

## **PROBLEM-SOLVING ABILITY: SEEN FROM THE APPLICATION OF DISCOVERY LEARNING**

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### **Abstract**

*This study aims to determine (1) the effect of application discovery learning on mathematics problem-solving ability. (2) The effect of conventional learning on mathematics problem-solving ability. (3) Comparison of mathematics problem-solving abilities between students taught using discovery learning and those taught using conventional learning. This was a quantitative study. The population in this study was class VIII students in one of the junior high schools in Batam City. The sampling was performed using the purposive sampling technique. Data collection techniques use tests. The instrument was tested using validity and reliability tests. Data analysis was performed using a one-sample t-test and a paired sample t-test. The results of the analysis show that (1) there is an influence of the application of discovery learning on mathematics problem-solving ability, (2) there is an influence of conventional application on mathematics problem-solving ability, and (3) there is a difference in problem-solving ability between students taught using discovery learning and students taught using conventional learning.*

**Keywords:** *discovery learning, quasi experiment, probability, learning mathematics*

## **INTRODUCTION**

Mathematics is one of the subjects that influences and plays an important role in the world of education because mathematics can develop creative, critical, systematic and logical thinking. In addition, mathematics makes a major contribution to the continuity of daily life. It is known that mathematical processes are involved in most daily activities (Mulyatiningsih and Nuryanto, 2014). Mathematics has a very important role in developments in the fields of education as well as science and technology. However, in fact, the majority of people still think that mathematics is a very difficult and scary subject, so that there is a feeling of reluctance and unwillingness to deepen its learning. Mathematics also aims to train students to understand concepts, explain the relationship between concepts, use reasoning on patterns and properties, have the ability to understand and solve problems, communicate ideas, and have curiosity, attention and an attitude of appreciating the usefulness of mathematics in life (Lutfiana, 2022). To make this happen, one very influential factor is the mathematics learning process itself.

Mathematics learning is an activity of acquiring self-constructed knowledge and should be carried out in such a way as to provide opportunities for students to rediscover mathematical concepts (Wahyuni et al. 2018). Mathematics learning must start from life

problems that are contextual or practical and close to students and socially relevant in order to provide human values to students. Therefore, mathematics learning must be in accordance with the characteristics of mathematics itself, namely the existence of a logical flow of thought and a coherent deductive way of thinking. One of the goals of mathematics education is to improve students' mathematics problem-solving ability. To achieve this goal, students must be able to understand what they are learning. However, many students do not deepen, understand and re-learn, making the lessons taught easy to forget. Therefore, as a teacher, one of the considerations in the learning process is to guide students to understand the basic concepts of mathematics education (Widiasworo, 2017). With this learning pattern, students are better able to solve mathematical problems and retain the material longer. Mathematics problem-solving ability will increase when students are able to interpret lessons. Increased mathematics problem-solving ability can be caused by mastering mathematical concepts which transform students' cognitive, effective and psychomotor aspects (Mulyatiningsih & Nuryanto, 2014).

Based on observations made in class VIII of SMPN 20 Batam, it is known that mathematics learning activities are still teacher-centered. The teacher conducts lectures and dominates mathematical problems. Students do not focus on following the teacher's explanation and are reluctant to ask questions about material they do not understand. This makes it difficult for students to solve problems in learning mathematics. Students are only able to work on questions according to the examples given, so that when given practice questions with a higher level of difficulty, only a few students can solve math problems well. Furthermore, some students are reluctant to carry out individual exercises, they only rely on their friends' answers without trying to find solutions to problems and the conventional learning model which is centered on the lecture method carried out in mathematics subjects is less efficient so that the material taught in class is less understood and only a few Only students follow the learning process.

Therefore, the need for new innovations in learning models is the right solution so that students are expected to be more able to improve their reasoning power in finding concepts and solving problems. So, to learn well, direct experience is needed where students not only observe but are also directly involved and responsible for the results obtained. The learning model used must make students feel more happy and cooperative during the learning process. By implementing innovative learning models, researchers aim to create an interesting learning

atmosphere, make students more enthusiastic about participating in the learning process, and improve mathematics problem-solving ability.

The learning model used needs to provide opportunities for students to gain knowledge by discovering the concepts and expressions being studied for themselves so that the concepts learned remain stored in the students' memories. The learning model that provides students with the opportunity to discover their own learning concepts is the discovery learning model. According to Mulyatiningsih and Nuryanto (2014), discovery learning is a cognitive learning model and teachers need to be more creative to create situations where students can participate in active learning and discover their own knowledge. On the other hand, according to the Education Personnel Development and Education and Culture Quality Assurance Agency in Widiaworo (2017), discovery learning is a learning theory which is defined as learning that occurs when students are not presented with lesson material.

In its final form, students must learn to organize themselves. This Discovery Learning learning model has the advantage that it can instill a sense of joy in students along with an increased willingness to explore and of course it is always successful and encourages students to involve their minds and themselves in the learning process so that they are involved in learning activities to direct motivate them in class. This learning model is also an opportunity for students to gain knowledge by discovering unique concepts and formulas that they have learned. to students, letting the concepts and phrases stick with them.

## **METHODOLOGY**

This research is quantitative research with a type of quasi-experimental research (quasi experiment) which is a development of true experimental design which is difficult to implement, especially in the social and educational fields. The research design used by researchers is Posttest Only-Control Group Design. The sampling carried out by the researcher was purposive sampling.

**Table 1.** Posttest Research Design Only-Control Group Design

| <b>Class</b> | <b>Treatment</b> | <b>Measurement</b> |
|--------------|------------------|--------------------|
| Eksperimen   | X                | $O_1$              |
| Kontrol      | -                | $O_2$              |

The sample in the research was determined using a purpose sampling technique, namely a non-random sampling method and using certain considerations. The place used for carrying out this research was SMP Negeri 20 Batam. The time for conducting research is in the even semester. In this research there are two variables, namely the independent variable (x), namely the Discovery Learning learning model. The dependent variable (y) is student mathematics problem-solving ability. The research instrument used in this research was a test. Where tests are used to measure student mathematics problem-solving ability. The instrument used was declared valid and reliable. To test instrument reliability, use the Crobach alpha formula. To test the hypothesis, the test given to students is in the form of an essay test on the main topic of opportunity with 10 essay questions given to the experimental class and control class to see student mathematics problem-solving ability. The question grid includes indicators to determine the mathematics learning outcomes of class VIII students as follows:

**Table 2.** Instrument Question Indicators

| Question Indicators                                    | Question Number |
|--|-----------------|
| Determine the sample space and sample points           | 1, 2            |
| Determine the empirical probability of an event        | 3, 4, 5         |
| Determine the theoretical probability of an event      | 6, 7, 8         |
| Solving problems related to the concept of opportunity | 9, 10           |

## RESULT AND DISCUSSION

The research data described is data on student mathematics problem-solving ability obtained by researchers after implementing the Discovery Learning model and conventional models in the experimental class and control class. This research aims to determine student mathematics problem-solving ability using the main material of opportunities. The instruments used are valid and reliable. The reliability of the instrument is in the range of 0.60 to 0.80, which states that the reliability of this instrument is high. To test data normality, namely a prerequisite test regarding the suitability of the data for analysis. Through this test, research data can be in the form of a normal or abnormal distribution. Normality testing was carried out with the help of Microsoft Word using the Kolmogorov Smirnov test with a significance level of 5%.

From the results above, you can see the Post-Test scores for the experimental class and control class. With a  $D_{table}$  level of 0.21 then  $0.08 \leq 0.21$ . These results indicate that the experimental class mathematics mathematics problem-solving ability data is normally distributed and the  $D_{table}$  level is 0.21, then  $0.10 \leq 0.21$ . These results indicate that the control class mathematics mathematics problem-solving ability data is normally distributed.

Next, a homogeneity test is carried out with the aim of finding out whether the data comes from the same population (homogeneous) or not. The data homogeneity test carried out in this research was by comparing the largest variance with the smallest variance. Homogeneity testing was carried out with the help of Microsoft Excel using the F test. It can be seen that in the tabwl above that  $F_{table} 0.549 \geq F_{(count)} 0.329$  with a probability of  $0.001 \leq \alpha$  0.05. So it can be concluded that the data in this research is homogeneous so that Hypothesis Testing can be continued. To test the hypothesis in this research, 3 tests were used, namely to test hypotheses 1 and 2 using the One Sample t-Test. The data was processed using Microsoft Excel with the hypothesis testing criteria being if  $sig < \alpha/2$  then  $H_0$  was rejected and if  $sig > \alpha/2$  then  $H_0$  was accepted. Meanwhile, hypothesis 3 testing was carried out using paired samples t-test. The data was processed using Microsoft Excel with the hypothesis testing criteria being if  $sig < \alpha/2$  then  $H_0$  was rejected and if  $sig > \alpha/2$  then  $H_0$  was accepted.

Based on the calculation results of hypothesis test 1 in the experimental class,  $t_{count} = -3.096$  and  $t_{table} = 2.040$ . Because  $t_{count} > t_{table}$  ( $-3.096 > 2.040$ ) and the probability is 0.004, because  $|t_{count}|$  is negative and the probability is  $0.004 < 0.025$ , then  $t_{count}$  is absolute and compared with one-sided  $t_{table}$  and it is found that ( $3.096 > 1.696$ ). It can be concluded that  $H_0$  is rejected. Thus, it can be concluded that there is an influence of the discovery learning model on the mathematics problem-solving ability of class VIII students at SMPN 20 Batam. Based on the calculation results of hypothesis test 1 in the experimental class,  $t_{count} = -17.165$  and  $t_{table} = 2.040$ . Because  $t_{count} > t_{table}$  ( $-17.165 > 2.040$ ) and the probability is 0.000, because  $|t_{count}|$  is negative and the probability is  $0.000 < 0.025$ , then  $t_{count}$  is absolute and compared with one-sided  $t_{table}$ , it is found that ( $17.165 > 1.696$ ). It can be concluded that  $H_0$  is rejected. Thus, it can be concluded that there is an influence of the conventional model on the mathematics problem-solving ability of class VIII students at SMPN 20 Batam.

Based on the calculation results, it is obtained that  $t_{count} = -5.843$  and  $t_{table} = 2.040$  with  $df = n_1 - 1 = 31$  and  $df = n_2 - 1 = 31$ , because  $t_{count} > t_{(table)}$  ( $-5.843 > 2.040$ ) and

Probability 0.000, because  $|t_{\text{count}}|$  is negative and the probability is  $0.000 < 0.025$ , then  $t_{\text{count}}$  is absolute and compared with one-sided  $t_{\text{table}}$  then it is found that  $(5.843 > 1.696)$ . It can be concluded that  $H_0$  is rejected. Thus it can be concluded that there is a difference in influence between the discovery learning model and the conventional model on student mathematics problem-solving ability at SMPN 20 Batam.

In discovery learning, researchers first explain the motivation and learning objectives and distribute worksheets before class begins. The teacher then discusses problems related to the material so that students can identify the topic. The teacher then gives assignments to students as teaching material. Students collect information from material contained in textbooks and other sources, and write these sources on student worksheets (Ardelina et al. 2021). Apart from that, students interact by asking questions and answers to the teacher, the teacher guides the students and observes the work of each group, the teacher also provides instructions and assistance to students who experience difficulties. Students are asked to send representatives of their groups to answer the questions in front of them, and the teacher provides opportunities for other students to understand and ask questions and the teacher guides students in the decision-making process in the form of definitions of the material being studied and stages of completing the material (Hilmi et al. 2017).

The effect after treatment with the discovery learning model is that the teacher gives students the opportunity and freedom to discover, explore and construct their own knowledge, so that students can understand the learning material better and more easily. By learning to discover for themselves, students will be better able to understand and remember the concepts and knowledge learned by themselves (Astari et al. 2018). so that students' mathematics mathematics problem-solving ability increase. With the influence of the discovery learning model on students' mathematics mathematics problem-solving ability. There are factors such as supporting factors and success factors for the discovery learning model. Supporting factors for the discovery learning model are teaching staff, facilities and infrastructure, student motivation and the education system used. Teaching materials have a strategic role in improving the quality of Human Resources (HR) because teaching materials are the most important part of the learning process (Simangunsong and Pane, 2021). Teaching materials are learning components used by mathematics subject teachers as learning materials for students in carrying out teaching and learning activities. The success factors for the discovery learning model are that the model taught is not boring, the method used is interesting for



learning mathematics, the teaching materials used are power points and student worksheets as well as encouraging students' interest to be more active and find out more about the ongoing learning.

## **CONCLUSION AND SUGGESTION**

Based on the results of the research and discussion, it can be concluded that there is an influence of the discovery learning model on the mathematics mathematics problem-solving ability of class VIII students at SMPN 20 Batam. There is an influence of the conventional model on the mathematics mathematics problem-solving ability of students at VIII SMPN 20 Batam. There is a difference in the influence between the discovery learning model and the conventional model on the mathematics mathematics problem-solving ability of class VIII students at SMPN 20 Batam. Based on the research results and conclusions that have been completed above, several suggestions can be given as follows:

1. The discovery learning model can be considered as a choice of learning model and teaching variation in mathematics learning so that the right mathematics learning model can be obtained.
2. The discovery learning model can be applied and developed gradually in learning material so that you will get better learning results.

## **REFERENCE**

- Ardelina, A. Y., Ain, N., & Ayu, H. D. (2021). Pengaruh Model Pembelajaran Discovery Learning Berbantuan Media Audio Visual Untuk Meningkatkan Keaktifan Dan Prestasi Belajar Siswa. *RAINSTEK: Jurnal Terapan Sains & Teknologi*, 3(4), 300–312.
- Astari, F. A., Suroso, S., & Yustinus, Y. (2018). Efektifitas penggunaan model discovery learning dan model problem based learning terhadap hasil belajar siswa kelas 3 SD. *Jurnal Basicedu*, 2(1), 1–10.
- Hilmi, N., Harjono, A., & Soeprianto, H. (2017). Pengaruh Model Pembelajaran Discovery Dengan Pendekatan Saintifik dan Keterampilan Proses Terhadap Hasil Belajar Peserta Didik. *Jurnal Penelitian Pendidikan*, 3(2).
- Lutfiana, D. (2022). Penerapan Kurikulum Merdeka Dalam Pembelajaran Matematika Smk Diponegoro Banyuputih. *Vocational: Jurnal Inovasi Pendidikan Kejuruan*, 2(4), 310–319.
- Mulyatiningsih, E., & Nuryanto, A. (2014). *Metode Penelitian Terapan Bidang Pendidikan*. Alfabeta.

- Simangunsong, A. D. B., & Pane, E. P. (2021). Pengembangan Modul Kimia Dasar Berbasis Discovery Learning pada Materi Stoikiometri. *Edukatif: Jurnal Ilmu Pendidikan*, 3(6), 4415–4425.
- Wahyuni, A. P., Abbas, A. B., & Kuku, K. (2018). Pengaruh Model Pembelajaran Discovery Learning Terhadap Hasil Belajar Matematika Siswa Pada Materi Bangun Ruang Sisi Datar. *Primatika: Jurnal Pendidikan Matematika*, 7(2), 115–122.
- Widiasworo, E. (2017). Strategi & Metode Mengajar Siswa di Luar Kelas. *Yogyakarta: Ar-Ruzz Media*.