M A T H L I N E
JURNAL MATEMATIKA DAN PENDIDIKAN MATEMATIKA
ISSN 2502-5872 (Print)
ISSN 2622-3627 (Elektronik)

This is an open access article under the CC BY-SA license

Volume 11 Number 4, November 2026, 963-974

PADLET-ASSISTED DISCOVERY LEARNING: UNDERSTANDING MATHEMATICAL CONCEPTS IN THE PYTHAGOREAN THEOREM

Gnadia R. N. Jaki[1*], Karyati[2]
[1,2] Department of Mathematics Education, Universitas Negeri Yogyakarta, DI Yogyakarta, Indonesia

*Correspondence: gnadia0052fmipa.2024@student.uny.ac.id

Received 10 August 2026; Revised 2 September 2026; Accepted 15 September 2026

ABSTRACT

This study aims to determine improvements in students' mathematical conceptual understanding and to evaluate the effectiveness of the discovery learning model aided by Padlet media in teaching the Pythagorean Theorem. The study employed a quantitative approach using a one-group pretest–posttest pre-experimental design. The research sample consisted of 34 eighth-grade students at a public junior high school in Yogyakarta, selected through purposive sampling; 27 students with complete pretest and posttest data pairs were analyzed in this study. The research instrument was a test of mathematical conceptual understanding. Data were analyzed descriptively and inferentially using a paired-samples t-test to determine the difference between pretest and posttest scores, as well as a one-sample t-test to test whether the posttest mean exceeded the minimum passing score (KKM). The results showed that the students' average score increased from 29.33 on the pretest to 70.81 on the posttest, with a Cohen's d effect size of 2.530, which falls into the very large category. A total of 44.4% of students achieved learning mastery based on the KKM of 75, and the results of the one-sample t-test indicated that the posttest average score had not yet exceeded the established KKM. Based on these findings, it is concluded that students' understanding of mathematical concepts improved following the implementation of discovery learning supported by Padlet media, but it does not yet meet the criteria for effectiveness based on classical learning mastery.

Keywords: Discovery Learning, Padlet, Mathematical Concept Understanding, Pythagorean Theorem.

How to Cite: Jaki, G. R. N & Karyati, K. (2026). Padlet-Assisted Discovery Learning: Understanding Mathematical Concepts in the Pythagorean Theorem. *Mathline: Jurnal Matematika dan Pendidikan Matematika, 11*(4), 963-974. http://doi.org/10.31943/mathline.v11i4.1222

PRELIMINARY

In modern life, mathematics plays a vital role because it helps people develop logical, critical, and systematic ways of thinking. This logical and critical thinking is closely related to mathematical reasoning, which plays a vital role in helping students understand concepts, identify patterns, and solve problems effectively (Marjud et al., 2025). Through mathematics, one not only learns numbers and formulas but also learns to

understand and solve various problems in daily life as well as in the advancement of science and technology. The goal of mathematics education in school is to help students prepare for life's changes by thinking logically, rationally, and critically, as well as being able to apply mathematics in daily life and study various fields of science (Andriawan & Budiarto, 2014). Therefore, mathematics instruction should focus on the thinking process, which helps students understand concepts, connect knowledge, and apply it in relevant situations. An ideal learning process encourages students to discover connections between concepts on their own, reason logically, and develop higher-order thinking skills, with the teacher serving as a guide (Rahmadani et al., 2022). This is what is known as mathematical conceptual understanding—that is, a student's ability to grasp, apply, and connect mathematical ideas, rather than simply memorizing formulas.

However, mathematics instruction in the classroom is still often teacher-centered. Based on observations and interviews conducted at a public junior high school in Yogyakarta, teachers tend to provide examples and practice problems without encouraging students to explore their own ideas. As a result, many students tend to memorize formulas without truly understanding their origins. Students become passive in the learning process, unaccustomed to constructing their own thoughts, and increasingly difficult to guide in discovering concepts on their own. This cycle then becomes a poor culture of mathematics learning. This situation leads to low mathematical proficiency among students, particularly in their ability to understand mathematical concepts, which affects their ability to solve problems and connect one concept to another.

At the middle school level, according to Piaget, students are in a transitional phase from concrete to abstract thinking (Marinda, 2020). At this stage, students begin to grasp logical concepts but still require concrete objects, visualizations, or real-life situations to construct abstract ideas. These developmental characteristics make the ability to understand mathematical concepts a crucial foundation, enabling students to reason, comprehend relationships between concepts, and apply them in various contexts. However, data indicates that Indonesian students' mathematics achievement remains concerning. The 2022 PISA results recorded an average score of 366 points for Indonesia, far below the OECD average of 472 points, with only 18% of students reaching the minimum proficiency level (Kemendikbudristek, 2023). One reason for these low achievement levels is a weak understanding of mathematical concepts; students are able to follow the steps to solve problems but struggle when faced with problems in new forms, indicating a tendency to memorize procedures without understanding their meaning. This situation aligns with

the constructivist view that learning should encourage students to actively construct knowledge through discovery and exploration (Darmayanti et al., 2024). Discovery learning, as explained by Bruner's theory, operationalizes this constructivist principle through stages of problem identification, exploration, and conclusion drawing, while Padlet supports this process by providing a collaborative space for students to record, compare, and refine their ideas.

Several previous studies have also shown that students' understanding of mathematical concepts is relatively low. A study conducted at a public junior high school in the Special Region of Yogyakarta, based on an analysis of five indicators with a sample size of 32 students on the Pythagorean Theorem, found that 21.8% of students fell into the high category, 37.5% into the moderate category, and 40.62% into the low category. This distribution indicates that the majority of students are still in the moderate and low categories, suggesting that students' overall mathematical conceptual understanding remains low (Setiawan & Nuryadi, 2024). These findings are supported by research of Priyatna & Marsigit (2024) which, in the preliminary study phase, found that junior high school students' understanding of mathematical concepts in the Special Region of Yogyakarta (DIY) remains low, particularly in geometry, as evidenced by students' suboptimal average scores. Furthermore, the results of the DIY Regional Standardized Education Assessment (ASPD) for the 2024/2025 academic year also confirm that students' numeracy skills in this region still need to be improved (Putra, 2025). Overall, these data indicate that a lack of understanding of mathematical concepts is a consistent and significant issue among junior high school students in the Special Region of Yogyakarta, necessitating a systematic approach through the selection of appropriate instructional models and media.

Abstract concepts such as the Pythagorean Theorem require students to understand the relationships between the sides of a triangle and apply them in various contexts. Students with high prior knowledge can translate visual representations into mathematical forms and apply the concepts accurately, while students with low prior knowledge tend to struggle with determining the appropriate steps and procedures (Azizah et al., 2021). In addition, students with low motivation tend to merely repeat concepts without being able to apply them in different contexts (Kuba et al., 2023). This situation reflects a lack of conceptual understanding, which is influenced by the prevalence of teacher-centered learning approaches, one-way lectures, and repetitive exercises without contextual variation. Given this, there is a need for a learning model that actively guides students to

discover mathematical concepts on their own through exploration, so that the transition from concrete to abstract thinking can occur more effectively.

One learning model considered capable of meeting these needs is discovery learning. This model positions students as active participants who construct their own knowledge through a process of exploration, discovery, and reflection, rather than merely as recipients of information from the teacher. According to Hosnan (2014), discovery learning is a model for developing active learning methods through self-directed exploration and analysis, ensuring that the knowledge gained is retained. In line with this, Indah (2020) said that discovery learning emphasizes a process in which students independently discover new knowledge based on their prior experiences, without being directly provided with the final answer by the teacher. This model requires students' active engagement through a series of activities—including observation, data collection, information processing, verification, and drawing conclusions—so that students are expected not only to understand the meaning of concepts but also to develop their reasoning skills and curiosity about mathematical phenomena.

As technology advances, mathematics education can leverage innovative and interactive digital media. One such tool is Padlet, a web-based collaborative platform that allows students to write ideas, upload images, and respond to their peers' work directly within a single organized digital space. Padlet's main advantage lies in its ability to create a participatory and collaborative learning environment, while also serving as a hub for integrating various other learning media. In this study, Padlet was utilized as an integrated platform that incorporates GeoGebra—selected for its ability to visualize geometric concepts dynamically and interactively—and Lumio, an interactive tool that supports structured and engaging learning activities. However, the use of Padlet also has limitations, including a reliance on a stable internet connection and the need for an account to access full features. Previous research has shown that Padlet can enhance student engagement and understanding of mathematical concepts through spaces for reflection and interactive discussion (Aristianti et al., 2024; Maarif et al., 2024; Pratama & Nuryadi, 2022). When combined with the discovery learning model, Padlet serves as a platform for exploring and documenting conceptual discoveries, while also strengthening communication and interaction among students during the learning process.

Although various studies have examined the use of digital media in mathematics instruction based on discovery learning, most of these studies have only utilized a single medium in isolation and have not yet integrated multiple digital media into a single

integrated learning platform. Specifically, no study has been found that systematically integrates Padlet, GeoGebra, and Lumio within a discovery learning framework for the Pythagorean Theorem at the junior high school level, particularly in the context of students in the DIY Province, where empirical data indicates that their understanding of mathematical concepts remains low. The novelty of this study lies in the instructional design that positions Padlet not merely as an additional medium but as an integrated learning ecosystem that incorporates GeoGebra for dynamic visualization and Lumio for structured interactivity within a comprehensive discovery learning sequence. Thus, this study aims to determine the improvement in eighth-grade students' mathematical conceptual understanding and to evaluate the effectiveness of applying the discovery learning model supported by Padlet in teaching the Pythagorean Theorem.

METHODS

This study employs a quantitative approach using a one-group pretest–posttest pre-experimental design. This design involves a single group that takes a pretest before the intervention and a posttest after the intervention to determine the improvement in students' mathematical conceptual understanding and to assess the effectiveness of the discovery learning model supported by Padlet media on the Pythagorean Theorem material. The study was conducted at a public junior high school in Yogyakarta during the first semester of the 2025/2026 academic year, specifically from October to November 2025. The research sample consisted of 34 eighth-grade students selected through purposive sampling based on teacher recommendations, taking into account class availability and the research timeline. Of these 34 students, the pretest was completed by 28 students, as six students were engaged in other school activities during the pretest session. During the posttest, one additional student was unable to participate due to illness, resulting in 27 students with complete pretest and posttest data pairs; therefore, data analysis was conducted on these 27 students. The intervention was delivered over four sessions following the pretest and concluded with a posttest.

The research instrument consists of a test of mathematical conceptual understanding comprising 15 multiple-choice questions and 5 open-ended questions, with a maximum score of 50, consisting of a maximum score of 30 for the multiple-choice section (2 points per item) and a maximum score of 20 for the open-ended section (4 points per item). The test was designed based on seven indicators of mathematical conceptual understanding, namely: (1) identifying key elements in a mathematical object or situation;

(2) organizing and logically connecting steps of reasoning or proof; (3) using definitions, properties, or mathematical relationships to determine unknown values or quantities; (4) recognizing patterns, regularities, or specific relationships within a concept; (5) applying concepts to solve problems in new situations or different contexts, including real-world situations; (6) connecting various mathematical representations, such as verbal, symbolic, numerical, visual, or geometric, to clarify ideas; and (7) relating a concept to other related concepts within the mathematical structure. The content validity of the instrument was examined through face and logical validity assessed by one validator, a graduate student of the Mathematics Education Master's Program, following consultation with the course instructor. The validation covered both the pretest and posttest instruments, using a checklist adapted from Miller et al. (2009) that assessed logical validity (the alignment between indicators, learning objectives, and test items) and face validity (item clarity and relevance). The reliability of the instrument was examined using Cronbach's alpha coefficient, yielding a value of $\alpha = 0.635$, which is categorized as fairly high according to the reliability criteria of Djatmiko (2018).

The data were analyzed using both descriptive and inferential methods. Descriptive analysis was used to describe students' mathematical concept comprehension through pretest and posttest data, including mean scores, standard deviations, maximum and minimum scores, and the percentage of students meeting the learning achievement threshold (KKM) of 75. Inferential analysis was used to test the research hypotheses. Before hypothesis testing, a normality test was conducted using the Shapiro–Wilk test because the sample size was less than 50. Subsequently, hypothesis testing was performed using a paired samples t-test to determine the difference between pretest and posttest scores, as well as a one-sample t-test to test whether the mean posttest score exceeded the passing score. In this study, the discovery learning model supported by Padlet media was considered effective if the average posttest score reached or exceeded the minimum passing score (KKM) of 75 established by the school. Additionally, the effect size was calculated using Cohen's d to determine the magnitude of the treatment's influence.

RESULT AND DISCUSSION

This study aims to determine the improvement in students' mathematical conceptual understanding and to evaluate the effectiveness of the discovery learning model supported by Padlet in teaching the Pythagorean Theorem. The following presents the results of the data analysis along with a discussion.

1. Improvements in Students' Mathematical Conceptual Understanding Following Discovery Learning Supported by Padlet

To assess improvements in students' mathematical conceptual understanding, an analysis was conducted of the pretest and posttest results. Of the 34 students who participated in the instruction, 27 completed both the pretest and posttest, and their data were used in the statistical analysis. Descriptive statistics for the test results on students' mathematical conceptual understanding are presented in Table 1.

Table 1. Descriptive Statistics of Students' Mathematical Conceptual Understanding

Statistical Values	Pretest	Posttest
Number of Students	27	27
Mean	29,33	70,81
Standard Deviation	12,20	14,16
Highest Score	56	92
Lowest Score	12	48
Completed (KKM ≥ 75)	0 (0,0%)	12 (44,4%)
Not Completed (KKM < 75)	27 (100%)	15 (55,6%)

Based on Table 1, students' mathematical concept comprehension improved after instruction, with the average score increasing from 29.33 on the pretest to 70.81 on the posttest. Before testing the hypothesis, a normality test was first conducted using the Shapiro–Wilk test on the difference between the posttest and pretest scores. The test results indicated that the data were normally distributed ($W = 0.934$, $p = 0.087$), so the subsequent analysis used a paired samples t-test. The test results showed a significant difference between the pretest and posttest scores ($t = 13.15$, $p < 0.001$), with a Cohen's d effect size of 2.530, which falls into the very large category.

This improvement in ability can be explained by the key characteristics of discovery learning, which positions students as active participants in the process of discovering concepts. According to Bruner's theory, the discovery process enables students to understand the structure of the material more deeply because they are directly involved in exploring, organizing information, and drawing conclusions. In the context of this study, based on field observations, the use of Padlet was found to reinforce this process. Students actively recorded ideas, compared answers with peers, and observed patterns through organized visual displays, making the process of concept discovery more focused and systematic. These findings align with previous research. Research of Purwanto et al. (2024) reported that the integration of Padlet into discovery learning was able to improve student learning outcomes and motivation. Furthermore, the study of Astrilia et al. (2025) found that the use of visual tools such as GeoGebra helps reinforce the process of

conceptual discovery in geometry. In addition, Caesavitri et al. (2023) indicates that digital tools based on discovery learning are effective in improving students' mathematical abilities. Based on these descriptive and inferential findings, as well as the theoretical support, it can be concluded that discovery learning facilitated by Padlet improves eighth-grade students' understanding of mathematical concepts in the Pythagorean Theorem. However, this very large effect size should be considered together with the absence of a control group in this pre-experimental design, which does not allow other explanations, such as testing effects or students' natural maturation, to be ruled out as contributing factors to the observed improvement.

Beyond this improvement, the findings also provide empirical support for the novelty proposed in this study, namely the positioning of Padlet as an integrated learning ecosystem rather than merely an additional medium. Specifically, GeoGebra's dynamic visualization was found to help students explore the quadratic relationship between the sides of a right triangle more concretely, while Lumio's structured interactive activities helped sustain students' attention and motivation throughout the learning process. Unlike previous studies that generally examined the use of a single digital medium in discovery learning, this study demonstrates that the integration of Padlet, GeoGebra, and Lumio within a single learning platform enables the visualization, engagement, and documentation functions of each medium to reinforce one another within a discovery learning sequence. This integration constitutes the scientific contribution of the present study to the existing literature on technology-assisted discovery learning in mathematics education.

2. The Effectiveness of the Discovery Learning Model Using Padlet as a Learning Tool in Terms of Mathematical Conceptual Understanding

As previously established, the discovery learning model supported by Padlet was considered effective if the average posttest score reached or exceeded the KKM of 75. Referring back to Table 1, the average posttest score of the students was 70.81, which was still below the passing threshold, with only 44.4% of students achieving a score of ≥ 75 and the remaining 55.6% failing to meet the standard. The results of the one-sample t-test reinforce these findings, as the average posttest score does not differ significantly from the passing score ($t = -1.536$, $p = 0.932$). Thus, Padlet-assisted discovery learning cannot yet be deemed effective based on classical learning mastery indicators.

The failure to achieve this effectiveness can be explained by several factors identified during the learning process. Based on field observations conducted across the

four learning sessions, approximately 40% of the 34 students who participated in the instruction tended to read the instructions on the worksheets in Padlet carelessly, leading them to perform steps incorrectly or skip important parts of the exploration activities. Given that discovery learning heavily relies on students' ability to follow instructions and construct knowledge independently, this situation prevents the discovery process from proceeding optimally. Additionally, the observation results indicate that approximately 50% of the 34 students still struggled to connect the problem context with relevant geometric representations, leading them to perform numerical calculations directly without understanding the conceptual meaning of the situation. This aligns with the cognitive development characteristics of junior high school students, who are still in the transitional stage from concrete to formal thinking. Previous learning habits that emphasized procedural practice have also left students unaccustomed to formulating hypotheses and drawing conclusions independently—the very essence of discovery learning. In fact, based on the observation results, some students expressed a preference for teacher-centered learning, indicating that readiness for learning through the discovery approach still needs to be developed gradually.

These findings are consistent with a number of previous studies showing that improved understanding does not always lead to the achievement of classical mastery within a single learning cycle. The results study of Pratiwi & Ariawan (2020) reported that discovery learning can improve students' understanding, but the standard proficiency level was only achieved after two learning cycles. Similar findings were reported in the study of Ruliani et al. (2024), which showed an increase in completion rates from 64% to 86% after the second cycle. The study results of (Lestariningsih, 2020) also reported an increase in completion rates from 50% to 88% after two implementation cycles at the elementary school level. This pattern suggests that the full effectiveness of discovery learning generally develops gradually as students gain more experience with discovery-based learning; therefore, a longer implementation period is needed for its potential to be fully realized.

Given these conditions, the improvement in mathematical conceptual understanding observed in this study is actually consistent with the fundamental characteristics of discovery learning. However, variations in students' prior knowledge, uneven cognitive readiness, and learning habits still dominated by conventional approaches are factors that prevent the class average from exceeding the minimum passing score. The literature also indicates that implementing discovery learning within a single learning cycle

is often insufficient to achieve classical mastery, particularly in classes with high heterogeneity in ability. Consequently, a longer implementation period and adequate pedagogical support are necessary to ensure that the potential of discovery-based learning can develop optimally. Separately, it should be noted that the exclusion of seven students (approximately 21% of the initial sample) due to incomplete data may pose a threat to the internal validity of this study, and the interpretation of the findings should therefore take this limitation into account.

CONCLUSION

This study concludes that the implementation of discovery learning supported by Padlet media improved students' understanding of mathematical concepts in the Pythagorean Theorem, as indicated by a significant increase in the average score from pretest to posttest with a very large effect size. However, based on the established effectiveness criterion, this improvement did not yet meet the classical learning mastery threshold, as the average posttest score remained below the minimum passing score (KKM) of 75. This indicates that the success of discovery learning is determined not only by the use of the model and learning media, but also by students' cognitive readiness and their ability to engage independently in the discovery process. Thus, this study contributes to enriching the literature on the integration of collaborative digital media within discovery-based mathematics learning, while also affirming that adequate pedagogical support remains an important factor in optimizing its potential.

DECLARATIONS

Author Contribution	:	Author 1: Conceptualization, Writing - Original Draft, Editing and Visualization, Writing - Review & Editing, Formal Analysis, and Methodology. Author 2: Validation and Supervision.
Funding Statement	:	This research received no external funding.
Conflict of Interest	:	The authors declare no conflict of interest.
Additional Information	:	No additional information to declare.

REFERENCES

Andriawan, B., & Budiarto, M. T. (2014). Identifikasi Kemampuan Berpikir Logis dalam Pemecahan Masalah Matematika pada Siswa Kelas VIII-1 SMP Negeri 2 Sidoarjo. *MATHEdunesa*, *3*(2). https://doi.org/10.26740/mathedunesa.v3n2.p%25p

Aristianti, S. D., Ramadhani, N. L., Inayati, C. M., & Amaliyah, F. (2024). Pengaruh Media Padlet terhadap Hasil Belajar dengan Menggunakan Metode Statistik: Uji Paired T-Tes. *MathVision: Jurnal Matematika*. https://doi.org/10.55719/mv.v6i2.1258

Astrilia, I. A. K. C., Wibawa, K. A., & Wulandari, I. G. A. P. A. (2025). Pembelajaran Discovery Learning Berbantuan Geogebra untuk Meningkatkan Pemahaman Matematis Siswa pada Materi Bangun Ruang Sisi Lengkung Kelas IX-4 SMP Negeri 7 Denpasar. *Jurnal Pembelajaran Dan Pengembangan Matematika (PEMANTIK)*, *5*(1). https://e-journal.unmas.ac.id/index.php/pemantik/article/view/11378

Azizah, N., Budiyono, & Siswanto. (2021). Kemampuan Awal: Bagaimana Pemahaman Konsep Siswa pada Materi Teorema Pythagoras? *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *10*(2), 1151. https://doi.org/10.24127/ajpm.v10i2.3662

Caesavitri, A., Marsitin, R., & Yuwono, T. (2023). Elektronik Lembar Kerja Peserta Didik (E-LKPD) Berbasis Discovery Learning untuk Meningkatkan Kemampuan Penalaran Matematis. *Jurnal Pendidikan Dan Riset Matematika*, *6*(1). https://ejurnal.uibu.ac.id/index.php/prismatika

Darmayanti, R., Tobroni, & Widodo, J. (2024). *Filsafat dan Teori Pendidikan: Pembelajaran Matematika untuk Berfkir Kritis dan Kreatif*. Adab.

Djatmiko, I. W. (2018). Strategi Penulisan Skripsi Tesis & Disertasi Bidang Pendidikan. UNY Press.

Hosnan, M. (2014). *Pendekatan Saintifik dan Konstektual dalam Pembelajaran Abad 21: Kunci Sukses Implementasi Kurikulum 2013*. Ghalia Indonesia.

Indah, P. (2020). Development of HOTS (High Order Thinking Skill) Oriented Learning Through Discovery Learning Model to Increase The Critical Thinking Skill of High School Students. *International Journal of Chemistry Education Research*, 26–32. https://doi.org/10.20885/ijcer.vol4.iss1.art4

Kemendikbudristek. (2023). *PISA 2022 Results Factsheets Indonesia PUBE*. https://oecdch.art/a40de1dbaf/C108.

Kuba, R. F. C., Husna, A., & Amelia, F. (2023). Analisis Pemahaman Konsep Matematis Siswa SMK Berdasarkan Minat Belajar. *PYTHAGORAS*. https://www.journal.unrika.ac.id/index.php/jurnalphythagoras/article/view/4551/0

Lestariningsih. (2020). Peningkatan Prestasi Belajar Matematika Melalui Pendekatan Discovery Learning Siswa Kelas V. *Jurnal Ilmiah WUNY*, *2*(2), 9–19. https://doi.org/10.21831/jwuny.v2i2.34680

Maarif, S., Aprilia, R. R., & Hartiningrum, E. S. N. (2024). Penerapan Media Pembelajaran Padlet pada Pembelajaran Matematika. *Paradigma: Jurnal Filsafat, Sains, Teknologi, Dan Sosial Budaya*. https://doi.org/10.33503/paradigma.v29i3

Marinda, L. (2020). *Teori Perkembangan Kognitif Jean Piaget dan Problematikanya pada Anak Usia Sekolah Dasar*.

Marjud, F., Hasanah, A., Lukman, L., & Harahap, P. A. (2025). A Study Of Differences In Mathematical Reasoning Among Junior High Students With Field Independent And Field Dependent Cognitive Styles. *Mathline : Jurnal Matematika Dan Pendidikan Matematika*, *10*(4), 959–972. https://doi.org/10.31943/mathline.v10i4.1049

Miller, M. D., Linn, R. L., & Gronlund, N. E. (2009). Measurement and Assessment in Teaching. Pearson Education, Inc.

Pratama, N. A., & Nuryadi, N. (2022). Efektivitas Penggunaan Media Pembelajaran Padlet Untuk Meningkatkan Prestasi Belajar Siswa SMP N 3 Kembang. *Jurnal Pendidikan Dan Konseling (JPDK)*, 320–325.

Pratiwi, K. D., & Ariawan, I. P. W. (2020). Peningkatan Prestasi Belajar Matematika Siswa Melalui Penerapan Model Pembelajaran Discovery Learning. *Jurnal Ilmiah Tri Hita Karana*, *1*(1), 38–47. https://doi.org/10.23887/jithk.v1i1.27833

Priyatna, S., & Marsigit, M. (2024). Pengembangan Perangkat Pembelajaran Berbasis Etnomatematika Keraton Yogyakarta Berorientasi pada Pemahaman Konsep Matematis Siswa. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *13*(2), 458. https://doi.org/10.24127/ajpm.v13i2.8825

Purwanto, J., Muliyati, R., Soesanto, D. A. S., Mahendra, A. S. P., & Wiyananda, A. S. R. (2024). Penerapan Aplikasi Padlet dan Google Meet dalam Upaya Meningkatkan Hasil Belajar dan Motivasi Belajar Siswa pada Siswa Kelas XI IPA 2 SMAN 1 Sumberrejo Bojonegoro Menggunakan Model Pembelajaran Discovery Learning. *Journal Educatione: Jurnal Manajemen Pendidikan*, *1*(2), 127–134. https://journal.univgresik.ac.id/index.php/je/article/view/222

Putra, L. (2025). *Peringkat dan Nilai ASPD SMP DIY 2025*. https://www.scribd.com/document/870626826/NILAI-RATA-RATA-PPASPD-DIY-TH-2025

Rahmadani, A., Wandini, R. R., Dewi, A., Zairima, E., & Putri, T. D. (2022). Upaya meningkatkan berpikir kritis dan mengefektifkan pendekatan kontekstual dalam pembelajaran matematika. *Edu Society*, *2*. https://www.jurnal.permapendis-sumut.org/index.php/edusociety/article/view/167

Ruliani, I. D., Purwati, H., Windiarti, W., & Harun, L. (2024). Penerapan Model Discovery Learning Berbasis Soal Cerita untuk Meningkatkan Hasil Belajar Siswa. *MATH LOCUS: Jurnal Riset Dan Inovasi Pendidikan Matematika*, *5*(1), 16–25. https://doi.org/10.31002/mathlocus.v5i1.4314

Setiawan, N., & Nuryadi. (2024). Analisis Pemahaman Konsep Matematis dalam Menyelesaikan Soal pada Materi Teorema Pythagoras SMP Kelas VII. *Jurnal Ilmiah Pendidikan*, *10*(2), 178–185.