

SYSTEMATIC LITERATURE REVIEW: EFEKTIVITAS DISCOVERY LEARNING BERBANTUAN CANVA DAN WORDWALL TERHADAP KEMAMPUAN KONEKSI MATEMATIS DAN MINAT BELAJAR SISWA

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ABSTRACT

Mathematical connection skills and learning interest are two important aspects in mathematics learning that influence student learning success. Low mathematical connection skills cause students to experience difficulties in connecting mathematical concepts and relating them to everyday life. In addition, low learning interest impacts a lack of student engagement during the learning process. This study aims to analyze the effectiveness of the implementation of Discovery Learning assisted by Canva and Wordwall on students' mathematical connection skills and learning interest through a Systematic Literature Review (SLR) approach. The articles analyzed were obtained through Google Scholar and accredited national journals using the 2019–2024 period. The article selection process used the PRISMA stages which include identification, screening, eligibility, and inclusion. A total of 20 articles that met the inclusion criteria were systematically analyzed. The results of the study indicate that Discovery Learning is effective in improving mathematical connection skills through the processes of exploration, information processing, verification, and generalization of concepts. Canva plays a role in facilitating the visualization of mathematical concepts in an interesting and systematic manner, thereby helping students' conceptual understanding. Meanwhile, Wordwall functions as an interactive practice medium that increases students' active participation, motivation, and learning interest. The integration of Discovery Learning, Canva, and Wordwall creates constructive, interactive, and meaningful mathematics learning, thereby improving the quality of learning both cognitively and affectively.

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INTRODUCTION

Mathematics learning plays an important role in developing students' logical, critical, systematic, and creative thinking skills. However, in practice, mathematics education still faces various challenges, one of which is the low level of students' mathematical connection ability. According to the National Council of Teachers of Mathematics (NCTM, 2000), mathematical connection ability refers to the ability to connect mathematical concepts with one another, relate mathematics to other disciplines, and apply mathematical concepts in everyday life. This ability is essential because it enables students to view mathematics as an interconnected body of knowledge rather than as separate and unrelated topics.

The low level of mathematical connection ability causes students to experience difficulties in understanding relationships among mathematical concepts and applying them to contextual problem-solving situations. Ningsih and Astuti (2020) stated that mathematics instruction in schools still tends to emphasize procedural memorization and routine exercises, providing limited opportunities for students to develop deep conceptual understanding.

In addition to mathematical connection ability, learning interest is another important factor influencing success in mathematics learning. According to Slameto (2015), learning interest is an individual's tendency to pay attention to and engage in learning activities with a sense of enjoyment. Students with high learning interest are generally more active, enthusiastic, and intrinsically motivated during the learning process. Conversely, low learning interest often results in passive participation and limited engagement in classroom activities.

One learning model considered effective in improving both mathematical connection ability and learning interest is Discovery Learning. According to Jerome S. Bruner (1961), Discovery Learning is a learning model that emphasizes students' active involvement in discovering concepts through exploration, observation, data collection, and conclusion drawing. This model allows students to construct knowledge independently, making the learning process more meaningful and engaging.

In its implementation, the success of Discovery Learning is greatly influenced by the instructional media used. Advances in educational technology have introduced various digital media that can support mathematics learning and make it more engaging and interactive. Canva is a visual design-based medium that can be utilized to present mathematical content in a systematic, contextual, and communicative manner. Meanwhile, Wordwall is an interactive game-based platform that can be used for practice activities and learning assessment.

Several studies have shown that Canva can enhance students' motivation and conceptual understanding through attractive visual representations of learning materials (Rahmawati, 2021). On the other hand, Wordwall has been proven effective in increasing active participation and learning interest through interactive game-based learning activities (Putri & Hadi, 2022). However, most existing studies have examined Discovery Learning, Canva, and Wordwall separately.

Based on the preliminary review, studies integrating Discovery Learning assisted by Canva and Wordwall to improve students' mathematical connection ability and learning interest remain limited. Furthermore, comprehensive analyses using a Systematic Literature Review (SLR) approach that examine the relationships among these variables are still relatively scarce. Therefore, this study aims to systematically analyze the effectiveness of Discovery Learning assisted by Canva and Wordwall in improving students' mathematical connection ability and learning interest.

RESEARCH METHOD

Research Design

This study employed the **Systematic Literature Review (SLR)** method. SLR is a research method used to identify, evaluate, and synthesize findings from previous studies in a systematic and structured manner in order to obtain comprehensive conclusions regarding a particular research topic. Through this method, researchers can critically analyze existing evidence and identify trends, gaps, and implications related to the effectiveness of Discovery Learning assisted by Canva and Wordwall in mathematics learning.

METHOD

Research Questions (RQs)

This study was conducted based on the following research questions:

1. How does Discovery Learning influence students' mathematical connection ability?
2. What is the role of Canva in supporting mathematics learning?
3. How does Wordwall affect students' learning interest?
4. How can Discovery Learning, Canva, and Wordwall be integrated into mathematics learning?

Article Search Strategy

The articles reviewed in this study were obtained through **Google Scholar** and accredited national journals. The search process was conducted using the following keywords:

1. Discovery Learning
2. Canva in mathematics learning
3. Wordwall in mathematics learning
4. Mathematical connection ability
5. Students' learning interest

The publication period selected for this review ranged from **2019 to 2024** to ensure the relevance and recency of the studies included in the analysis.

Inclusion and Exclusion Criteria

To ensure the quality and relevance of the selected studies, inclusion and exclusion criteria were established as follows:

Inclusion Criteria

1. The article discusses Discovery Learning.
2. The article utilizes Canva and/or Wordwall as learning media.
3. The article examines mathematical connection ability and/or students' learning interest.
4. The article was published between 2019 and 2024.
5. The article is written in Indonesian or English.

Exclusion Criteria

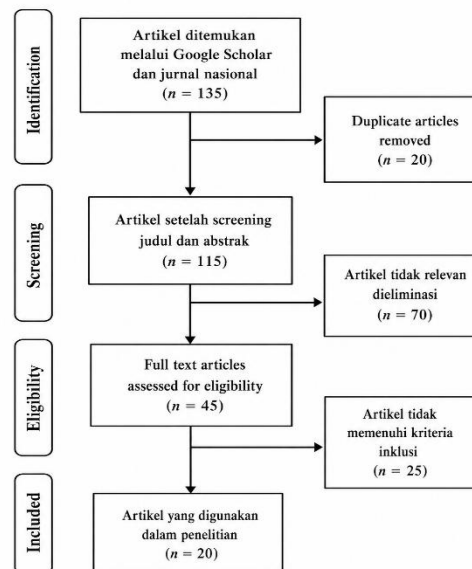
1. The article is not relevant to mathematics learning.
2. The article does not address the research variables.
3. The article is an opinion paper, editorial, or non-research publication.

Article Selection Process Using PRISMA

Table 1. Results of the Article Selection Process Based on the PRISMA Method

PRISMA Stage	Number of articles
Articles identified	135
Duplicate articles	20
Articles after duplicate removal and screening	115
Artikel tidak relevan	70
Irrelevant articles excluded	45
Full-text articles assessed for eligibility	20

Gambar 1. PRISMA Flow Diagram of Article Selection Process



Source: Adapted from the PRISMA Guidelines (Page et al., 2021).

Quality Assessment (QA)

Table 2. Quality Assessment (QA) Results of the Selected Articles

Code articles	The carity of the research method	The suitability of the research variables	The availability of research instruments	The relevance of the research	Skor
A1	✓	✓	✓	✓	4
A2	✓	✓	✓	✓	4
A3	✓	✓	✗	✓	3
A4	✓	✓	✓	✓	4
A5	✓	✓	✓	✓	4

Articles with a quality assessment score of ≤ 2 were excluded from the study, while only articles meeting the established quality criteria were included in the final review and analysis.

Table Synthesis if Research Articles

Table 3. Synthesis of Research Articles

NO	Authors	Year	Educational Level	Research Method	Research Variabel	Research Findings
1	Sari & Wulandari	2020	Junior High School	Quasi-Experimental	Discovery Learning,	Discovery Learning improved students'

NO	Authors	Year	Educational Level	Research Method	Research Variabel	Research Findings
2	Rahmawati	2021	Elementary School	Descriptive	Mathematical Connection Ability Canva, Learning Motivation	ability to connect mathematical concepts across different topics. Canva helped visualize abstract concepts and increased students' attention during learning activities.
3	Putri & Hadi	2022	Junior High School	Experimental	Wordwall, Learning Interest	Wordwall increased students' active participation and enthusiasm during learning.
4	Nurhadi et al.	2023	Junior High School	Mixed Methods	Discovery Learning, Digital Media	The integration of digital media strengthened students' conceptual understanding.
5	Lestari & Fitri	2020	Junior High School	Experimental	Mathematical Connection Ability	Active learning helped students connect mathematical concepts to real-life situations.
6	Pratama & Suyanto	2021	Senior High School	Quasi-Experimental	Discovery Learning, Conceptual Understanding	Discovery Learning improved students' ability to explain relationships among mathematical formulas.
7	Dewi & Kurniawan	2022	Elementary School	Quantitative Descriptive	Canva, Learning Motivation	Canva enhanced students' intrinsic motivation through interactive visual designs.
8	Hasanah	2021	Junior High School	Survey	Learning Interest	Learning interest influenced students' engagement in mathematics learning.
9	Fadillah & Rini	2023	Junior High School	Experimental	Wordwall, Learning Assessment	Wordwall improved the effectiveness of formative assessment and student feedback.
10	Ningsih & Astuti	2020	Junior High School	Descriptive	Mathematical Connection Ability	Mathematical connection ability supported students in

NO	Authors	Year	Educational Level	Research Method	Research Variabel	Research Findings
11	Kurnia & Saputra	2022	Elementary School	Literature Review	Discovery Learning	solving contextual problems. Discovery Learning supported student-centered learning within the Merdeka Curriculum.
12	Hidayat & Putra	2021	Elementary School	Experimental	Digital Media	Digital media enhanced interaction and understanding of mathematical concepts.
13	Yuliani	2020	Elementary School	Descriptive	Discovery Learning, Learning Interest	Discovery-based learning increased students' curiosity and interest in learning.
14	Setiawan & Laila	2023	Elementary School	Experimental	Canva and Wordwall	The combination of Canva and Wordwall improved student engagement in learning activities.
15	Amalia & Ridwan	2021	Elementary School	Qualitative	Learning Activities	Discovery Learning increased students' participation in classroom discussions.
16	Safitri	2022	Elementary School	Survey	Interactive Media, Learning Interest	Interactive media increased students' focus and interest in mathematics.
17	Fitria & Anwar	2023	Junior High School	Experimental	Mathematical Connection Ability	Contextual exercises strengthened relationships among mathematical concepts.
18	Wibowo	2020	Elementary School	Experimental	Discovery Learning	Discovery Learning improved students' understanding of basic mathematical concepts.
19	Kusuma & Pratiwi	2022	Junior High School	Quasi-Experimental	Wordwall	Wordwall improved mathematics learning assessment outcomes.
20	Salsabila & Nugroho	2024	Elementary School	Mixed Methods	Canva, Wordwall	Canva and Wordwall increased students' active participation and learning outcomes.

RESULTS AND DISCUSSION

Research Trends of Discovery Learning in Mathematics Education

The analysis results indicate that research on Discovery Learning has increased significantly over the last five years, particularly at the elementary and junior high school levels. Most studies employed a quasi-experimental design using a pretest-posttest control group design.

The increasing trend of research suggests that Discovery Learning is considered a relevant instructional model for developing students' higher-order thinking skills. According to Bruner (1961), discovery-based learning provides students with opportunities to construct concepts independently through exploration and investigation processes.

Furthermore, the implementation of Discovery Learning is aligned with the Merdeka Curriculum, which emphasizes student-centered learning and the development of twenty-first-century competencies. In general, the reviewed articles demonstrate that Discovery Learning is increasingly integrated with digital technologies. This trend reflects a paradigm shift from teacher-centered instruction toward technology-supported student-centered learning.

The Effect of Discovery Learning on Students' Mathematical Connection Ability

The review findings reveal that Discovery Learning has a positive effect on students' mathematical connection ability. Improvements were identified in students' ability to:

- a. Connect mathematical concepts with one another;
- b. Relate concepts across different mathematical topics;
- c. Apply mathematical concepts to real-life situations.

During the stimulation and problem statement stages, students are encouraged to connect prior knowledge with new situations. The data collection and data processing stages facilitate the development of relationships among concepts through discussion and exploration. Subsequently, the verification and generalization stages strengthen students' conceptual understanding.

According to Lestari and Yudhanegara (2017), mathematical connection ability develops when students are given opportunities to establish meaningful relationships among concepts actively.

Based on the synthesis of the reviewed studies, Discovery Learning consistently improves mathematical connection ability because students are directly involved in discovering concepts rather than merely receiving information from teachers. This active engagement enables students to understand the interrelationships among mathematical concepts more deeply.

However, the effectiveness of Discovery Learning is highly dependent on the quality of the stimuli provided by teachers at the beginning of the learning process. Several studies reported that students experienced difficulties when teachers failed to provide clear guidance or contextual problems. Therefore, successful implementation of Discovery Learning requires systematic instructional planning and appropriate learning media to support conceptual exploration.

The Role of Canva in Visualizing Mathematical Concepts

Canva functions as a visual learning medium that helps present mathematical concepts in a more attractive and understandable manner. Visual representations such as infographics, illustrations, diagrams, and simple animations assist students in understanding abstract concepts, including fractions, geometric solids, and ratios.

According to Arsyad (2019), visual media help clarify learning messages and reduce verbalism in the instructional process. The use of Canva also increases students' attention and motivation because learning materials are presented creatively and communicatively.

In addition to supporting conceptual understanding, Canva helps students identify relationships among various mathematical representations, such as symbols, images, tables, and concrete models. Consequently, Canva contributes to the development of students' mathematical connection ability.

Research findings indicate that Canva helps students understand learning materials more systematically because visual presentations facilitate information organization. Canva also supports contextual learning by presenting images and illustrations closely related to students' daily lives.

Nevertheless, the effectiveness of Canva depends largely on teachers' ability to design instructional materials. Overly complex designs may distract students from the essential content. Therefore, teachers should consider principles of simplicity, readability, and visual balance when designing learning materials using Canva.

Wordwall as an Interactive Practice Medium

Wordwall is widely used as an interactive game-based medium for practice and assessment activities. Learning activities such as quizzes, matching games, maze chase, and random wheel create an enjoyable learning environment.

The review findings indicate that Wordwall improves:

- a. Students' active participation;
- b. Learning motivation;
- c. Accuracy in answering questions;
- d. Engagement during classroom activities.

Wordwall also provides immediate feedback, allowing students to identify and correct their mistakes promptly. According to Sudjana (2016), immediate feedback in formative assessment contributes significantly to learning effectiveness.

In addition to increasing learning interest, Wordwall helps strengthen conceptual understanding through repetitive and interactive practice activities. Students become more enthusiastic because the game elements create a competitive yet enjoyable learning atmosphere.

However, some studies reported that excessive use of Wordwall may cause students to focus more on the game itself than on understanding mathematical concepts. Therefore, teachers should align game activities with learning objectives to ensure that Wordwall functions as a tool for conceptual reinforcement rather than mere entertainment.

Impact on Students' Learning Interest

The integration of Discovery Learning, Canva, and Wordwall has a positive impact on students' learning interest. Students demonstrated:

- a. Higher levels of attention;
- b. Greater enthusiasm for learning;
- c. Increased confidence in asking questions;
- d. More active participation during lessons.

Interactive and visually appealing learning experiences make students feel more comfortable and interested in mathematics learning. According to Safitri (2022), game-based interactive media can enhance students' intrinsic motivation because learning becomes more enjoyable.

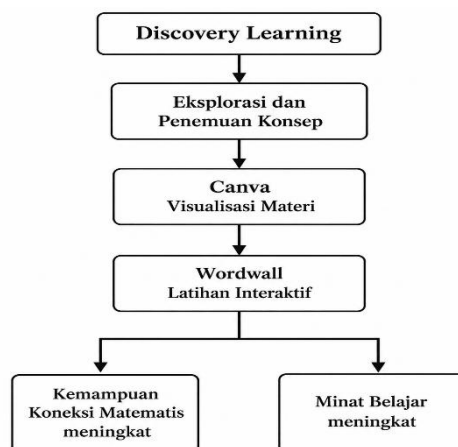
The synthesis results indicate that learning interest increases when students play an active role in the learning process. Discovery Learning provides opportunities for students to discover concepts independently, Canva creates an engaging visual learning environment, and Wordwall offers enjoyable assessment activities.

Increased learning interest is also reflected in students' classroom behavior. Students become more active in discussions, more confident in expressing opinions, and demonstrate greater curiosity toward mathematics learning.

Integrative Synthesis of Variables

From an integrative perspective, Discovery Learning serves as the primary pedagogical framework for developing students' mathematical connection ability through concept discovery processes. Canva supports visualization and conceptual understanding, while Wordwall strengthens practice and assessment activities.

The relationship among the variables can be illustrated as follows:



The integration of these three components creates a mathematics learning environment that is constructive, interactive, and meaningful.

CONCLUSION

Based on the synthesis of the twenty selected articles, Discovery Learning consistently demonstrates a positive impact on students' mathematical connection ability. However, the effectiveness of the model depends on the quality of implementation, teacher readiness, and the learning media used to support concept exploration.

Several studies reported substantial improvements in mathematical connection ability when students were provided with opportunities to explore concepts through contextual activities and collaborative discussions. Nevertheless, some articles indicated that discovery-based learning may be less effective when teachers fail to provide appropriate stimuli during the initial stages of learning. Under such circumstances, students may experience difficulties in identifying relationships among mathematical concepts.

The review also revealed that Canva plays an important role in addressing challenges related to the visualization of mathematical concepts. Canva helps students understand abstract concepts through more concrete and communicative visual representations. However, its effectiveness is influenced by teachers' ability to design instructional materials effectively. Overly complex designs may divert students' attention from the main learning objectives.

Similarly, Wordwall has been shown to effectively increase students' learning interest and engagement by incorporating game elements into mathematics learning. However, excessive use of Wordwall may lead students to focus more on gameplay than conceptual understanding. Therefore, teachers should carefully align Wordwall activities with instructional objectives to ensure that the platform serves as a tool for reinforcing mathematical concepts.

The synthesis further indicates that integrating Discovery Learning, Canva, and Wordwall produces more optimal outcomes than using each component separately. Discovery Learning facilitates concept construction through exploration, Canva enhances conceptual visualization, and Wordwall reinforces understanding through interactive practice. Together, these components create a mathematics learning environment that is more constructive, engaging, and meaningful.

Therefore, the integration of Discovery Learning, Canva, and Wordwall can be considered an effective instructional approach for improving students' mathematical connection ability and learning interest in mathematics education.

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