

THE EFFECT OF THE DISCOVERY LEARNING MODEL ON THE MATHEMATICS LEARNING OUTCOMES OF GRADE V STUDENTS

Irawaty Mei Delila Damanik¹, Janwar Tambunan², Muktar B Panjaitan³

¹Faculty of Teacher Training and Education, Universitas HKBP Nomennsen Pematangsiantar, Indonesia; irawatydamanik@gmail.com

²Faculty of Teacher Training and Education, Universitas HKBP Nomennsen Pematangsiantar, Indonesia; janwartambunan@uhn.ac.id

³Faculty of Teacher Training and Education, Universitas HKBP Nomennsen Pematangsiantar, Indonesia; muktar.panjaitan@uhnp.ac.id

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ABSTRAK

Penelitian ini bertujuan untuk mengetahui pengaruh model pembelajaran Discovery Learning terhadap hasil belajar Matematika siswa kelas V UPTD SD Negeri 122345 Pematangsiantar. Penelitian ini menggunakan pendekatan kuantitatif dengan metode eksperimen dan desain One-Group Pretest-Posttest Design. Sampel penelitian berjumlah 25 siswa. Instrumen penelitian berupa tes pilihan ganda sebanyak 20 soal yang telah memenuhi uji validitas dan reliabilitas dengan nilai Cronbach's Alpha sebesar 0,898 (sangat tinggi). Analisis data menggunakan uji paired sample t-test dan uji N-Gain. Hasil penelitian menunjukkan nilai rata-rata pretest sebesar 30,80 meningkat menjadi 82,80 pada posttest. Nilai t hitung sebesar 49,960 lebih besar dari t tabel 2,064 dengan signifikansi $0,000 < 0,05$. Nilai N-Gain sebesar 0,76 termasuk kategori tinggi. Dengan demikian, model Discovery Learning berpengaruh signifikan dan efektif dalam meningkatkan hasil belajar Matematika siswa.

Kata Kunci: Discovery Learning, Hasil Belajar, Matematika

ABSTRACT

This study aims to determine the effect of the Discovery Learning model on the Mathematics learning outcomes of fifth-grade students of UPTD SD Negeri 122345 Pematangsiantar. This study uses a quantitative approach with an experimental method and a One-Group Pretest-Posttest Design. The research sample consisted of 25 students. The research instrument was a multiple-choice test of 20 questions that had met the validity and reliability tests with a Cronbach's Alpha value of 0.898 (very high). Data analysis used paired sample t-test and N-Gain test. The results showed that the average pretest score of 30.80 increased to 82.80 in the posttest. The calculated t-value of 49.960 was greater than the t-table of 2.064 with a significance of $0.000 < 0.05$. The N-Gain value of 0.76 was included in the high category. Thus, the Discovery Learning model had a significant and effective effect in improving students' Mathematics learning outcomes.

Keyword: Discovery Learning, Learning Outcomes, Mathematics

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Corresponding Author:

Irawaty Mei Delila Damanik
Universitas HKBP Nomensen Pematangsiantar, Indonesia

1. INTRODUCTION

Education is a conscious and planned effort to create active learning, so that students can develop their potential, acquire skills, intelligence, noble morals, good personality, self-control, and religious spiritual strength that are beneficial to themselves and society. Therefore, the government in Indonesia makes various efforts to advance education that creates a quality next generation of the nation. In accordance with Law Number 20 of 2003 concerning the National Education System Article 3, national education aims to develop the potential of students to become people who believe in and fear God Almighty, have noble morals, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. Education is one of the important components that influence the development and construction of a nation. Education plays a very strategic role in efforts to improve the quality of human resources (Supriyanto, 2014).

Through the educational process, students are expected to develop their full potential, across the cognitive, affective, and psychomotor domains. Furthermore, education serves to equip students with logical, critical, and creative thinking skills, as well as the skills to solve various problems encountered in everyday life (Sinaga, Fadhilaturrahmi, Ananda, & Ricky, 2022).

Education is the most important component of daily life. It plays a significant role and function in human life, encompassing cognitive, affective (attitude), and psychomotor aspects. Therefore, it is imperative for humans to experience this process and to recognize it as a force that can propel humanity towards the advancement of civilization (Simamora, Saragih, & Hasratuddin, 2022).

Learning outcomes are the culmination of student learning success towards predetermined learning objectives. Student learning outcomes can include cognitive (knowledge), affective (attitude), and psychomotor (behavior) aspects. This is in accordance with Bettencourt's opinion, who wrote that, "Learning outcomes are influenced by students' experiences with the physical world and their environment." A person's learning outcomes depend on what they already know; for example, concepts, goals, and motivations that influence interactions with the material being studied (Batubara, 2019). According to (Lestari, 2014), learning outcomes are the result of a person's learning process. Learning outcomes are related to changes in the person who is learning. The form of change as a result of learning is in the form of changes in knowledge, understanding, attitudes and behavior, skills and abilities.

Changes in the sense of changes caused by growth are not considered learning outcomes. Changes as a result of learning are relatively permanent and have the potential to develop.

Based on the above opinion, the author can conclude that learning outcomes can be interpreted as a reflection of the level of student success after participating in the learning process, as demonstrated by changes in knowledge, attitudes, and skills. Learning outcomes are not only related to mastery of the subject matter but also reflect the development of students' attitudes and abilities as a result of the learning experiences they have undergone.

Furthermore, learning outcomes demonstrate changes that tend to be permanent and can develop within students. These changes include increased understanding, the development of better attitudes, and the refinement of skills. Therefore, learning outcomes are not solely measured by grades earned, but also by the overall process of change occurring within students (Jaya, Auliah, & Hardin, n.d.).

Several efforts can be made to improve student learning outcomes, including implementing varied and innovative learning strategies, providing encouragement or motivation to learn, and creating a comfortable and supportive learning environment. Furthermore, using appropriate learning media, conducting ongoing assessments, and providing constructive feedback are also crucial for students to continuously improve and develop their learning abilities (Zubainur, Jannah, Syahjuzar, & Veloo, 2020).

Furthermore, the results of the research that has been carried out by (Sipayung, 2024) The population of this study was all fifth grade students with a total of 23 students. The data collection technique used in this study was a multiple-choice test (pretest and posttest). The results of the analysis of fifth grade student learning outcomes data obtained an average pretest score of 50.35 and student learning outcomes data increased with an average posttest score of 81.91. The results of this study were strengthened by the results of the t-test which showed that the average value of the t-test (t count) was 10.724. So it can be concluded that variable X (Guided Discovery Learning Model) has a significant effect on variable Y (Student Learning Outcomes) (Ujud, Nur, Yusuf, Saibi, & Ramli, 2023).

In Mathematics learning, students have difficulty absorbing the material being taught. To anticipate this, mathematics learning begins with an introduction to problems that are relevant to everyday life situations. Mathematics is a basic subject taught from elementary school and is the foundation for the development of science and technology (Hendrayani, Sutresna, & Rusyana, 2021). Mathematics learning aims to familiarize students with understanding concepts, using reasoning appropriately, and solving problems systematically. In grade V of elementary school, one of the important materials studied is the Least Common Multiple (LCM) and the Greatest Common Factor (GCF) (Saputra, Sudargo, & Endahwuri, 2021). This material requires a good understanding of concepts, logical thinking skills, and accuracy in determining factors and multiples of a number. However, in practice, the material on Multiples and Factors is often considered difficult by students because it is abstract and requires sequential stages of thinking. This condition causes some students to be unable to fully understand the concept of Multiples and Factors, which has an impact on low Mathematics learning outcomes (Ervian, 2002).

Based on initial observations in class V of the UPTD of SD Negeri 122345 Pematang Siantar, it was found that students' Mathematics learning outcomes have not yet reached optimal results. Some students have difficulty understanding the Mathematics concepts being taught. The ongoing learning process still tends to be teacher-centered, where the teacher is more dominant in delivering the material, while students only play the role of listeners and note-takers (Rusinta, Hambali, & Winarni, 2019). This situation causes students to be less active, less directly involved in the learning process, and easily feel bored, so that the understanding of the concepts obtained is less in-depth (Subagio, Karnasih, & Irvan, 2021).

Based on initial observations conducted by researchers in class V of the UPTD of SD Negeri 122345 Pematang Siantar, several problems related to students' mathematics learning outcomes were identified. An overview of these learning outcomes is presented in Table 1.1 below.

Table 1. Data on Grade V Grade Results of Elementary School 122345 Pematangsiantar for the 2026 Academic Year

KKTP	Value	Many Student	Percentage	Completeness
70	>70	12	36%	Complate
	<70	21	64%	Incomplate
Total		33	100%	

(Source: SD Negeri 122345 Pematangsiantar)

Table 1. above shows that the completeness of student learning outcomes can be seen based on the established Learning Objective Achievement Criteria (KKTP). The KKTP for Mathematics at the UPTD SD Negeri 122345 Jl. Thamrin Pematangsiantar is 70.

The results of the daily tests of fifth-grade students show that out of 33 students, 12 students have achieved the KKTP, while 21 students have not achieved the KKTP. Thus, it can be concluded that the learning outcomes of fifth-grade students at the UPTD of State Elementary School 122345 Jl. Thamrin Pematangsiantar are still relatively low, so improvements are needed in the learning process (Tarigan, 2022).

In Mathematics learning, students have difficulty absorbing the material being taught. To anticipate this, Mathematics learning begins with an introduction to problems that are relevant to everyday life situations (Hartini, 2021). Mathematics is a basic subject taught from elementary school level and is the foundation for the development of science and technology (Isnawati, 2021). Mathematics learning aims to familiarize students with understanding concepts, using reasoning appropriately, and solving problems systematically. In grade V of elementary school, one of the important materials studied is the Least Common Multiple (LCM) and the Greatest Common Factor (GCF). This material requires a good understanding of concepts, logical thinking skills, and accuracy in determining factors and multiples of a number. However, in practice, Multiples and Factors material is often considered difficult by students because it is abstract and requires sequential stages of thinking (Rusinta et al., 2019). This condition causes some students to be unable to fully understand the concept of Multiples and Factors, which has an impact on low Mathematics learning outcomes (Prasetyo & Kristin, 2020).

These problems indicate the need for the implementation of learning models that can actively involve students in learning activities. One learning model that is considered appropriate to overcome these problems is the Discovery Learning model. The Discovery Learning model emphasizes the active involvement of students in discovering learning concepts or principles themselves through activities such as observing, asking questions, collecting data, processing information, and drawing conclusions (Thalib, Rusli, & Syarifatunnisa, 2022). Thus, students do not only receive information passively, but also build their knowledge based on direct learning experiences (Lase, 2020). The application of the Discovery Learning model in Mathematics learning is expected to create a more active, creative, and enjoyable learning atmosphere. Through the discovery process, students are expected to be able to understand Mathematics concepts more deeply and meaningfully so that learning outcomes can be improved. In addition, this model can also train critical thinking skills and foster students' curiosity. Based on this description, the researcher is interested in conducting a study entitled "The Effect of the Discovery Learning Model on Mathematics Learning Outcomes of Grade V Students of the UPTD of SD Negeri 122345 Pematangsiantar."

2. METHOD

The type of research used in this study is quantitative research using experimental methods. According to (Azizah & Fajeriah, 2021) quantitative research methods are research methods based on the philosophy of positivism used to research certain populations and samples, sampling techniques are generally carried out randomly, data collection uses instruments in research, data analysis is quantitative/statistical with the aim of testing predetermined hypotheses (Wahyuddin & Nurcahaya, 2018).

This quantitative research type was chosen because it aims to determine the effect of the Discovery Learning model on students' mathematics learning outcomes, which can be objectively measured through pretest and posttest scores (Rachma & Winanto, 2024). By using a quantitative approach, researchers can analyze data statistically, making the results more measurable and systematic, and can be used to test the formulated hypotheses (Sihombing, Silalahi, Sitingjak, & Tambunan, 2021). The population in this study was all fifth grade students of UPTD SD Negeri 122345 Pematangsiantar, which consisted of 1 class with 33 students (A Marbun, Sitepu, & Juliana, 2021).

In this study, the dependent variable is the Mathematics learning outcomes of fifth-grade students of UPTD SD Negeri 122345 Pematangsiantar. Learning outcomes are the abilities possessed by students after completing the learning process using the Discovery Learning model. In this study, the indicators measured are students' abilities in recognizing the concepts of factors and multiples, determining prime factorization, and their ability to solve contextual problems related to LCM and GCF. In addition, the indicator measured is students' accuracy in solving calculation problems related to LCM and GCF correctly and precisely (Simangunsong & Pane, 2021). These learning outcomes are shown through scores or grades obtained by students after taking the evaluation or final test at the end of the meeting.

3. RESULTS AND DISCUSSION

The instrument trial was conducted at SD Negeri 091288 Sibaganding, Panei District, Simalungun Regency, North Sumatra (Umar & Pamuti, 2022). The trial was conducted from April 20-25, 2026. Data from the trial were then processed to determine validity, reliability, difficulty level, and discriminatory power. The data from the trial w Validity test results are a measure of how valid an instrument is. Validity is carried out to determine valid test items so they can be used in research. To test the instrument, researchers used the SPSS 26 program (Tarigan, 2021).

The items are considered valid if $r_{hitung} > r_{tabel}$ with a significance level of 0.05. The data used to find the results of the research instrument trial, which consisted of 40 multiple-choice questions. The results of the question analysis can be seen in the following table:ere analyzed using Microsoft Excel and SPSS 26.

Tabel 1. Uji Validitas

No Soal	r_{hitung}	r_{tabel}	Keterangan
1	0,286	0,396	Tidak Valid
2	0,427	0,396	Valid
3	0,358	0,396	Tidak Valid
4	0,590	0,396	Valid
5	0,349	0,396	Tidak Valid
6	0,719	0,396	Valid
7	0,347	0,396	Tidak Valid
8	0,515	0,396	Valid
9	0,443	0,396	Valid
10	0,506	0,396	Valid
11	0,721	0,396	Valid
12	0,520	0,396	Valid
13	0,504	0,396	Valid
14	0,774	0,396	Valid
15	0,352	0,396	Tidak Valid
16	0,524	0,396	Valid
17	0,343	0,396	Tidak Valid
18	0,626	0,396	Valid
19	0,575	0,396	Valid
20	0,550	0,396	Valid
21	0,434	0,396	Valid
22	0,707	0,396	Valid
23	0,52	0,396	Valid
24	0,333	0,396	Tidak Valid
25	0,695	0,396	Valid
26	0,637	0,396	Valid
27	0,644	0,396	Valid
28	0,755	0,396	Valid
29	0,602	0,396	Valid
30	0,689	0,396	Valid
31	0,582	0,396	Valid
32	0,404	0,396	Valid
33	0,575	0,396	Valid
34	0,409	0,396	Valid

No Soal	r_{hitung}	r_{tabel}	Keterangan
35	0,260	0,396	Tidak Valid
36	0,085	0,396	Tidak Valid
37	0,370	0,396	Tidak Valid
38	0,207	0,396	Tidak Valid
39	0,226	0,396	Tidak Valid
40	0,304	0,396	Tidak Valid

Based on Table above, the Validity Test Results can be concluded that out of 40 questions, 27 were valid and 13 were invalid. Valid questions can be used for subsequent tests (Sari, Yensy, & Maizora, 2019).

Reliability testing measures the reliability of the research instrument, indicating its reliability as a data collection tool. In this study, the researchers used the Cronbach's Alpha formula and SPSS 26 software (Fauziah & Puspitasari, 2022). The criteria are that if the Cronbach's Alpha value is >0.60 , the data is considered reliable. If the Cronbach's Alpha value is <0.60 , the data is considered unreliable (Lestari, 2019).

Table 2. Reliability Test Results

Reliability Statistics	
Cronbach's Alpha	N Of Items
.898	20

Based on the table above, the Cronbach's Alpha value was 0.898. Because this value is greater than 0.60, the instrument is considered highly reliable.

The item difficulty level test is used to test which questions fall into the difficult, medium and easy categories. Based on the results of the analysis, there were instruments that had been tested, and 27 questions were declared valid. Researchers chose 20 questions to be used in the research. The next level of difficulty analyzed can be seen in the following table:

Tabel 3. Uji Tingkat Kesukaran

No Soal	Tingkat Kesukaran	Keterangan
2	0,92	Mudah
4	0,24	Sukar
6	0,36	Sedang
8	0,88	Mudah
9	0,49	Sedang
10	0,32	Sedang
12	0,40	Sedang
13	0,48	Sedang
14	0,64	Sedang
16	0,28	Sukar
18	0,40	Sedang
20	0,76	Mudah
22	0,28	Sukar
23	0,36	Sedang

No Soal	Tingkat Kesukaran	Keterangan
26	0,72	Mudah
28	0,36	Sedang
29	0,64	Sedang
32	0,40	Sedang
33	0,52	Sedang
34	0,44	Sedang

Based on Table, it is known that there are 4 questions that have easy criteria, 13 questions that have medium criteria and 3 questions that have difficult criteria (Ayu, Ardianti, & Wanabuliandari, 2021).

4. CONCLUSION

Based on the research results and data obtained, the researcher can conclude that the use of the Discovery Learning learning model in Mathematics subjects has an effect on the learning outcomes of fifth-grade students of UPTD SD Negeri 122345 Pematangsiantar. This is evidenced by the results of the hypothesis test using a paired t-test which shows a $t_{(count)}$ value of 49.960 greater than the t_{table} of 2.064 and a significance value of $0.000 < 0.05$. From these results it can be seen that H_0 is rejected and H_a is accepted. In addition, the results of the N-Gain test of 0.76 are included in the high category, which indicates that the Discovery Learning model is effective in improving student learning outcomes. Thus, it can be concluded that the use of the Discovery Learning model is able to significantly improve students' Mathematics learning outcomes.

ACKNOWLEDGMENT

Based on the findings related to the research results, namely the influence of the Discovery Learning model on student learning outcomes in Mathematics, the following recommendations are made:

- Future researchers are expected to develop the use of the Discovery Learning model in other subjects to further improve student learning outcomes.
- Students are expected to be more active in participating in the learning process, focused during learning, and directly involved in discovering concepts to improve their understanding of the material.
- Educators are expected to use the Discovery Learning model as an alternative learning method in the learning process and actively involve students to improve student understanding and learning outcomes.

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