIVENESS OF DISCOVERY LEARNING MODEL ASSISTED BY VBA FOR EXCEL TO IMPROVE THE COMPREHENSION ABILITY OF GRADE IV ELEMENTARY SCHOOL STUDENTS

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Abstract

This research is motivated by students' difficulties in solving story problems on the material of area and perimeter of flat shapes, therefore a learning model and interactive media are needed to overcome these problems. The alternative learning model applied is the discovery learning model. And the media used to help the learning process of VBA for Excel students. The purpose of this study was to examine the improvement of students' understanding ability in one of the State Elementary Schools in Bandung Regency. The instrument used in this research is a description question with as many as four items to determine students' understanding ability. The research method used in this research is experimental in the form of a group pretest-posttest design. The subjects in this study were students in one of the public elementary schools in Bandung Regency. The research data were obtained from the pretest and posttest results. The data were then processed using IBM SPSS Statistics 25 software. The results of data processing showed that there was an increase in the understanding ability of elementary school students after being given treatment using the discovery learning model assisted by VBA for Excel. Students are very enthusiastic about learning, it is proven that the discovery learning model assisted by VBA for Excel is very effective for further learning.

Keywords: Mathematical Comprehension Skills, Discovery Learning Model, VBA for Excel

Abstrak

Penelitian ini dilatarbelakangi oleh kesulitan siswa dalam menyelesaikan soal cerita pada materi luas dan keliling bangun datar, oleh karena itu diperlukan adanya suatu model pembelajaran dan media interaktif untuk mengatasi masalah tersebut. Alternatif model pembelajaran yang diterapkan adalah model *discovery learning*. Dan media yang digunakan untuk membantu proses belajar siswa VBA *for Excel*. Tujuan dari penelitian ini untuk menelaah peningkatan kemampuan pemahan siswa di salah satu Sekolah Dasar Negeri di Kabupaten Bandung. Instrumen yang digunakan dalam penelitian ini berupa soal uraian sebanyak empat butir soal untuk mengetahui kemampuan pemahaman siswa. Metode penelitian yang digunakan dalam penelitian ini yaitu metode eksperimen dalam bentuk *one group pretest posttest design*. Subyek dalam penelitian ini adalah siswa di salah satu sekolah dasar negeri yang ada di Kabupaten Bandung. Data penelitian diperoleh dari hasil pretes dan postes. Data kemudian diolah menggunakan *software IBM SPSS statistics* 25. Dari hasil pengolahan data menunjukkan bahwa terjadi peningkatan kemampuan pemahaman siswa sekolah dasar setelah diberikan treatment dengan menggunakan model *discovery learning* berbantuan VBA *for Excel*. Siswa sangat antusias dalam belajar, hal ini terbukti bahwa model *discovery learning* berbantuan VBA *for Excel* sangat efektif untuk digunakan dalam pembelajaran selanjutnya.

Kata Kunci: Kemampuan Pemahaman Matematis , Model Discovery Learning, VBA for Excel

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INTRODUCTION

Mathematics education plays an important role in the cognitive development of students, especially at the elementary school level. Mathematics is a fundamental science because it provides a basis for logical and analytical thinking which is indispensable in everyday life and various other fields of science. Mathematics is one of the lessons that is closely related to everyday life, not a few things or problems that surround us require mathematics (Chotimah & Bernard, 2018). Mathematics is not only a tool for solving problems but also a way of thinking that makes it possible to understand and explore the world around us.

Mathematics is one of the oldest and most fundamental scientific disciplines. Mathematics as a discipline is broad and diverse, covering everything from the abstract study of structures and patterns to applications in science and engineering. Mathematics as a branch of philosophy deals with numbers and space. We know Galileo Galilei who is called the "father of modern science", considered mathematics as the language of nature, the universe is written in the language of mathematics, and its letters are triangles, circles, and other geometric figures.

Mathematical comprehension ability is the ability of individuals to understand, interpret, and use mathematical concepts effectively in various contexts. This understanding ability involves the ability to solve problems, analyze information, and apply mathematical knowledge to different situations. A student must have the ability to understand mathematics because it is the basis for learning mathematics. According to Hendriana, and Rohaeti Sumarmo (2017), the mathematical understanding ability is a basic competency in learning mathematics which includes the ability of students to absorb the material, remember mathematical formulas and concepts, and apply them in simple or similar cases, estimate the truth of a statement, and apply formulas and theorems in problem-solving.

According to Skem, there are two types of understanding abilities, namely: 1) instrumental understanding; and b) relational understanding (Hendriana, Rohaeti Sumarmo, 2017). Meanwhile, Polattsek distinguishes two types of understanding, namely: 1) computational understanding; and 2) functional understanding (Hendriana, Rohaeti Sumarmo, 2017).

But in reality, there are still students in elementary schools who have difficulty understanding mathematical concepts, especially in the area and perimeter of flat shapes with story problems. Students do not understand the contents of the problem and its order. This difficulty is caused by several factors, including the learning model and media that are less interactive and fun. For this reason, teachers must be able to innovate in the learning process, for example, teachers must master interactive and fun learning models and media, so that learning is more meaningful.

The selection of the discovery learning model can help teachers deliver learning materials easily, and help students understand the lessons well. Discovery learning is based on the theory of constructivism developed by Bruner, meaningful learning occurs when students actively

construct their knowledge. Discovery learning emphasizes the importance of students to discover concepts and knowledge independently through exploration and investigation. Hosnan (2014) said discovery learning is a learning model to develop an active way of learning through self-discovery, and self-investigation. Through discovery learning, students can think analytically and try to solve problems themselves.

According to Darmawan and Dinn (2018), discovery learning is a learning model that can place students in a role so that they can solve existing problems with the material studied and by the learning framework that the teacher has designed. Discovery learning is a learning model that requires teachers to create a creative learning atmosphere to learn and find their knowledge (Hanida, Neviyarni & Fahrudin, 2019).

The steps of the discovery learning model according to the Ministry of Education and Culture (2013), the first is stimulation, the second is problem identification (problem statement), the third is data collection, the fourth is data processing, the fifth is verification, the sixth is concluding (generalization). Furthermore, Kemendikbud (2013) states that the strengths of the discovery learning model are: 1) the discovery learning model helps students repair and improve student cognitive skills and processes; 2) the discovery learning model allows students to develop quickly according to their abilities; 3) the discussion activities foster students' attitudes to respect each other; 4) it gives a sense of pleasure when students succeed in conducting research; 5) the discovery learning model fosters students' optimism because the findings lead to final and definite truth.

VBA for Excel is a programming language used to automate tasks in Microsoft Excel, as well as other Microsoft Office applications such as Word and PowerPoint. VBA is a subset of the Visual Basic Applications programming language, which allows users to write scripts often known as "macros" to execute a series of commands automatically. VBA for Excel is a powerful tool to increase productivity and efficiency in data processing and task automation in Excel. However, to utilize it optimally requires a basic understanding of programming and the structure of the VBA language. Visual Basic has great advantages that object, tinkering with objects in programming languages, and adding functions to Microsoft Office applications (Marcovits, 2012).

VBA for Excel in learning mathematics allows it to be used as an interactive dynamic approach in teaching mathematics. VBA for Excel can help improve students' understanding ability in teaching mathematics, especially the area and perimeter of flat shapes in story problems.

METHOD

The method used in this research is an experiment with one group pretest and posttest design. The sample subjects were elementary school students selected by purposive sampling at one of the elementary schools in Bandung Regency. This research instrument used four questions. The material taught in this study is the area and perimeter of flat shapes. The following one-group pretest-posttest design scheme is presented in Table 1.

Table 1. Schematic of One Group Pretest Posttest Design

Pretest	Treatment	Posttest
T_1	X	T_2

In this study, students' learning outcomes were obtained from the discovery learning model assisted by VBA for Excel media. Students' ability test scores were obtained from the results of the pretest and posttest. The n-gain value is the difference in data between the post-test and pretest, which will be categorized according to the range of gains/scores. The n-gain score criteria according to Meltzer & David (2002) are presented in Table 2.

Table 2. N-Gain Score Criteria

Criteria	N-Gain Score
High	$g > 0,7$
Medium	$0,3 < g \leq 0,7$
Less	$g \leq 0,3$

Based on the N-Gain score criteria in Table 2 learning using the discovery learning model assisted by VBA for Excel is said to increase if student learning outcomes obtain an n-gain score> 0.3 with moderate or high criteria. The n-gain value obtained will later be interpreted into a presentation form which aims to determine the grouping of the effectiveness of the n-gain value. The following categories of effectiveness of n-gain scores according to Hake (1999) are presented in Table 3.

Table 3. N-Gain Effectiveness Score Categories

Criteria	N-gain Score Value
Not Effective	< 40
Less Effective	40 – 55
Moderately Effective	56 – 75
Effective	> 76

RESULTS AND DISCUSSION

Results

This study aims to see the effectiveness of the discovery learning model assisted by VBA for Excel in improving the comprehension skills of elementary school students. The research method used was an experiment with a group pretest and posttest design. This research begins

with a pretest, which aims to determine the initial ability of students. Meanwhile, the posttest was conducted after students were given treatment with the discovery learning model assisted by VBA for Excel.

Based on the results of the pretest and post-test, both see from the lowest score, the highest score was observed to increase. The following pretest and post-test results are presented in Figure 1.

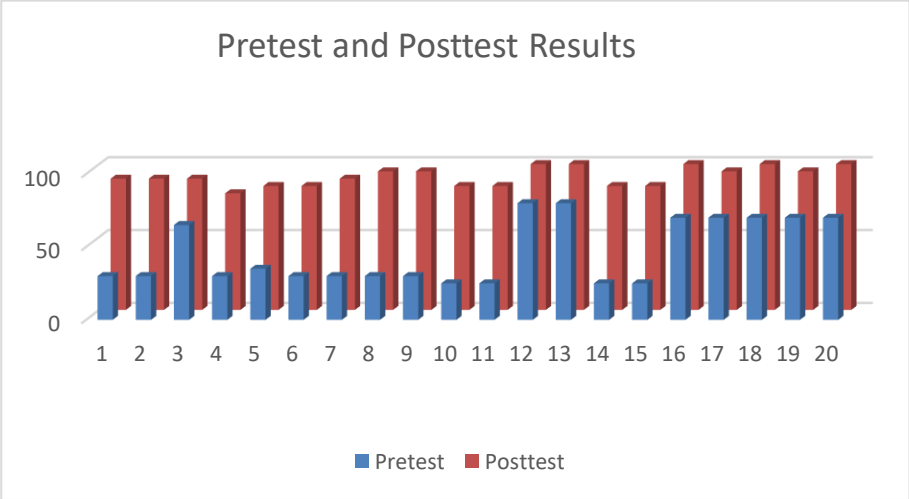

Figure 1. Pretest and Posttest Results

Furthermore, to strengthen the research results, statistical testing of the N-Gain test was carried out, to measure the effectiveness of using the discovery learning model assisted by VBA for Excel. The following N-Gain descriptive statistics are presented in Table 4.

Table 4 . Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Ngain_skor	20	.71	1.00	.8639	.09711
Ngain_Persen	20	71.43	100.00	86.3938	9.71064
Valid N (listwise)	20				

Based on Table 4 above, shows that the n-gain score mean value is 0.8639. This mean value is greater than the criterion of 0.7, which means the increase in students' understanding ability is high. For n-gain percent, the mean value is 86.3938. This mean value is greater than the effectiveness criterion of 76 which means that the effectiveness is very effective.

Discussion

The discussion that will be examined in this study is the learning outcomes of students in mathematics lessons on the material of the area and perimeter of flat shapes of story problems using the discovery learning model assisted by VBA for Excel. In the beginning, students were given a pretest. The next meet learning activities on broad material using the discovery learning model assisted by VBA for Excel.

Learning activities with the discovery learning model in the first stage of stimulation, at this stage students observe the material and media assisted by VBA for Excel which the teacher broadcasts through the projector, the teacher facilitates students by providing questions, directions to read the text, and learning activities lead to discovery activities in preparation for problem identification. In the second stage of problem identification, the teacher distributes the LKS, and students and groups identify the problems in the LKS in the form of hypotheses. In the third stage of data collection, students and groups explore to collect relevant data or information to answer questions or prove the truth of the hypothesis of the problem on the worksheet. In the fourth stage of data processing, students together with the group process the data or information that has been obtained then analyzed and interpreted. In the fifth stage of proof, students together with the group present the results of their discussion in front of the class to verify carefully to test the hypothesis and other groups respond, this stage aims to make the learning process run well and students and groups become active and creative in solving problems. The sixth stage concludes, in this last stage students together with the teacher conclude the discussion of the problem in the LKS.

From the process of learning activities with the discovery learning model assisted by VBA for Excel, students are very enthusiastic about following it. The learning atmosphere is very effective and fun. This can be seen in Table 4 which shows that the n-gain score mean value is 0.8639. This mean value is greater than the criterion of 0.7 which means that the increase in students' understanding ability is high. For n-gain percent, the mean value is 86.3938. This mean value is greater than the effectiveness criterion of 76 which means that the effectiveness is very effective. In line with the research of Moko, Chamdani & Salimi (2022) the discovery learning model can improve the mathematics learning outcomes of fourth-grade students.

Through statistical analysis and testing, it can be concluded that there is a significant effect on improving understanding ability. The discovery learning model assisted by VBA for Excel is proven to be effective in advancing the understanding ability of grade IV elementary school students on the material of area and perimeter of flat shapes of story problems. VBA for Excel allows better visualization of concepts through graphs and simulations, thus helping students understand the concept more concretely. The discovery learning model encourages students to be actively involved in the learning process, seek solutions, and discover ideas on their own, which can improve mathematical understanding and long-term retention. VBA for Excel can provide immediate feedback on students' activities, allowing them to recognize errors.

CONCLUSION

Based on the results and discussion, it can be concluded that the discovery learning model assisted by VBA for Excel is effective in improving the understanding ability of grade IV elementary school students on the material of the area and perimeter of flat shapes of story problems. VBA for Excel can provide a more interactive learning experience, and help students understand mathematics concepts well. The application of the discovery learning model

assisted by VBA for Excel if managed properly can create an effective and fun classroom atmosphere, learning is more meaningful, and students do not feel pressured.

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