

## The Effect of Model Discovery Learning on Students' Self-Efficacy and Student Learning Outcomes

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### ABSTRACT

One of the factors that influences a person's level of success in the learning process is self-efficacy. Low self-efficacy and student learning outcomes in the learning process are the background for this research. In order for student self-efficacy and learning outcomes to increase, there needs to be a learning process that makes students learn meaningfully, one of which is the model discovery learning. The purpose of writing the article is to see whether there is an increase in student self-efficacy after implementing the discovery learning model and whether there are differences in learning outcomes between the application of the model discovery learning and student learning outcomes using the scientific approach. The method in this research uses experimental research methods with research instruments in the form of questionnaires given to students before and after the learning process using discovery learning models and learning outcomes tests. Based on the calculations, it was found that there is an increase in students' self-efficacy after applying the model discovery learning, with a value  $g = 0,5$  of 0.43 categorized as a "moderate" improvement. This indicates that the discovery learning model positively contributes to enhancing students' self-confidence. This means that there is an increase in student self-efficacy by implementing the model discovery learning. For student learning outcomes, the calculation results obtained are  $t_{hitung} = 2.38$  and  $t_{tabel} = 1.67$ . This means that student learning outcomes by applying the model discovery learning are better than by applying learning using the scientific approach.

**Keywords:** Model Discovery Learning, Self-Efficacy, Learning Outcomes.

### ABSTRAK

Salah satu faktor yang mempengaruhi tingkat keberhasilan seseorang dalam proses pembelajaran adalah self-efficacy. Rendahnya self-efficacy dan hasil belajar siswa dalam proses pembelajaran menjadi latar belakang dalam penelitian ini. Agar self-efficacy dan hasil belajar siswa meningkat perlu adanya suatu proses pembelajaran yang membuat siswa belajar bermakna salah satunya adalah model discovery learning. Tujuan dari penulisan artikel adalah untuk melihat Apakah terjadi peningkatan self-efficacy siswa setelah menerapkan model discovery learning dan apakah terdapat perbedaan hasil belajar antara penerapan model pembelajaran discovery learning dengan hasil belajar siswa dengan menggunakan pendekatan scientific. Metode dalam penelitian ini menggunakan metode penelitian eksperimen dengan instrumen penelitian berupa angket yang diberikan kepada siswa sebelum dan sesudah proses pembelajaran dengan menggunakan model discovery learning dan tes hasil belajar. Berdasarkan hasil perhitungan, ditemukan bahwa terdapat peningkatan self-efficacy siswa setelah menerapkan model discovery learning, dengan nilai  $g = 0,5$  sebesar 0,43 yang dikategorikan sebagai peningkatan yang "sedang". Hal ini menunjukkan bahwa model pembelajaran discovery learning memberikan kontribusi positif terhadap peningkatan keyakinan diri siswa. Hal ini berarti terdapat peningkatan self-efficacy siswa dengan menerapkan model discovery learning. Untuk hasil belajar siswa diperoleh hasil perhitungan  $t_{hitung} = 2,38$  dan  $t_{tabel} = 1,67$  hal ini berarti bahwa hasil belajar siswa dengan menerapkan model discovery learning lebih baik dibandingkan dengan menerapkan pembelajaran menggunakan pendekatan scientific.

**Kata kunci:** Model Discovery Learning, Self-Efficacy, Hasil belajar

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### Introduction

Mathematics learning is an interactive process between teachers and students, including the development of thinking styles in a learning environment created by the teacher using various methods so that the mathematics curriculum develops and develops optimally. Students can

carry out learning activities effectively and efficiently. In the 21st century, teachers are challenged to make decisions on how best to meet the needs of students who are met by pressure testing with local, state and national standards. (Salar, 2021). The learning process at school will be successful if supported by psychological aspects related to student attitudes during the learning process, more specifically task completion. Self-efficacy is a psychological aspect that has a significant influence on student success in completing homework and solving problems (Jatisunda, 2017).

Students' independent learning ability in mathematics is still low, especially in understanding complex mathematical concepts. In addition, students' low self-efficacy can hinder their ability to solve mathematical problems. The problem of low student academic achievement in mathematics subjects in Indonesia is not only caused by less effective learning, but is also caused by several factors, namely lack of student motivation to learn, lack of use of media and technology in learning, lack of student activity. The model Discovery Learning can be an option for solving mathematical problems. This model can develop students' understanding abilities through real-life problem solving experiences, to improve the quality of learning outcomes and student independence (Nugraha & Wulansari, 2023). The use of the model discovery learning allows students to learn interactively and actively through real-life experiences while solving mathematical problems.

Self-Efficacy is a belief or belief that each individual has in performing and completing the tasks he faces, in certain situations and conditions, to be able to overcome obstacles and achieve predetermined goals. Students with high self-efficacy choose to try harder and not give up easily, setting difficult tasks to complete. Meanwhile, students with low self-efficacy often have difficulty solving problems and consider the task as a threat to themselves, so it is easy to get angry (Jannah et al., 2019). Self-efficacy is the result of an individual's cognitive process in the form of confidence in their learning abilities so that they can achieve the desired learning outcomes (W. Fitriani, 2017). Individuals who can achieve results, achieve goals, and overcome obstacles often have high self-efficacy. It is clear that high self-efficacy makes a positive contribution to almost every aspect of life. People with low self-efficacy will feel helpless, even hopeless, when faced with a situation and will think that they only have a very small chance of being able to influence the situation they face. Learning outcomes are abilities obtained by students through learning experiences which aim to achieve predetermined skills or master the content of subjects obtained through a planned assessment process to measure student abilities (Hasanah et al., 2018). Learning outcomes are used as a measure to evaluate students' level of success in the learning process.

Based on the results of interviews with Class VII students at SMP Negeri 31 Padang, mathematics is considered a difficult and difficult subject to understand because it is always associated with numbers and formulas. After conducting interviews with teachers and students, it can be concluded that it is necessary to find solutions to the problems faced so that students become more confident and learning becomes meaningful. During the learning process, students lack confidence in their work, this can be seen when the teacher asks students to present their work. In general, students do not want to excel because they are afraid of making mistakes, which means they are not confident in completing their assignments. When the teacher poses a problem, students are only silent and do not want to express their opinions, views or solutions. When the teacher poses a problem, students are silent and do not want to express their opinions, views or solutions. Although the teacher gives an overview of the material, students still look confused because they cannot relate it to

real life. One learning model that makes learning meaningful is the model discovery learning. The model discovery learning can be used to develop active learning activities through self-discovery and self-inquiry so that students can explore the concepts in the learning material themselves (Sari et al., 2020; Romadon & Mahmudi, 2019). By using this learning model, it is hoped that it can help students understand mathematical problems during the learning process. Materials are one of the elements supporting the learning process. Mathematics teaching materials are specific documents that help students understand mathematical concepts clearly, not only creating conditions for students to learn the subject but also helping teachers in teaching mathematics. (Ahyansyah et al., 2020; Febriana et al., 2017). By using this learning model, it is hoped that it can help students understand mathematical problems during the learning process (R. N. Fitriani & Pujiastuti, 2021). Based on this, research was conducted to see how students' self-efficacy increased after implementing the model Discovery learning and whether there were differences in learning outcomes between the application of the model Discovery Learning and student learning outcomes using a scientific approach.

### **Research Methods**

This research is experimental research, which was carried out to determine the value of the independent variable, either one or more (independent) variables without making comparisons, or connecting them with other variables. (Sugiyono, 2013). The experimental research in this study aims to get an idea of the differences in self-efficacy and learning outcomes of Padang students after being treated with the application of the model Discovery Learning. The self-efficacy instrument used is a questionnaire which includes 4 things, namely: Performance Accomplishment, Vicarious Experience, Verbal Persuasion, and Emotional Arousal. Self-efficacy questionnaires were distributed to all students in both sample classes at the beginning of meeting I before learning began and at the end of meeting IV after implementing learning using the model Discovery Learning. Learning outcome tests are given to students after applying the model Discovery Learning and using the scientific learning model. Based on data obtained through questionnaires, the data management or data analysis techniques used are quantitative and qualitative data. The results of data processing are presented in table form to present the results of analysis using qualitative descriptive techniques. (Sugiyono, 2013) In analyzing the data in this research, descriptive statistical analysis techniques were used. According to Descriptive statistics are statistics that are used to analyze data by describing or illustrating the data that has been collected as it is without the intention of making general conclusions or generalizations. Questionnaire analysis was carried out in several stages as follows: The questionnaire had its score calculated, then the average of the questionnaires before and after being given treatment. (Rahmi et al., 2020) Analysis of the Self Efficacy questionnaire was carried out to see the increase before and after treatment in each sample class calculated using the N-gain (Normalized-gain) formula. Gain is the difference between the pretest and posttest scores. Gain shows an increase after learning is carried out by the teacher (Nengsi et al., 2017).

### **Result and Discussions**

The purpose of this study was "Students' self-efficacy after using the model Discovery Learning is better than students' self-efficacy before using the model Discovery Learning". To find out whether the level of students' self-efficacy ability increased or not, the N-Gain test was conducted. The results of testing the two schools can be seen in the Table 1.

**Table 1.** N-gain Test Results at SMP Negeri 31 Padang

	Pretest	Posttest
$\Sigma x$	4572	5364
$\bar{x}$	134,47	162,55
g	0,43	

Based on Table 1 shows that the questionnaire given has  $\bar{x}_{\text{posttest}} > \bar{x}_{\text{pretest}}$ . So obtained  $g = 0,5$  and 0.43 which is categorized as moderate, meaning that students' self-efficacy has increased with "moderate" criteria. Mathematics learning outcomes are the abilities students gain during the mathematics learning process to use these abilities in the form of action. Learning outcomes are often used as a benchmark for how well someone has mastered the material being taught. To realize these learning outcomes, a series of efforts are needed using effective and quality assessment tools.

For this, at SMPN 31 Padang a final test was carried out after using the model discovery learning. The test used is the t test. Before the t test, normality and homogeneity tests are carried out first. After the data is normal and homogeneous, the t test is carried out with the results obtained  $t_{hitung} = 2.38$  and  $t_{tabel} = 1.67$ . because t arithmetic is greater than t table, it can be concluded that student learning outcomes by applying the model discovery learning are better than student learning outcomes by implementing learning using the Scientific approach in class VIII students at SMPN 31 Padang. This is supported by research (Agus, 2019) which states that the Guided Discovery Learning Method uses a contextual approach that is effective in middle school students' critical thinking abilities, academic success, and independent mathematics learning abilities. Discovery Guided Learning with a contextual approach is also more effective than conventional learning for students' critical thinking skills, academic achievement and independent learning in mathematics.

The implementation of the Model Discovery Learning is applied with the following steps: In its implementation, it begins by checking the presence of students, preparing students psychologically and physically, conveying the objectives and scope of the subject matter to be achieved by students, providing motivation and apperception to take part in learning, and instructing students on the steps of learning that will be implemented (Discovery Learning). After that, the teacher divides students into several groups heterogeneously, each group consists of 4-5 students. Students discuss in groups to find a concept. In discussing, students are facilitated with the Learner Worksheet (LKPD). LKPD is a tool to prove the truth of students' initial guesses. An example of a LKPD looks like Figure 1.

Before students work on the LKPD, students fill out a self-efficacy questionnaire to see student confidence. Then the LKPD that has been received, then students start working according to the stages in Discovery Learning.

**Lembar Kerja Peserta Didik**  
**1**

**Materi** : Lingkaran dan unsur-unsurnya  
**Tujuan** : 1. Siswa dapat mengetahui pengertian lingkaran  
2. Siswa dapat menentukan unsur-unsur lingkaran

**Nama Anggota Kelompok:**

1. ....

2. ....

3. ....

4. ....

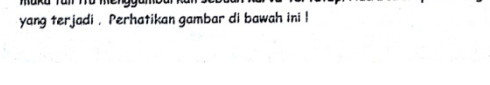
5. ....

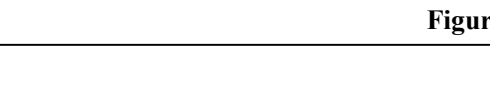
**Petunjuk :**

1. Waktu Pengerjaan 15 menit.
2. Kerjakan Lembar Kerja Siswa ini secara berkelompok.
3. Bacalah Lembar Kerja Siswa dengan teliti dan cermat.
4. Jawablah pertanyaan pada tempat yang disediakan.
5. Tanyakan pada Bapak/Ibu guru jika ada yang kurang jelas.

**Apa itu Lingkaran?**

Jika kedua ujung seutas tali disambung dan diletakkan di bidang datar , maka tali itu menggambarkan sebuah kurva tertutup. Ada beberapa kemungkinan yang terjadi . Perhatikan gambar di bawah ini !





**Student Worksheet 1**  
Material: Circles and their elements  
Objectives: 1. Students can understand the meaning of a circle  
2. Students can determine the elements of a circle  
Instruction :  
1. Working time 15 minutes.  
2. Do this Student Worksheet in groups.  
3. Read the Student Worksheet carefully and carefully.  
4. Answer the questions in the space provided.  
5. Ask the teacher if something is not clear.


**What is a Circle?**  
If the two ends of a string are connected and placed on a flat plane, then the string describes a closed curve. There are several possibilities that could happen. Look at the picture below!

Figure 1. Example LKPD

Stage I is the Simulation stage, where at this stage the teacher provides an initial description of the subject matter found in real life. This can be seen in Figure 2.

**Simulation**

Andi mempunyai hobi naik sepeda. Suatu hari dia diberi pertanyaan oleh Pamannya.  
Bantulah Andi menjawab pertanyaan dari Pamannya!



Gambar 1

**Simulation**

Andi has a hobby of riding a bicycle. One day he was asked a question by his uncle. Help Andi answer questions from his uncle!




Figure 2. Stage simulation

Phase II is Problem Statement, where at this stage after students read the description that contains a problem to be solved. Furthermore, students identify the problem by answering the questions that have been asked. This can be seen in Figure 3.

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**Problem Statement**

1. Berbentuk apakah roda sepeda tersebut?  
 .....

2. Coba kamu sebutkan benda-benda di sekelilingmu yang mempunyai seperti roda sepeda.  
 .....

3. Jika roda sepeda diputar, adakah bagian yang tidak bergerak? Dis apakah bagian itu?  
 .....

4. Perhatikan jeruji sepeda, adakah jeruji yang panjangnya tidak sam Jika roda sepeda tersebut berbentuk lingkaran/ disebut apakah bagian sepeda itu?  
 .....

Problem Statement

1. What shape are the bicycle wheels?  
 .....

2. Try to name objects around you that are shaped like bicycle wheels!  
 .....

3. If the bicycle wheel is turned, is there any part that does not move? What is that part called?  
 .....

4. Look at the bicycle spokes, are there any spokes that are not the same length? If the bicycle wheel is circular, what are the spokes of the bicycle called?  
 .....

**Figure 3. Stage problem statement**

Stage III is data collection, where at this stage students collect various information to answer questions. This can be seen in Figure 4.

5. Busur ( $\frown$ ) yaitu garis lengkung bagian dari keliling lingkaran. Busur terbagi dua:

- Busur kecil/pendek : yaitu busur yang panjangnya kurang dari setengah lingkaran
- Busur besar / panjang yaitu busur yang panjangnya lebih dari setengah lingkaran

Keterangan : jika busur tidak disebutkan keterangan maka busur yang dimaksud adalah busur kecil

6. Juring adalah daerah yang dibatasi oleh dua buah jari - jari dan busur

7. Tembereng adalah daerah yang dibatasi oleh tali busur dan busur

8. Apotema yaitu garis lurus yang tegak lurus terhadap tali busur dan merupakan jarak terpendek tali busur terhadap pusat lingkaran

Dari uraian di atas coba kamu tunjukkan/sebutkan unsur - unsur lingkaran pada Gambar 2!

jari-jari = OA

Gambar 2

NO	Unsur-unsur Lingkaran	Keterangan
1	titik pusat	0
2	jari-jari (r)	OA - OB, OD - OB
3	diameter	OA - OD - OB

5. Arc ( $\square$ ) is a curved line part of the circumference of a circle. The arc is divided into two:

- Small/short arc: namely an arc that is less than half a circle long
- A large/long arc is an arc that is more than half a circle long

Description: if the bow is not stated in the description then the bow in question is a small bow

6. Juring is an area bounded by two spokes and an arc

7. A section is an area bounded by a bowstring and a bow

8. Apothem is a straight line that is perpendicular to the chord and is the shortest distance from the chord to the center of the circle

From the description above, try showing/mentioning the elements of the circle in Figure 2!

radius = OA

**Figure 4. Stage data collection**

Stage IV is data processing, where at this stage after students get information from the LKPD that has been done. Then students in groups process the information that has been obtained. So that students are able to find a concept about the material being studied. Furthermore, the teacher ensures that each group member understands a concept that has been discovered. Stage V is verification, at this stage after the discussion activity, the teacher asks one of the groups to come forward to the class to convey the results of their discussion. The last stage is Generalization, where the teacher and students together to conclude the problem that has been solved. This can be seen in Figure 5.

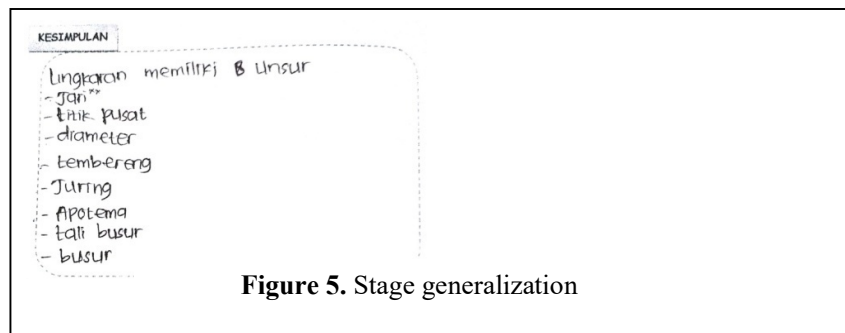


Figure 5. Stage generalization

The guided model discovery learning ends with students exploring the concepts in the material they have learned and drawing their own conclusions based on their own understanding. Therefore, in this case the Guided model Discovery Learning can increase student self-efficacy. because during the discovery process, students will be guided and oriented to find the concepts they are exploring. Therefore, students will always actively participate until the correct conclusion is reached (Nxiety, 2020). In model Discovery Learning, students really use their thinking skills to improve their ability to understand concepts in mathematics. (Mawaddah & Maryanti, 2016).

Perceptions of mathematical competence are students' perceptions of themselves when completing tasks, activities, or problems related to mathematics (Hackket & Betz, 1989). Perceived self-efficacy also indicates a strong ability to control a task. Lack of control often leads to boredom. This situation also occurs during the learning process at school, causing boredom when students feel less able to master the subject (Morin et al., 2022). Self-efficacy, often used to explain action control, refers to an individual's perception of their ability to perform academic tasks (Pekrun, 2006). Therefore, persistence in a job, activity, or task is considered to be related to perceptions of self-efficacy. Therefore, there is a strong relationship between Self-efficacy and feelings of boredom due to failure in a task (Belton & Priyadharshini, 2010). Based on this theoretical explanation, it can be assumed that perceived self-efficacy is an important variable in learning mathematics, so that mathematics learning can be understood by students. Research by (Belton & Priyadharshini, 2010) The results showed that students' problem solving ability and mathematical self-efficacy increased after learning using Guided Discovery Learning material by integrating local culture in mathematics learning is an important thing to consider in an effort to maximize students' mathematics learning achievement. There is an interactive effect between Guided model Discovery Learning and students' self-efficacy on Learning Outcomes (Atiyah et al., 2020).

## **Conclusion**

Based on the discussion above, it can be concluded that the model discovery learning can increase students' self-efficacy in the learning process because students are actively involved in discovering mathematical concepts in the learning process. Apart from that, the model discovery learning can improve student learning outcomes compared to the scientific learning model. The contribution of this research is that using the model discovery learning can increase self-efficacy and student learning outcomes specifically in mathematics learning.

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