INTERNATIONAL JOURNAL OF CONTEMPORARY STUDIES IN EDUCATION
IJ-CSE
https://journals.eduped.org/index.php/ijcse
E-ISSN 2963-0282, P-ISSN 2963-5993

Connecting Concepts and Representations in Mathematics: A Systematic Literature Review

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Received: 17/04/2025 Revised: 29/05/2025 Accepted: 14/06/2025

ABSTRACT

Purpose - This study aims to identify effective media, instructional strategies, or teaching models that can bridge conceptual understanding and mathematical representation in mathematics education. It was motivated by the persistent gap observed between students' conceptual grasp and their ability to translate concepts into mathematical forms, which hinders problem-solving competence.

Methodology - A Systematic Literature Review (SLR) was conducted following the PRISMA 2020 guidelines. Literature was sourced from Google Scholar and DOAJ databases, focusing on publications from 2015 to 2025. The review process resulted in seven articles meeting the inclusion criteria. Data analysis involved thematic synthesis of instructional approaches and their reported effectiveness in bridging conceptual and representational understanding.

Findings - The review found that the relationship between conceptual understanding and mathematical representation is closely linked but not automatic, depending significantly on the instructional strategies employed. Effective approaches identified include the Concrete–Pictorial–Abstract (CPA) model, GeoGebra media, SAVI strategy, Joyful Problem-Based Learning (JPBL), and Role-Playing Game (RPG)-based learning, which enhance engagement and facilitate conceptual-visual connections. These findings imply the need for intentional instructional designs that integrate conceptual and representational aspects in mathematics learning.

Novelty - This study contributes by systematically mapping and synthesising diverse strategies and media specifically targeting the integration of conceptual understanding with mathematical representation, an area underexplored in prior reviews.

Significance - The results are valuable for mathematics educators, curriculum developers, instructional designers, and educational policymakers seeking evidence-based practices to improve mathematics teaching and learning outcomes.

Keywords: Concrete–Pictorial–Abstract model; Conceptual understanding; Joyful Problem-Based Learning; Mathematical representation; Systematic literature review.

How to cite: Latifa, U., Indrasari, P., Pramuditya, S. A & Asnawati, S. (2025). Connecting Concepts and Representations in Mathematics: A Systematic Literature Review. *International Journal of Contemporary Studies in Education. 04*(2), pp. 100-113, doi: https://doi.org/10.56855/ijcse.v4i2.1483

1. Introduction

Amid rapid technological advancements, the relationship between conceptual understanding and mathematical representation has become a critical concern in mathematics education. These two skills are interrelated and form the foundation of mathematical mastery, playing a central role in students' ability to solve problems, communicate ideas, and adapt to global challenges. Mathematical ability has become one of the fundamental competencies required in the modern era (Indrawati, 2023). Mathematics not only serves as a tool for problem-solving but also as a foundation for developing critical and analytical thinking skills that are highly needed in various fields such as technology, economics, and science (Putri et al., 2022).

Conceptual understanding is a crucial aspect of mathematics education, as it enables students to comprehend, explain, and apply mathematical concepts in various situations (Gusmana & Amir, 2024). This deep understanding fosters the ability to reconstruct ideas in one's own words, classify mathematical objects, and connect related concepts (Hutagalung, 2017; Valentine et al., 2024). According to Pramuditya et al., (2021), when students build their understanding independently, the knowledge tends to be more meaningful and long-lasting. This view emphasizes that meaningful learning is rooted in active internal construction rather than passive reception.

In addition, the The National Council of Teachers of Mathematics (2000) states that, beyond problem-solving, reasoning and proof, communication, and connections, students must also possess the ability of mathematical representation. Mathematical representation is a crucial component in mathematics learning, serving as a connector for students to connect abstract ideas with a more concrete understanding, as well as to express their comprehension in various forms such as diagrams, graphs, equations, symbols, and verbal models (Ainunnisa et al., 2021; Choerunnisa et al., 2024). The representations that emerge within students are ways in which they express mathematical ideas or concepts when attempting to find solutions to problems they encounter (The National Council of Teachers of Mathematics, 2000). In order to understand abstract mathematical concepts, students need to construct mathematical models (Hidayat et al., 2023). This will help students to better understand and communicate their ideas in the language of mathematics in a practical, systematic, and efficient manner (Monariska & Komala, 2021).

According to Anderson & Krathwohl (2001), students can be said to understand the material if they are able to construct meaning from the instructional messages, whether conveyed through oral, written, or graphic communication during the learning process. Understanding occurs when new knowledge received can be connected to existing knowledge within the student's cognitive structure. This aligns with the view of Hiebert & Carpenter, (1992), who stated that mathematical ideas, procedures, or facts can be considered understood

if they have become part of an internal network within the student's cognitive structure. This interconnectedness indicates that the ability of mathematical representation cannot be separated from conceptual understanding, as representation is the way students express and construct meaning from the concepts they learn (Asnawati & Dewi, 2020).

However, in instructional practice, the development of conceptual understanding and mathematical representation skills is often carried out separately. This separation leads to difficulties for students in connecting abstract ideas with concrete forms, thereby hindering the effectiveness of the problem-solving process (Pramuditya et al., 2021). In addition, key issues frequently observed in the field include difficulties in understanding basic mathematical concepts, lack of accuracy during problem-solving, and challenges in comprehending the meaning of problems. These factors collectively further exacerbate students' ability to solve mathematical problems in a systematic and comprehensive manner (Hafizah et al., 2025). For example, students may be able to verbally explain a concept but struggle to translate it into graphical or equation forms, which are essential in many mathematical problems. Therefore, the topic of "Connecting Concepts and Representations in Mathematics" becomes highly important to explore, especially in the context of how these two abilities can be developed through appropriate instructional strategies or methods.

Based on the results of the literature review conducted, it was found that instructional strategies such as SAVI, GeoGebra, and Problem-Based Learning (PBL), as well as concrete and contextual approaches, are capable of supporting the simultaneous development of both skills. Moreover, the use of innovative media, such as educational games based on Role-Playing Games (RPG), also holds great potential as an engaging and immersive bridge in linking conceptual understanding with representational forms. This indicates that comprehensive and contextual learning development is key to enhancing the overall quality of students' mathematical competencies (Nuraeni & Rusnilawati, 2022; Uya, 2023).

Based on the above, this study aims to conduct a Systematic Literature Review (SLR) to identify effective strategies or methods for connecting students' conceptual understanding and mathematical representation. The findings of this review are expected to provide practical contributions for teachers in designing integrated learning, as well as theoretical contributions for curriculum development and future research in the field of mathematics education. Therefore, this review seeks to answer the following research question: How do instructional strategies and media serve as connecting elements between conceptual understanding and mathematical representation in mathematics learning?

2. Methods

The method employed in this study is a Systematic Literature Review (SLR) aimed at identifying media, learning strategies, or models that can connect students' conceptual understanding and mathematical representation skills. SLR is a systematic procedure used to search, select, screen, and extract relevant data based on predetermined inclusion criteria (Triandini et al., 2019). According to Sulistiani et al. (2021), SLR is a method for collecting, reviewing, evaluating, and interpreting available studies within a specific topical area, with a focus on answering

relevant research questions. This study follows the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines (Page et al., 2021) to ensure transparency and systematic rigor in the literature search and selection process. The PRISMA framework involves several key stages: (1) establishing inclusion and exclusion criteria, (2) determining sources of information, (3) developing a comprehensive literature search strategy, and (4) synthesizing the findings of the selected studies.

The article search was conducted using two databases: Google Scholar and the Directory of Open Access Journals (DOAJ). These sources were chosen due to their broad coverage and ease of access. Although Elsevier was initially considered, access limitations prevented its effective use. The publication period was limited to the years 2015 to 2025. This timeframe was selected to broaden the search scope, considering the limited number of studies linking conceptual understanding and mathematical representation.

The search strategy involved keywords in both Indonesian and English relevant to the topic, including "pemahaman konsep" (conceptual understanding), "representasi matematis" (mathematical representation), "pemahaman konsep dan representasi matematis" (conceptual understanding and mathematical representation), "relationship between conceptual understanding and mathematical representation", "connecting conceptual understanding and mathematical representation," and "correlation between conceptual understanding and mathematical representation." These keywords were combined using Boolean operators, with AND to narrow the search and OR to expand it.

From the initial search, a total of 30 articles were identified. After removing three duplicates, 27 articles remained and were screened based on their titles and abstracts. The screening process was conducted manually, and titles and abstracts were carefully reviewed to ensure relevance to the study's objectives. Sixteen articles were selected for full-text review. Subsequently, seven articles met the inclusion criteria and were analyzed further. Reference management and screening were conducted using Mendeley, while the screening itself was performed manually to minimize selection bias.

Data extraction was performed manually by thoroughly reading each selected article without using a specific tabular format. Quality assessment was conducted using the Joanna Briggs Institute (JBI) and Critical Appraisal Skills Programme (CASP) tools. All articles were deemed methodologically sound, although some had limitations regarding ethical aspects and reliability.

The entire article selection process is visualized using the PRISMA 2020 flow diagram, illustrating the number of articles at each stage: identification (30 articles), duplicate removal (3 articles), title and abstract screening (27 articles), full-text eligibility assessment (16 articles), and final inclusion in the review (7 articles). This diagram is included to enhance transparency and facilitate replication of the study.

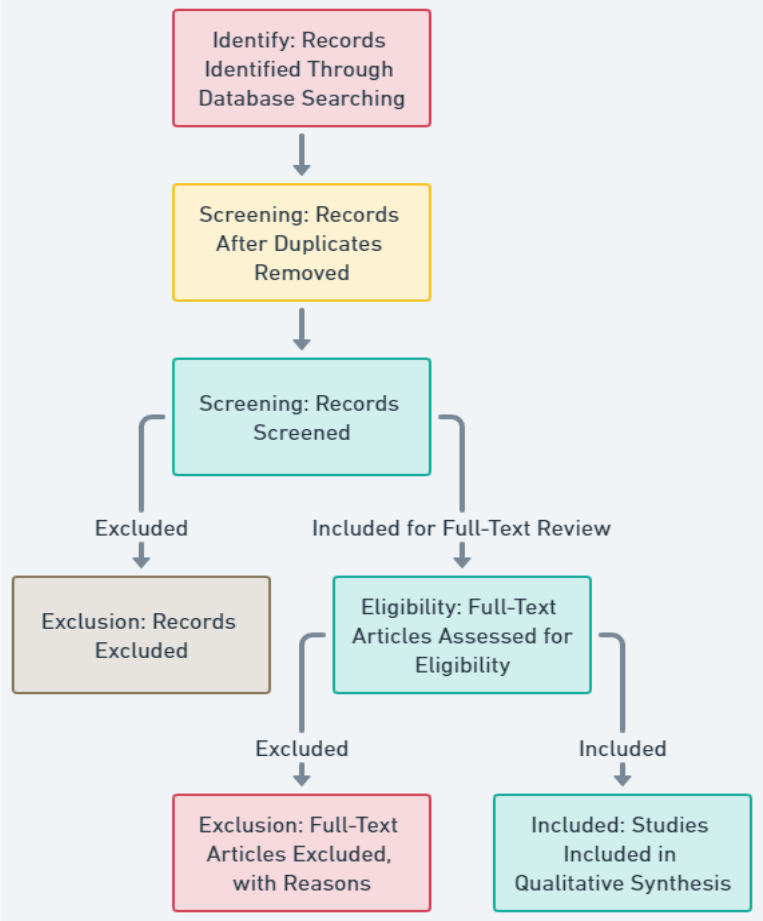

Figure 1. PRISMA Flow Diagram

The inclusion and exclusion criteria applied during the article selection are as follows:

Inclusion Criteria:

1. Articles explicitly discussing both conceptual understanding and mathematical representation.
2. Studies involving students from elementary to high school levels.
3. Articles published between 2015 and 2025.
4. Written in either Indonesian or English.
5. Qualitative, quantitative, or literature review studies published in relevant journals.

Exclusion Criteria:

1. Articles that do not address both conceptual understanding and mathematical representation simultaneously or are irrelevant to the study focus.
2. Studies involving subjects outside the elementary to high school range.
3. Articles published before 2015 or after 2025.
4. Articles without full-text availability or inaccessible in full.
5. Duplicate articles or those with unclear sources.

By applying this approach, the study aims to provide a comprehensive and reliable overview of effective media, learning strategies, or models that connect conceptual understanding and mathematical representation skills.

3. Results and Discussion

3.1. Result

The literature search was conducted through the Google Scholar and DOAJ databases for the period from 2015 to 2025. The keywords used included "conceptual understanding," "mathematical representation," as well as combinations such as "connecting conceptual understanding and mathematical representation." Based on the inclusion and exclusion criteria described in the methods section, seven articles were deemed relevant and selected for further analysis. The results of the literature search are presented in Table 1.

Table 1 - Literature Search Results

No	Author (Year)	Title	Level and Subject	Strategy/Model/ Media	Contribution to Conceptual Understanding and Mathematical Representation
1	Rosyani (2023)	Relationship between Conceptual Understanding and Mathematical Representation Ability of Grade 5 Students at SD Negeri 2 Way Huwi	Grade 5 Elementary School	Correlational Study	A very strong correlation (r = 0.981) exists between students' conceptual understanding and mathematical representation abilities.
2.	Anggraini and Syahlan (2024)	Utilization of GeoGebra to Improve Students' Mathematical Representation Ability on Three-Dimensional Material	Grade 12 Senior High School	Digital media GeoGebra	Enhances visualization of spatial geometry concepts; facilitates deeper mathematical representation.
3.	Rahmadian et al. (2019)	Mathematical Representation Ability in the Somatic, Auditory, Visualization,	Junior High School (SMP)	SAVI Model (Somatic, Auditory, Visualization, Intellectually)	Multisensory activation promotes balanced understanding and representation abilities.

No	Author (Year)	Title	Level and Subject	Strategy/Model/ Media	Contribution to Conceptual Understanding and Mathematical Representation
		Intellectuall (SAVI) Learning Model			
4.	Minarni et al. (2016)	Mathematical Understanding and Representation Ability of Public Junior High School in North Sumatra	Junior High School (SMP)	Joyful Problem-Based Learning (JPBL)	Improves conceptual understanding and mathematical representation abilities through solving contextual and enjoyable problems.
5.	Jäder & Johansson, (2025)	Exploring students' conceptual understanding through mathematical problem solving: students' use of and shift between different representations	Elementary School (Grades 2, 5, 6)	Representation-based problem solving	Enhances conceptual understanding through flexibility in visual, symbolic, and contextual representations
6.	Putra et al. (2023)	A Correlational Study on Representational Abilities and Mathematical Connections in Junior High School	Grade 8 Junior High School	Correlational skills	Shows a strong correlation between representation skills and mathematical connections, which indicates conceptual understanding.
7.	Purwadi et al., (2019)	The Effect of Concrete-Pictorial-Abstract Strategy toward Students' Mathematical Conceptual Understanding and Mathematical Representation	Grade 3 Elementary School	CPA Model (Concrete–Pictorial–Abstract)	An explicit strategy that bridges conceptual understanding and mathematical representation gradually and systematically

The main question in this study is: "What types of media, learning strategies, or instructional methods are effective in connecting conceptual understanding and mathematical representation in mathematics learning?" Based on the analysis of seven articles selected through the Systematic Literature Review (SLR) process, it was found that various learning approaches have proven capable of bridging these two main cognitive abilities in mathematics education, namely conceptual understanding and mathematical representation.

One prominent approach is the use of representation-based problem solving, as described in the study by Jäder & Johansson (2025), which emphasizes the importance of students' flexibility in shifting between different forms of representation—visual, symbolic, and contextual—as both an indicator and enhancer of deep conceptual understanding. In addition, the progressive learning approach through the Concrete–Pictorial–Abstract (CPA) model applied to elementary school students (Purwadi et al., 2019) demonstrated high effectiveness in gradually and systematically building strong connections between concrete concepts and abstract forms of representation.

In the context of technology utilization, GeoGebra as an interactive visual medium Anggraini & Syahlan (2024) has significantly improved students' mathematical representation skills, particularly in three-dimensional geometry topics, while also strengthening their understanding of spatial relationships. Furthermore, approaches that activate all learning styles, such as the SAVI model (Somatic, Auditory, Visualization, Intellectual) studied by Rahmadian et al. (2019), provide a holistic and dynamic learning experience, enabling students not only to understand concepts cognitively but also to express them in various forms of representation.

Problem-based approaches packaged in an enjoyable learning atmosphere, such as those implemented in Joyful Problem-Based Learning (JPBL) by Minarni et al. (2016), have also proven effective in integrating conceptual understanding with the representation process through active student engagement in solving contextual problems. Lastly, two correlational studies by Putra et al. (2023) and Rosyani (2023), reinforce the empirical evidence of a strong relationship between these two abilities. In this regard, improvements in mathematical representation skills positively correlate with enhanced meaningful and structured conceptual understanding.

The findings from these seven articles indicate that the connection between conceptual understanding and mathematical representation can be effectively facilitated through various active, contextual, visual, and progressive learning approaches.

3.2. Discussion

3.2.1. The Relationship Between Conceptual Understanding and Mathematical Representation

The relationship between conceptual understanding (CU) and mathematical representation (MR) constitutes two closely interrelated cognitive aspects of mathematics learning that mutually reinforce each other. Based on the findings of this systematic review, the connection between the two is neither incidental nor merely correlational but can be systematically mapped within a conceptual framework. Within this framework, instructional strategies or

models serve as connecting elements that facilitate a meaningful transition between mastery of concepts and representational abilities.

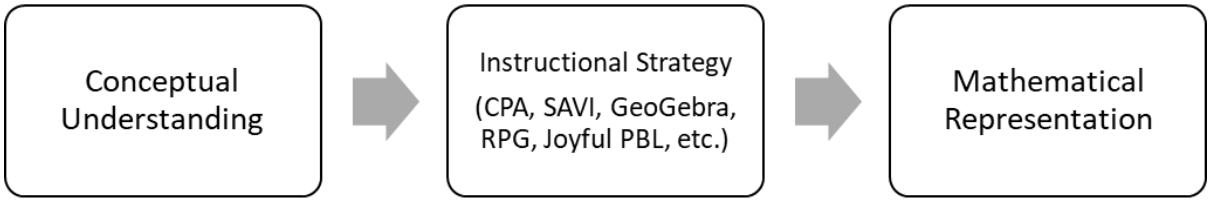

Figure 2. Instructional Strategies as a Bridge Between Conceptual Understanding and Mathematical Representation

Theoretically, the initial framework (pre-review) is based on the assumption that there is a direct relationship between conceptual understanding and mathematical representation, in which conceptual understanding will automatically be followed by the ability to represent it mathematically. However, the results of this literature review indicate that this connection is not automatic but highly dependent on how instructional practices are designed and implemented. Learning processes that do not explicitly emphasize the connection between concepts and their representations tend to result in partial understanding or mechanical representation (Saputra et al., 2025).

Findings from the selected articles highlight that specific approaches, such as the CPA model, the use of GeoGebra, the application of the SAVI strategy, and the Joyful Problem-Based Learning (JPBL) method, are highly effective as mediators in building the connection between conceptual understanding and appropriate representation. These approaches provide diverse learning experiences and structurally support students in internalizing mathematical concepts and expressing them through suitable forms of representation. Therefore, instructional strategies are central in bridging these two aspects, making mathematics learning more comprehensive and meaningful for students.

3.2.2. Theoretical Implication

The findings of this review provide reinforcement for several key theories in mathematics education, particularly concerning the relationship between conceptual understanding and mathematical representation. First, the results support the constructivist view, where students build understanding through direct experience and meaningful activity. The CPA model, SAVI strategy, and Problem-Based Learning (PBL) approach demonstrate that representations are not merely instructional aids but integral components of the concept internalization process. Second, these findings align with Dual Coding Theory, which posits that information is more easily understood when simultaneously processed through visual and verbal channels. This is reflected in using tools like GeoGebra, which helps students connect visualizations with mathematical symbols directly. Third, the review strengthens the concept of representational fluency, which is the ability to move flexibly between different forms of representation as a key indicator of deep conceptual understanding. The analyzed studies, such as those by Jäder &

Johansson (2025) and Putra et al. (2023), highlight that this skill is essential for problem-solving and communicating mathematical ideas flexibly.

The results of this review affirm that instructional strategies integrating the balanced development of CU and MR are consistent with established theories and have strong empirical grounding for implementation in mathematics teaching practice.

3.2.3. Recommendations for Instructional Design

Based on the findings of this systematic review, effective mathematics instruction aimed at developing both conceptual understanding and mathematical representation requires a design that intentionally considers the strong interconnection between these two aspects. Therefore, instructional design should integrate approaches that enable students to gradually construct understanding while simultaneously communicating their mathematical ideas through various forms of representation. One recommended strategy is the Concrete–Pictorial–Abstract (CPA) model, which has been proven effective, especially at the elementary level. This approach provides a clear progression in learning—from concrete objects to visual representations and abstract symbols or notations. This sequence not only supports students in developing a deeper understanding of mathematical concepts but also enhances their ability to transform mathematical ideas into meaningful representations. Active learning strategies, such as SAVI (Somatic, Auditory, Visualization, Intellectual) and Joyful Problem-Based Learning (JPBL), are also recommended to encourage critical thinking and the flexible representation of mathematical ideas. These models emphasize enjoyable, collaborative, and contextual learning experiences, strengthening the link between what students understand and how they express it mathematically (Prapti et al., 2023).

Moreover, game-based media such as Role-Playing Games (RPGs) show great potential in bridging conceptual understanding and mathematical representation. In RPG-based learning, students assume specific roles and complete missions or challenges that involve mathematical problems. This process requires them to grasp the underlying concepts and construct appropriate mathematical representations as part of their problem-solving strategies. The immersive experience created by RPGs fosters a contextual and engaging learning environment where students naturally engage in the representation of understood concepts—whether in visual, symbolic, or narrative forms. RPGs can also be adapted to various educational levels and topics, making them a flexible and powerful instructional tool.

In summary, the instructional design recommendations from this review highlight the importance of creating learning experiences that are gradual, contextual, visual, and interactive. Teachers should design activities that explicitly teach mathematical concepts and encourage students to form and translate representations across multiple formats (Fadilla et al., 2024; Nasution et al., 2024). By integrating strategies such as CPA, GeoGebra, SAVI, PBL, and innovative media like RPGs, mathematics instruction can become more meaningful and comprehensive, fostering the balanced development of conceptual understanding and mathematical representation through active and purposeful learning experiences.

4. Conclusions

This study aims to identify media, learning strategies, or instructional models that can bridge conceptual understanding and mathematical representation abilities in mathematics education. Based on a systematic review, it was found that the connection between conceptual understanding and mathematical representation is not automatic but highly dependent on the design and implementation of effective learning strategies. Approaches such as the Concrete–Pictorial–Abstract (CPA) model, the use of GeoGebra media, the SAVI strategy, and Joyful Problem-Based Learning (JPBL) have proven to be strong mediators in building meaningful connections between these two aspects.

These findings have important implications for mathematics curriculum development, highlighting the need to integrate learning strategies that explicitly combine the development of conceptual understanding and mathematical representation skills in a balanced manner. The curriculum should encourage the use of visual media and interactive technologies such as GeoGebra to facilitate dual coding and representational fluency while also adopting active learning approaches that stimulate student engagement and collaboration.

Practically, teachers need to design gradual and contextual learning activities that not only explicitly teach concepts but also encourage students to internalize and transfer mathematical representations in various forms. The use of innovative media such as Role-Playing Games (RPGs) can also serve as an attractive and effective alternative to enhance students' motivation and understanding.

The limitations of this review lie in the focus of the literature, which is still limited to certain learning models and media, as well as the lack of longitudinal studies observing long-term impacts. Therefore, future research is recommended to be more exploratory and experimental, with rigorous research designs involving various educational levels and broader mathematical topics. Research should also further examine strategies for integrating technology in mathematics learning, particularly how interactive media can effectively enhance the relationship between conceptual understanding and mathematical representation.

Thus, the development of mathematics learning that is conceptually and representationally integrated not only strengthens the theoretical foundation of mathematics education but also provides significant practical contributions to improving the quality of teaching and student learning outcomes.

Acknowledgments

Thank you to Universitas Swadaya Gunung Jati for the support and facilities provided in conducting this research. The authors also appreciate the valuable input and constructive feedback from the editorial team and reviewers, which significantly contributed to the improvement of this article.

Conflict of Interest

The authors declare no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, misconduct, data fabrication and falsification, double publication and submission, and redundancies, have been completed by the authors.

References

Ainunnisa, D. A., Praja, E. S., & Dewi, I. L. K. (2021). Kemampuan Representasi Matematis Siswa Smp Dalam Menyelesaikan Soal Kubus Dan Balok. *Journal of Authentic Research …*, *3*(2), 166–177. https://doi.org/10.37058/jarme.v3i2.2572

Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives: complete edition*. https://eduq.info/xmlui/handle/11515/18824

Anggraini, A., & Syahlan, S. (2024). Pemanfaatan Geogebra Untuk Meningkatkan Kemampuan Representasi Matematis Siswa Pada Materi Dimensi Tiga. *Jejak Pembelajaran: Jurnal Pengembangan Pendidikan*, *8*(12), 158–164. https://oaj.jurnalhst.com/index.php/jpp/article/view/7930/8935

Asnawati, S., & Dewi, I. L. K. (2020). Mathematical representation ability using website for learning transformation geometry in a teacher education classroom. *Journal of Physics: Conference Series*, *1511*(1). https://doi.org/10.1088/1742-6596/1511/1/012115

Choerunnisa, C., Aminah, N., & Asnawati, S. (2024). Implementasi e-modul kodular berbasis representasi matematis siswa pada materi peluang. *SIGMA*, *9*(2), 141–148. https://doi.org/10.53712/sigma.v9i2.2143

Fadilla, J., Sari, F. W., Auladina, H., Angraini, L. M., & Bonyah, E. (2024). Analysis of Mathematical Critical Thinking Ability Junior High School Students on Systems of Linear Equations in Two Variables Material. *International Journal of Contemporary Studies in Education (IJ-CSE)*, *3*(3), 209–217. https://doi.org/10.56855/ijcse.v3i3.1021

Gusmana, I., & Amir, Z. (2024). Pemahaman Konsep Matematika Siswa Ditinjau Dari Motivasi Belajar Melalui Penggunaan Media Corong Berhitung Dan Kartu Pecahan (Studi Kajian Literatur). *Juring (Journal for Research in Mathematics Learning)*, *7*(3), 229–238. https://doi.org/10.24014/juring.v7i3.22992

Hafizah, N., Nurhalimah, S., Utami, W. L., & Angraini, L. M. (2025). Analysis of Problem-Solving Ability of Junior High School Students in A System of Linear Equations with One Variable. *International Journal of Contemporary Studies in Education (IJ-CSE)*, *4*(1), 1–14. https://doi.org/10.56855/ijcse.v4i1.1046

Hidayat, Y. W., Pramuditya, S. A., & Aminah, N. (2023). Analysis of Mathematical Representation Capabilities in Geometry Materials Assisted by Geogebra Applications. *IndoMath: Indonesia Mathematics Education*, *6*(1), 35–46. https://doi.org/10.30738/indomath.v6i1.57

Hiebert, J., & Carpenter, T. (1992). *Learning and Teaching with Understanding*.

Hutagalung, R. (2017). Peningkatan Kemampuan Pemahaman Konsep Matematis Siswa melalui Pembelajaran Guided Discovery Berbasis Budaya Toba di SMP Negeri 1 Tukka. *Journal of Mathematics Education and Science (MES)*, *2*(2), 70–77. https://doi.org/10.30743/mes.v2i2.133

Indrawati, F. (2023). Matematika dalam Menghadapi Tantangan Abad Ke-21. *Prosiding Diskusi Panel Nasional Pendidikan Matematika*, *80*, 411–418. https://proceeding.unindra.ac.id/index.php/DPNPMunindra/article/view/6546/19

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Jäder, J., & Johansson, H. (2025). Exploring students' conceptual understanding through mathematical problem solving: students' use of and shift between different representations of rational numbers. *Research in Mathematics Education*, *4802*, 1–18. https://doi.org/10.1080/14794802.2025.2456840

Minarni, A., Napitupulu, E. E., & Husein, R. (2016). Mathematical understanding and representation ability of public junior high school in North Sumatra. *Journal on Mathematics Education*, *7*(1), 45–58. https://doi.org/10.22342/jme.7.1.2816.43-56

Monariska, E., & Komala, E. (2021). Analisis Kemampuan Representasi Matematis Mahasiswa Pada Mata Kuliah Program Liniear. *Jes-Mat*, *7*(1), 43–58. https://doi.org/https://doi.org/10.25134/jes-mat.v7i1.3884

Nasution, E. L. S., Angraini, L. M., Widiati, I., & Amelia, S. (2024). Analysis of the Mathematical Reasoning Ability of Grade 8th Students on Triangular Materials. *International Journal of Contemporary Studies in Education (IJ-CSE)*, *3*(3), 236–244. https://doi.org/10.56855/ijcse.v3i3.1126

Nuraeni, Z., & Rusnilawati. (2022). Planting Mathematics Concepts for Low Grade Elementary Schools through the Traditional Games. *International Journal of Contemporary Studies in Education*, *1*(1), 37–46. https://doi.org/10.56855/ijcse.v1i1.117

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *The BMJ*, *372*, 2020–2021. https://doi.org/10.1136/bmj.n71

Pramuditya, S. A., Noto, M. S., & Handayani, V. D. (2021). Desain Didaktis Konteks Fabel Berbasis Pemahaman Matematis Siswa pada Materi Aljabar. *Jurnal Elemen*, *7*(1), 68–83. https://doi.org/10.29408/jel.v7i1.2730

Prapti, H. N., Susanto, E., & Sumardi, H. (2023). Students' Mathematical Problem-Solving Ability in Bengkulu Tabot Context Based on Polya Steps. *International Journal of Contemporary Studies in Education (IJ-CSE)*, *2*(1), 18–25. https://doi.org/10.56855/ijcse.v2i1.222

Purwadi, I. M. A., Sudiarta, I. G. P., & Suparta, I. N. (2019). The Effect of Concrete-Pictorial-Abstract Strategy toward Students' Mathematical Conceptual Understanding and Mathematical Representation on Fractions. *International Journal of Instruction*, *12*(1), 1113–1126. https://eric.ed.gov/?id=EJ1201375

Putra, F. G., Sunyono, S., Haenilah, E. Y., Hariri, H., Lengkana, D., & Nurhanurawati, N. (2023). A Correlational Study on Representational Abilities and Mathematical Connections in Junior High School. *AL-ISHLAH: Jurnal Pendidikan*, *15*(2), 1511–1518. https://doi.org/10.35445/alishlah.v15i2.2321

Putri, R. D. R., Ratnasari, T., Trimadani, D., Halimatussakdiah, H., Husna, E. N., & Yulianti, W. (2022). Pentingnya Keterampilan Abad 21 Dalam Pembelajaran Matematika. *Science and Education Journal (SICEDU)*, *1*(2), 449–459.

https://doi.org/10.31004/SICEDU.V1I2.64

Rahmadian, N., Mulyono, & Isnarto. (2019). Kemampuan Representasi Matematis dalam Model Pembelajaran Somatic, Auditory, Visualization, Intellectually (SAVI). *PRISMA, Prosiding Seminar Nasional Matematika*, *2*, 287–292. https://journal.unnes.ac.id/sju/prisma/article/view/28940

Rosyani, D. A. (2023). *Hubungan Pemahaman Konsep dengan Kemampuan Representasi Matematis Peserta Didik Kelas V SD Negeri 2 Way Huwi* [UIN Raden Intan Lampung]. https://repository.radenintan.ac.id/id/eprint/31842

Saputra, I., Septiawan, A., Stevano, N., Marina Angraini, L., & Bonyah, E. (2025). Analysis of Students' Mathematical Problem-solving Ability on Number Matter. *International Journal of Contemporary Studies in Education (IJ-CSE)*, *4*(1), 46–59. https://doi.org/10.56855/ijcse.v4i1.1045

Sulistiani, I., Mufida, E., Yasser, P. M., & Alamsyah, L. (2021). Systematic Literature Review: Bankruptcy Prediction Menggunakan Teknik Machine Learning dan Deep Learning. *INTECH (Informatika Dan Teknologi)*, *2*(1), 13–18. https://doi.org/10.54895/INTECH.V2I1.824

The National Council of Teachers of Mathematics. (2000). Principles and Standards for School Mathematics. In T. N. C. of T. of Mathematics (Ed.), *NCTM Publications* (1st ed., Vol. 43, Issue 5). Library of Congress Cataloguing-in-Publicarion. https://doi.org/10.5951/mt.43.5.0224

Triandini, E., Jayanatha, S., Indrawan, A., Putra, G. W., & Iswara, B. (2019). Metode systematic literature review untuk identifikasi platform dan metode pengembangan sistem informasi di Indonesia. *Indonesian Journal of Information Systems (IJIS)*, *1*(2), 63–77. https://doi.org/10.24002/ijis.v1i2.1916

Uya, A. O. (2023). Teaching Strategies, Geoboard Resource and Secondary School Students' Achievement in Mathematics in Akwa Ibom State, Nigeria. *International Journal of Contemporary Studies in Education (IJ-CSE)*, *2*(1), 11–17. https://doi.org/10.56855/ijcse.v2i1.258

Valentine, V. E., Alawiyah, T., Dewi, I. L. K., & Nopriana, T. (2024). Identifying the Mathematical Concept Understanding Ability of Junior High School Students in Learning Linear Function Material. *International Journal of Contemporary Studies in Education (IJ-CSE)*, *3*(2), 115–126. https://doi.org/10.56855/ijcse.v3i2.994