Unveiling the Power of Discovery Learning: Boosting Students' Mathematical Understanding and Confidence

Nur Hanipah[1*], Nia Kania[2]
[1*,2]Department of Mathematics Education, University of Majalengka, West Java, Indonesia
*hanipahnur22@gmail.com

DOI: https://doi.org/10.31980/pme.v2i3.1524

Submission Track:
Received: 09-09-2023 | Final Revision: 03-10-2023 | Available Online: 30-10-2023

How to Cite:
Hanipah, N., & Kania, N. (2023). Unveiling the Power of Discovery Learning: Boosting Students' Mathematical Understanding and Confidence. *Jurnal Inovasi Pembelajaran Matematika: PowerMathEdu (PME)*, *2*(3), 281-288.

Abstract
In education, it is stated that students' mathematical comprehension skills and self-efficacy are still lacking. As a result, there needs to be a change in the classroom instruction process. The first step in this process is to use model discovery learning. This study aims to determine how model discovery learning affects students' self-efficacy and comprehension of mathematical ideas. A systematic literature review is the term used to describe this kind of study (SLR). To acquire data for this study, several research publications were gathered from Google Scholar; sixteen articles were employed. Among the many activities that researchers perform include finding, confirming, evaluating, and summarising all of the currently available research. The conclusion of this study shows that the discovery learning model affects students' self-efficacy and mathematical concept understanding ability because it can make learning activities in the classroom active.
Keywords: Mathematical Concept Understanding; Model Discovery Learning; Self-Efficacy

Abstrak
Dalam bidang pendidikan, dinyatakan bahwa kemampuan pemahaman matematis dan self-efficacy siswa masih kurang. Oleh karena itu, perlu adanya perubahan dalam proses pembelajaran di kelas. Langkah pertama dalam proses ini adalah dengan menggunakan model discovery learning. Tujuan dari penelitian ini adalah untuk mengetahui bagaimana model discovery learning mempengaruhi self-efficacy dan pemahaman siswa terhadap ide-ide matematika. Tinjauan literatur sistematis adalah istilah yang digunakan untuk menggambarkan jenis penelitian ini (SLR). Untuk memperoleh data untuk penelitian ini, sejumlah publikasi penelitian dikumpulkan dari Google Scholar; total ada enam belas artikel yang digunakan. Di antara banyak kegiatan yang dilakukan para peneliti adalah menemukan, mengkonfirmasi, mengevaluasi, dan merangkum semua penelitian yang saat ini tersedia. Kesimpulan dari penelitian ini menunjukkan bahwa model discovery learning berpengaruh terhadap self-efficacy dan kemampuan pemahaman konsep matematis siswa karena dapat membuat kegiatan pembelajaran di kelas menjadi aktif.
Kata Kunci: Kemampuan Pemahaman Konsep Matematis; Model Discovery Learning; Self-Efficacy

Introduction

Mathematics is a subject taught at all educational levels (Kanah & Mardiani, 2022). Because mathematics is increasingly used daily, learning the subject helps enhance cognitive ability (Salma & Sumartini, 2022). According to the Badan Standar Nasional Pendidikan (BSNP), proficiency in mathematical concepts, their linkages, and their application are among the objectives of mathematics education. Thus, Understanding mathematical concepts is one of the most crucial abilities pupils need to acquire.

According to Dazrullisa & Mahdi (2020) the capacity of pupils to comprehend mathematical ideas in their mother tongue to solve problems is known as mathematical comprehension. According to Sya'adah & Samsudin (2022) Understanding the concept can improve confidence and provide a straightforward way to solve problems. As a result, it can be concluded that the ability to understand a mathematical idea is the ability of a student to apply a concept previously understood with their definition to solve a problem (Tayibu & Faizah, 2021).

Research indicates that Indonesian pupils' comprehension of mathematical ideas is still relatively poor. The findings of a study by Nasution & Dewi (2024), Indicated that pupils' comprehension of mathematical concepts falls into the low range. Based on students' responses, it can be inferred that they could not apply the concepts needed to solve the given problem, failed to convert the problem into mathematical symbols, and continued to make calculation mistakes (Istiqomah & Nurulhaq, 2021).

Students' poor comprehension of mathematical concepts results from the teacher's continued use of traditional lecture-based learning approaches. It is harder for kids to explore their ideas since they are less engaged in classroom learning. Such that kids' learning achievements could be improved. Internal variables also impact the attainment of ideal learning results (Silviana & Mardiani, 2021). A component of this is self-efficacy. Self-efficacy is the conviction that one can overcome obstacles (Fauziana, 2022). Meanwhile, according Samsuddin & Retnawati (2022) Claims that the ability to act in a way that guarantees the completion of a task is known as self-efficacy. Therefore, the belief that one can successfully do the tasks set to them can be defined as self-efficacy.

Students' challenges must be addressed, necessitating modifications to the educational process to help them gain self-efficacy and the capacity to comprehend mathematical ideas. The discovery learning model can be used to realise this. To ascertain students' comprehension of the subject matter, elucidated that the discovery learning model can boost student engagement and motivation for learning. Furthermore, because the learning process allows students to apply critical thinking abilities to investigate the concepts offered in problem-solving, the discovery learning model can help boost students' self-efficacy (Sumini et al., 2019). After providing the description above, the researcher will evaluate the existing literature. This study examines how the discovery

learning paradigm affects students' self-efficacy and capacity to understand mathematical concepts.

Method

This study employed the systematic literature review (SLR) method. Researchers perform many tasks, including finding, reviewing, assessing, and interpreting all existing research. By following the instructions provided, researchers can use this strategy to review and locate articles in an organized way (Triandini et al., 2019). Researchers used journal papers from the Google Scholar database. When looking for sources, they used the terms "self-efficacy," "mathematical concept understanding ability," and "discovery learning model." They used articles published between 2019 and 2024.

Result

Following data analysis of the gathered articles, researchers obtained ten journal papers regarding the impact of the discovery learning model on the comprehension of mathematical ideas, as shown in Table 1.

Table 1. Article Discovery Learning Model Effects on Math Concept Understanding

Researcher & Year	Journal	Research Results
(Trianingsih et al., 2019)	VARIABEL	The study's findings demonstrate that the discovery learning paradigm impacts students' capacity to comprehend mathematical concepts. By making discoveries, students can deepen their understanding through active classroom activities that follow the discovery learning model. The number of student learning activities also rose at the first and second meetings.
(Annisa et al., 2023)	Jurnal Ilmiah Matematika Realistik (JI-MR)	The study shows that applying the discovery learning paradigm increases students' comprehension of mathematical ideas. The pretest results show an average of 53.81, and the posttest results show an average of 77.81, demonstrating this.
(Hayati et al., 2022)	Jurnal Pendidikan Matematika Malikussaleh	The study's findings suggest that the discovery learning approach impacts the mathematical concept capacity of SMP Negeri 2 Bireuen's class IX pupils. This is demonstrated by the fact that, while employing the discovery learning model, the experimental class's posttest average result outperformed the control class's using the traditional learning model.
(Rahmadhani & Yerizon, 2020)	Jurnal Edukasi dan Penelitian Matematika	According to the study's findings, students actively participate in the learning process to enhance their comprehension of mathematical ideas through the steps of the discovery learning model.
(Surur & Oktavia,	Jurnal Pendidikan	The study's findings suggest that the discovery

Researcher & Year	Journal	Research Results
2019)	Edutama	learning paradigm is a better fit for teaching mathematics. This is because the discovery learning approach encourages students to participate and advance their knowledge.
(Nur Sya'adah & Samsudin, 2022)	Didaktik : Jurnal Ilmiah PGSD FKIP Universitas Mandiri	The study suggests the discovery learning model can enhance students' comprehension of division-related mathematical ideas.
(Razi & Mirunnisa, 2019)	AKSIOMA : Jurnal Program Studi Pendidikan Matematika	The study's findings show that students are highly motivated and eager to engage in the learning process while utilising the discovery learning paradigm with the help of Maple software. As a result, the pupils' capacity to comprehend mathematical concepts increased.
(Manalu et al., 2023)	Jurnal Pendidikan dan Konseling	The study's findings suggest that the discovery learning paradigm impacts comprehension of mathematical ideas. Students are more engaged in group discussions while learning new concepts.
(Dazrullisa & T. Chairul Mahdi, 2020)	Jurnal Numeracy	The study's findings show that 80% of students respond favourably to the application of the discovery learning paradigm in their understanding of mathematical ideas.
(M. Safitri et al., 2024)	Jurnal Riset Pembelajaran Matematika	The study's findings demonstrate how, with instructor direction and assistance, children become proactive and autonomous learners when the discovery learning paradigm obtains information about the subject matter.

Table 1's compilation of the ten prior journal papers suggests that applying the discovery learning model in learning enhances students' capacity to comprehend mathematical concepts. Students actively participate in the learning process by individually exploring concepts to expand their knowledge. Consequently, the discovery learning paradigm is one of the options available to educators to enhance their students' comprehension of mathematical ideas.

Additionally, the researchers found six academic publications about the impact of the discovery learning paradigm on self-efficacy, which are shown in Table 2.

Table 2. Article Self-Efficacy and the Discovery Learning Model's Impact

Researcher & Year	Journal	Research Results
(Razi & Mirunnisa, 2021)	Prosiding : Seminar Nasional Multi Disiplin Ilmu	The study's findings show that students who use the discovery learning model with Maple software have higher levels of self-efficacy than students who use traditional learning models.
(Febriana et al., 2023)	AlphaMath: Journal of Mathematics Education	The findings of this study demonstrate that the discovery learning model can raise students' self-efficacy when they actively search for mathematical concepts during the learning process.
(Hafni et al., 2021)	Jurnal Cendekia : Jurnal Pendidikan Matematika	The study's findings show that using the discovery learning paradigm raised students' self-efficacy from 68.75% to 87.50%.

Researcher & Year	Journal	Research Results
(Zakiah & Fitria, 2023)	Jurnal Inovasi Pendidikan dan Pembelajaran Sekolah Dasar	According to the study's findings, students who employ the discovery learning paradigm have a 77.6% influence on their self-efficacy, which means that these students will also achieve excellent learning outcomes.
(Prasetya, 2022)	JSIM : Jurnal Ilmu Sosial dan Pendidikan	The study's findings show that students' self-efficacy increased after using the discovery learning paradigm. Pupils are confident in their capacity to finish the assignment successfully.
(Sumini et al., 2019)	JP3D (Jurnal Pembelajaran dan Pengajaran Pendidikan Dasar)	The study's findings demonstrated that students' self-efficacy increased when the discovery learning paradigm was used in cycle III. Research indicates that pupils are motivated to work on challenging assignments.

Table 2 summarises six prior published studies that support the claim that the discovery learning paradigm can raise students' self-efficacy. During the learning process of the discovery learning model, students actively participate in discovering mathematical concepts. Pupils with strong self-efficacy typically keep going and complete the assignment successfully. As a result, learners with high levels of self-efficacy will also achieve high learning results.

Discussion

The independent curriculum aims to create an enjoyable education and develop students' potential. To achieve these goals, teachers and students must work together to create effective learning. Therefore, teachers must innovate to develop students' cognitive abilities. To learn mathematics, understanding mathematical concepts is one of the mental skills that pupils must acquire.

The foundation of mathematical comprehension is the capacity to comprehend and articulate ideas in one's language. Students can answer issues more quickly if they grasp the subject. Additionally, to learn as much as possible, students need to feel confident in their abilities, known as self-efficacy. Self-efficacy is the conviction that one can do the task at hand. As a result, self-efficacy and conceptual understanding of mathematics need to be enhanced. The exploration learning approach is one of the things that educators can undertake.

Because every student participates in the learning process, the discovery learning model transforms passive learning into active learning. Students follow the teacher's guidance and engage in discovery-based learning to acquire knowledge. The teacher merely assists, directs, and guides the students during the discovery process. As a result, children will have more self-assurance in their skills and be able to comprehend the information they have learned via discovery. As a result, the discovery learning paradigm influences how well students understand mathematical concepts and how confident they feel in their abilities.

Conclusion

According to the findings and discussion, the discovery learning model is one of the learning models that can be used to teach mathematics. The discovery learning paradigm encourages students to participate actively in their education, which impacts their capacity to comprehend mathematical ideas and their sense of self-efficacy.

Reference

Annisa, S. A., Ainy, F. N., Adelia, V. A., Annisa, I., & Ermawati, D. (2023). Pengaruh model discovery learning terhadap peningkatan pemahaman konsep matematis siswa kelas iii sekolah dasar. *Jurnal Ilmiah Matematika Realistik, 4*(2), 227–232.

Dazrullisa & T. Chairul Mahdi. (2020). Pengaruh penggunaan model pembelajaran discovery learning terhadap pemahaman konsep matematis siswa dengan menggunakan geometric sketcpad. *Numeracy*, *7*(1), 1–19. https://doi.org/10.46244/numeracy.v7i1.995

Fauziana. (2022). Pengaruh self efficacy terhadap kemampuan memecahkan masalah ipa. *PIONIR: Jurnal Pendidikan*, *11*(1), 151–162.

Febriana, R., Putri, P. O., & Delyana, H. (2023). The Effect of Model Discovery Learning on Students' Self-Efficacy and Student Learning Outcomes. *AlphaMath : Journal of Mathematics Education*, *9*(2), 119. https://doi.org/10.30595/alphamath.v9i2.19498

Hafni, M., Syahputra, E., & Khairani, N. (2021). Development of Interactive Learning Based Discovery Learning to Improve Mathematic Representation and Self-Efficacy Abilities of MAN 1 Medan Students. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *5*(2), 1201–1213. https://doi.org/10.31004/cendekia.v5i2.575

Hayati, K., Muhammad, I., & Isfayani, E. (2022). Pengaruh model pembelajaran discovery learning terhadap kemampuan pemahaman konsep matematis siswa pada materi persamaan kuadrat kelas ix smp negeri 2 bireuen. *Jurnal Pendidikan Matematika Malikussaleh*, *2*(1), 219. https://doi.org/10.29103/jpmm.v2i1.7461

Istiqomah, Q., & Nurulhaq, C. (2021). Perbandingan Kemampuan Koneksi Matematis Siswa antara Model Pembelajaran Discovery Learning dan Ekspositori. *Plusminus: Jurnal Pendidikan Matematika*, *1*(1), 135-144.

Kanah, I., & Mardiani, D. (2022). Kemampuan Komunikasi dan Kemandirian Belajar Siswa Melalui Problem Based Learning dan Discovery Learning. *Plusminus: Jurnal Pendidikan Matematika*, *2*(2), 255-264.

Manalu, B. M., Siahaan, T. M., & Novatrasio, G. (2023). Pengaruh Model Pembelajaran Discovery Learning Terhadap Kemampuan Memahami Konsep Matematika Siswa Kelas VIII SMP. *Jurnal Pendidikan dan Konseling*, *5*, 1780–1787.

Nasution, M. A., & Dewi, I. (2024). *Pengaruh Model Discovery Learning Berbantuan Geogebra terhadap Kemampuan Pemahaman Konsep Matematis Siswa di SMP Negeri 3 Tanjung Morawa*. *Journal on Education*, *06*(02).

Nur Sya'adah, A., & Samsudin, A. (2022). Penggunaan model discovery learning untuk meningkatkan kemampuan pemahaman konsep pembagian siswa sekolah dasar. *Didaktik : Jurnal Ilmiah PGSD STKIP Subang*, *8*(2), 2241–2250. https://doi.org/10.36989/didaktik.v8i2.519

Prasetya, A. E. (2022). Desain Pembelajaran Berbasis Discovery Learning untuk Meningkatkan Self Efficacy Siswa Sekolah Dasar. *JURNAL SYNTAX IMPERATIF : Jurnal Ilmu Sosial dan Pendidikan*, *3*(3), 218. https://doi.org/10.36418/syntax-imperatif.v3i3.170

Rahmadhani, A. T., & Yerizon. (2020). Pengaruh penerapan model discovery learning terhadap pemahaman konsep matematika peserta didik kelas xi ipa sma negeri 3 padang. *Jurnal Edukasi dan Penelitian Matematika*, *9*(3), 11–16.

Razi, Z., & Mirunnisa, M. (2019). Penerapan model discovery learning berbantuan software maple untuk meningkatkan kemampuan pemahaman matematis. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *8*(3). https://doi.org/10.24127/ajpm.v8i3.2423

Razi, Z., & Mirunnisa, M. (2021). Penerapan model discovery learning berbantuan software maple untuk meningkatkan self efficacy mahasiswa. *PROSIDING : Seminar Nasional Multidisiplin Ilmu*.

Safitri, M., Rahmi, & Aima, Z. (2024). Penerapan Model Discovery Learning Terhadap Kemampuan Pemahaman Konsep Matematis Siswa Kelas XI SMA PGRI 2 Padang. *Jurnal Riset Pembelajaran Matematika*, *6*(1), 55–62. https://doi.org/10.55719/jrpm.v6i1.1113

Safitri, S., Wahab, A. J., Nurazmi, & Rini. (2023). *Penerapan model pembelajaran discovery learning dalam meningkatkan hasil belajar matematika siswa kelas x agrobisnis upt smk negeri 7 pangkep*. *Jurnal Guru Pencerah Semesta, 1*(4).

Salma, F. A., & Sumartini, T. S. (2022). Kemampuan Representasi Matematis Siswa antara yang Mendapatkan Pembelajaran Contextual Teaching and Learning dan Discovery Learning. *Plusminus: Jurnal Pendidikan Matematika*, *2*(2), 265-274.

Samsuddin, A. F. & Heri Retnawati. (2022). Self-efficacy Siswa dalam Pembelajaran Matematika. *Buana Matematika : Jurnal Ilmiah Matematika dan Pendidikan Matematika*, *12*(1), 17–26. https://doi.org/10.36456/buanamatematika.v12i1.5521

Silviana, D., & Mardiani, D. (2021). Perbandingan kemampuan pemahaman matematis siswa melalui mood-understand-recall-digest-expand-review dan discovery learning. *Plusminus: Jurnal Pendidikan Matematika*, *1*(2), 291-302.

Sumini, Winarni, E. W., & Koto, I. (2019). Penerapan Discovery Learning untuk Meningkatkan Efikasi Diri dan HOTS pada Tema Daerah Tempat Tinggalku Siswa

Kelas IV A MIN 1 Kota Bengkulu. *JP3D (Jurnal Pembelajaran dan Pengajaran Pendidikan Dasar)*, *2*(2), 159–168.

Surur, M., & Oktavia, S. T. (2019). Pengaruh model pembelajaran discovery learning terhadap pemahaman konsep matematika. *Jurnal Pendidikan Edutama*, *6*(1), 11. https://doi.org/10.30734/jpe.v6i1.341

Tayibu, N. Q., & Faizah, A. N. (2021). Efektivitas Pembelajaran Matematika melalui Metode Penemuan Terbimbing Setting Kooperatif. *Mosharafa: Jurnal Pendidikan Matematika*, *10*(1), 117-128.

Triandini, E., Jayanatha, S., Indrawan, A., Werla Putra, G., & Iswara, B. (2019). Metode Systematic Literature Review untuk Identifikasi Platform dan Metode Pengembangan Sistem Informasi di Indonesia. *Indonesian Journal of Information Systems*, *1*(2), 63. https://doi.org/10.24002/ijis.v1i2.1916

Trianingsih, A., Husna, N., & Prihatiningtyas, N. C. (2019). Pengaruh Model Discovery Learning terhadap Pemahaman Konsep Matematis Siswa pada Materi Persamaan Lingkaran di Kelas XI IPA. *Variabel*, *2*(1), 1. https://doi.org/10.26737/var.v2i1.1026

Zakiah, Z., & Fitria, Y. (2023). Pencapaian Ranah Afektif Self-Efficacy Peserta Didik Sekolah Dasar pada Implementasi Model Pembelajaran Discovery Learning. *Jurnal Inovasi Pendidikan dan Pembelajaran Sekolah Dasar*, *7*(1), 50. https://doi.org/10.24036/jippsd.v7i1.121674

Author Biography

Nur Hanipah
Born in Majalengka, on February 15, 2002. Undergraduate student of Mathematics Education, Majalengka University in 2020 - present.

Nia Kania, M.Pd.
She commenced his teaching career in 2013 at Universitas Majalengka, West Java, Indonesia. The primary areas of his research are mathematical education, higher-order cognitive skills in education, and assessment and quantification. To reach her, please use the following email addresses: niakania@unma.ac.id