Journal of General Education and Humanities
Vol. 4, No. 4, November 2025, pp. 2297 – 2307, https://doi.org/10.58421/gehu.v4i4.774
ISSN 2963-7147

A Bibliometric Analysis of Mathematical Literacy Research in Indonesia Based on PISA Studies (2020–2025)

Ratu Defina Yuniar[1], Rohati Rohati[2], Marlina Marlina[3]
[1,2,3]Universitas Jambi, Jambi, Indonesia

Article Info

Article history:

Received 2025-10-26
Revised 2025-11-21
Accepted 2025-11-25

Keywords:

Bibliometric Analysis
Mathematical Literacy
Mendeley
Publish or Perish
VOSviewer

ABSTRACT

This study investigates the development of mathematical literacy research in Indonesia within the PISA context from 2020 to 2025. The analysis was conducted using a literature review combined with bibliometric techniques, drawing data from Publish or Perish (Google Scholar) and visualizing patterns using VOSviewer. From an initial collection of 200 publications, 25 studies were identified as relevant to the PISA framework. The bibliometric results include network visualization, which shows the clustering of key themes; overlay visualization, illustrating shifts in research focus over time; and density visualization, highlighting frequently explored topics. The findings reveal that studies on mathematical literacy in Indonesia remain primarily focused on educational themes, although an emerging interest in interdisciplinary and digital-related perspectives is evident. These results also highlight several ongoing issues, including the limited integration of PISA competencies, uneven distribution of research, and the need for stronger digital and cross-disciplinary approaches. Consequently, this study emphasizes the importance of advancing mathematical literacy research in Indonesia to address contemporary educational challenges and support the enhancement of students' competencies.

Corresponding Author:

Rohati
Faculty of Teacher Training and Education, Mathematics Education, Jambi University
Email: rohati.fkip@unja.ac.id

1. INTRODUCTION

Mathematical literacy remains a significant topic in the field of education, particularly in Indonesia. Considering the crucial role of literacy skills, Indonesian students need to acquire and develop these abilities [1]. Moreover, mathematical literacy refers to the capacity to comprehend and apply mathematical concepts in diverse real-life situations to solve problems and communicate their use to others [2]. Mathematical literacy is an individual's ability to understand, analyze, and apply mathematical concepts in various contexts of daily life, including formulating, interpreting, and using mathematical

procedures, facts, and tools to explain and predict phenomena [3]. Mathematical literacy is as important as reading and writing skills. This competence enables individuals to participate in mathematical reasoning, interpret and estimate information, solve problems, justify answers in numerical, graphical, and geometric contexts, and communicate effectively through mathematics [4]. Hence, mathematical literacy is a vital skill, particularly within the context of mathematics learning [5]. A person possessing mathematical literacy demonstrates a solid understanding of mathematical concepts [6].

Mathematical literacy represents one of the essential competencies required by the present generation in the 21st century [7]. In 21st-century learning, designed to prepare students for rapid technological and informational advancement [8], learners are expected to interpret mathematical concepts in real-world contexts. Consequently, mathematical literacy emphasizes the ability to describe, explain, and predict phenomena that occur in everyday life. Instruction emphasizing mathematical literacy fosters accurate decision-making and promotes effective communication through mathematics [9].

The Programme for International Student Assessment (PISA), administered by the OECD, is an international evaluation designed to measure how well 15-year-old students worldwide can apply their knowledge and skills to real-life situations, particularly in reading, science, and mathematics [10]. PISA defines mathematical literacy as an individual's ability to recognize and understand the role of mathematics, make sound judgments, and apply mathematical knowledge in various contexts [11].

The PISA results reveal that Indonesian students' mathematical literacy performance remains relatively low, with a score of 386 recorded in 2015 [12]. In 2018, the score declined to 379, and further dropped to 366 in 2022 [10], [13]. Therefore, initiatives to enhance mathematical literacy are crucial. This indicates that Indonesia's level of mathematical literacy demands serious attention and strategic action [14]. The low mathematics performance of Indonesian students in PISA can be attributed to several contributing factors. One key factor is that Indonesian students are not yet accustomed to solving problems with characteristics similar to those found in PISA assessments [15].

Although mathematical literacy has become a national priority and forms a key component of PISA assessments, studies that specifically map research trends on mathematical literacy in Indonesia for the 2020–2025 period remain scarce [16]. Existing bibliometric studies generally examine longer time spans or do not situate their analysis within the PISA framework, leaving recent developments in research topics, methodological approaches, and collaboration patterns insufficiently documented. Identifying research trends is crucial because it provides a clear overview of how the field is evolving, highlights existing gaps, and informs researchers, educators, and policymakers about areas that require further attention and investigation. Moreover, such trend analysis helps ensure that national research aligns with global challenges related to mathematical literacy. Therefore, a focused bibliometric analysis of Indonesian publications related to mathematical literacy and PISA from 2020 to 2025 is necessary to capture contemporary developments and map future research opportunities. Bibliometric methods have increasingly been used in educational research, demonstrating their value in understanding the progression and direction of studies within specific fields [14].

This study also seeks to identify the number of publications from 2020 to 2025 in Google Scholar, assess researcher productivity, and map the development of mathematical literacy research in Indonesia within the PISA context [15]. The findings are expected to offer a comprehensive overview of the progression of mathematical literacy research in Indonesia and serve as a reference for designing effective mathematics learning strategies aligned with 21st-century educational demands.

2. METHOD

This study employed a literature review method supported by a bibliometric analysis approach [16]. The analysis was conducted using VOSviewer software [19]. Bibliometric analysis employs mathematical and statistical techniques to assess and quantify productivity, impact, and development of scientific publications, including journal articles and books [17]. This analytical approach allows researchers to identify the structure, dynamics, and emerging themes of a research field over time [18]. In bibliometric network analysis, mapping and clustering techniques are frequently used to reveal relationships among publications, authors, or keywords [19]. Bibliometric analysis is particularly valuable for managing large datasets because of its systematic, rigorous, and data-driven characteristics [23].

The research procedure consisted of several stages. First, data were collected using Publish or Perish (Google Scholar) by entering the keywords “mathematical literacy” and “literasi matematis.” Second, the retrieved publications were screened using predefined inclusion and exclusion criteria. The inclusion criteria consisted of: (1) articles published between 2020 and 2025, (2) studies related to mathematical literacy within the PISA context, and (3) publications written in Indonesian or English. Meanwhile, the exclusion criteria included: (1) articles not related to PISA, (2) publications outside the educational or mathematical domain, and (3) documents that were not scientific articles, such as posters or non-academic reports.

The analysis process involved organizing the selected articles and exporting the bibliographic data into VOSviewer. Through this software, network visualization, overlay visualization, and density visualization were generated to identify keyword clusters, observe shifts in research focus, and determine dominant research themes. Furthermore, an integrated mapping and clustering approach was applied, in which VOSviewer mapping and modularity-based clustering techniques operate on shared conceptual principles, enabling the visualization of interconnected research patterns [22].

Bibliometric analysis is a quantitative technique used to examine patterns within scientific publications, including journals and academic articles [24]. In this study, a bibliometric analysis was conducted through a series of systematic steps, involving data retrieval from Google Scholar (via Publish or Perish) and visualization using VOSviewer. The procedure was adapted and modified from Rahman (2023) and consisted of five main stages, each described as follows:

1. Database Search and Initial Retrieval

   The first stage involved conducting a comprehensive search using Publish or Perish with Google Scholar as the primary database. The keyword “mathematical literacy”

was entered, and the search was restricted to articles published between 2020 and 2025. This initial step generated 200 publications, which served as the raw dataset for subsequent analysis.

2. Accessibility-Based Filtering
   At this stage, the retrieved publications were screened based on accessibility criteria, meaning only articles with full-text availability were retained. A total of 156 articles were excluded because they were inaccessible or incomplete.
3. Document Type and Publication Stage Filtering
   The next filtering stage focused on selecting only scientific articles, excluding book chapters, theses, posters, non-reviewed materials, and editorial notes. After applying these criteria, an additional 129 publications were removed.
4. Filtering Based on PISA-Related Criteria
   The remaining articles were then evaluated to determine their relevance to PISA-related mathematical literacy. Studies that did not explicitly connect mathematical literacy to the PISA framework were excluded from the analysis. A total of 25 articles met this criterion and were included in the final dataset.
5. Data Management and Preparation for Visualization
   After the selection process, the final set of articles was downloaded and imported into Mendeley to manage and organize the bibliographic data. The dataset was then exported in RIS format, ensuring the preservation of essential bibliographic information, including titles, authors, abstracts, keywords, publication year, journal details, and page numbers. This standardized dataset was subsequently imported into VOSviewer for generating network, overlay, and density visualizations.

After completing the five stages described above, a flow diagram summarizing data retrieval, accessibility filtering, document screening, PISA-based selection, and export for visualization can be included to provide a clear overview of the methodological process.

3. RESULTS AND DISCUSSION

This section presents the results of the bibliometric analysis conducted to explore the development and trends of mathematical literacy research in Indonesia within the PISA framework from 2020 to 2025.

Using the Publish or Perish application and the keywords “mathematical literacy” or “literasi matematis,” several relevant publications related to the research topic were identified. Among these, ten articles with the highest citation counts were recognized as the most influential works in mathematical literacy research in Indonesia, as presented in Table 1 below.

Table 1. Top articles with the keywords “mathematical literacy” or “literasi matematis”

Author	Article Title	Cited by
R Masfufah, EA Afriansyah	Analisis kemampuan literasi matematis siswa melalui soal PISA	294
H Habibi, S Suparman	Literasi Matematika dalam Menyambut PISA 2021 Berdasarkan Kecakapan Abad 21	119
M Jannah, M Hayati	Pentingnya kemampuan literasi matematika dalam pembelajaran matematika	105
VR Hidayati, NP Wulandari, NP Wulandari, MA Maulyda, M Erfan, AN Kholifatur Rosyidah	Literasi matematika calon guru sekolah dasar dalam menyelesaikan masalah PISA konten shape and space	103
MFB Paloloang, D Juandi, M Tamur, Baharudin Paloloang, Angela M G Adem	Meta analisis: pengaruh problem-based learning terhadap kemampuan literasi matematis siswa di Indonesia tujuh tahun terakhir	100
R Kholifasari, C Utami, M Mariyam	Analisis kemampuan literasi matematis siswa ditinjau dari karakter kemandirian belajar materi aljabar	99
J Hwang, Y Ham	Relationship between mathematical literacy and opportunity to learn with different types of mathematical tasks.	95
I Aritonang, I Safitri	Pengaruh blended learning terhadap peningkatan literasi matematika siswa	91
ND Puspaningtyas, M Ulfa	Pelatihan soal matematika berbasis literasi numerasi pada siswa SMA IT Fitrah Insani	90
R Vebrian, YY Putra, S Saraswati, TT Wijaya	Kemampuan penalaran matematis siswa dalam menyelesaikan soal literasi matematika kontekstual	79

The table indicates that the article titled *“Analysis of Students' Mathematical Literacy Skills through PISA Questions”* by R. Masfufah and E.A. Afriansyah ranks as the most cited publication in this field, with 294 citations. Subsequently, the articles were filtered to retain only those directly related to mathematical literacy within the context of PISA. This filtering process is shown in Table 2, which describes the selection stages from the initial number of articles to the final articles that met the research criteria.

Table 2. Results of the mathematical literacy article screening

Search Screening	Number of Articles
Mathematical Literacy Articles	200
Mathematical Literacy Articles that can be accessed	176
Mathematical Literacy Articles that can be accessed by document type and publication stage	157
Mathematical Literacy Articles on PISA topics that can be accessed by document type and publication stage	25

The screening yielded 25 articles relevant to the PISA study context. This data was then quantitatively compared to see changes in the number of articles and citations through matrix analysis, as shown in Table 3 below.

Table 3. Article Comparison Matrix

Data Matrix	Initial Search	Refinement Search
Keywords	literasi matematis or mathematical literacy	Mathematical Literacy in PISA Studies
Source	Google Scholar	Google Scholar
Article	200	25
Citation	3850	955
Cites Per Year	3850	955
Cites Per Article	19.25	38.2

This paper presents a bibliometric analysis using the keywords “mathematical literacy,” further refined to focus specifically on “PISA.” Data were collected using the Google Scholar database [22]. The bibliometric analysis utilized the PoP application, yielding a total of 200 articles.

After calculating citation frequencies and related metrics, the researchers imported the Publish or Perish data into VOSviewer to identify the most frequently occurring keywords. The researchers utilized the VOSviewer application to visualize the bibliometric map in two formats:etwork visualization and depth visualization [25]. VOSviewer can generate network maps and clusters from bibliometric data, enabling the identification of research trends, author collaborations, and the most frequently occurring topics and concepts [26].

The following are the results of the network visualization of research trends in this study using the VOSviewer application:

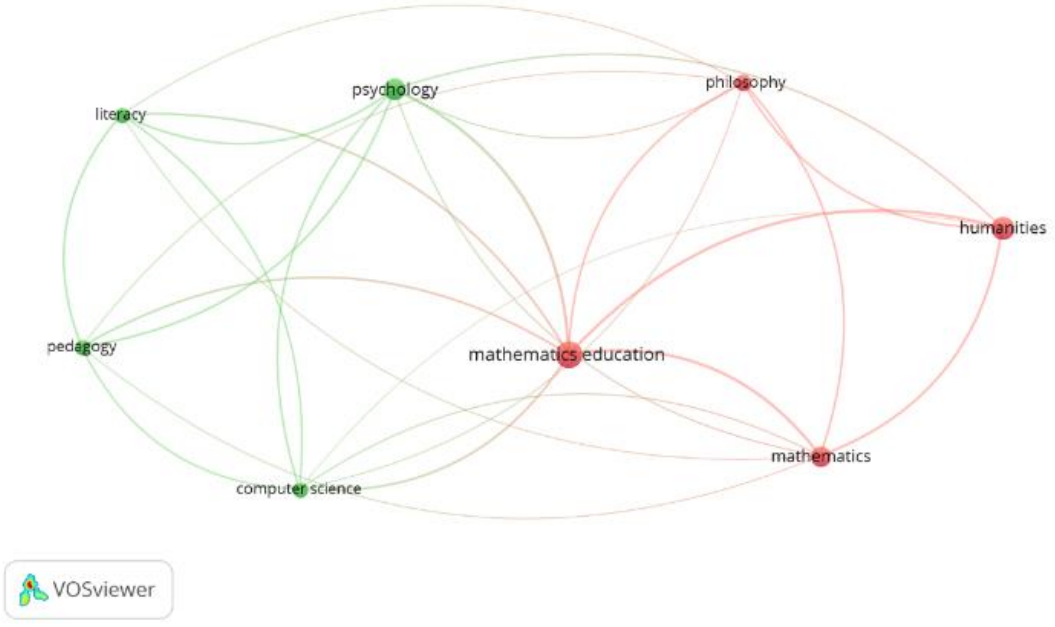

Figure 1. Visualization of research trend networks

The calculation in the Publish or Perish application was performed by setting a minimum limit of five occurrences, resulting in eight main keywords that appeared most frequently in the analyzed collection of articles. In the data processing, the author excluded the word art because it was considered to have no direct relevance to the topic of mathematical literacy research. The analysis then produced two main clusters or groups that showed thematic relationships between keywords. The first cluster contained the keywords Humanities, Mathematics, Mathematics Education, and Philosophy, reflecting research that focused on conceptual, theoretical, and educational aspects of mathematical literacy. The second cluster included themes such as Computer Science, Literacy, Pedagogy, and Psychology, illustrating the connections between mathematical literacy, technology integration, learning strategies, and students' psychological aspects. These two clusters demonstrate that mathematical literacy research in Indonesia has evolved not only in the realm of mathematics education but has also begun to intersect with various other disciplines, as illustrated in the figure below.

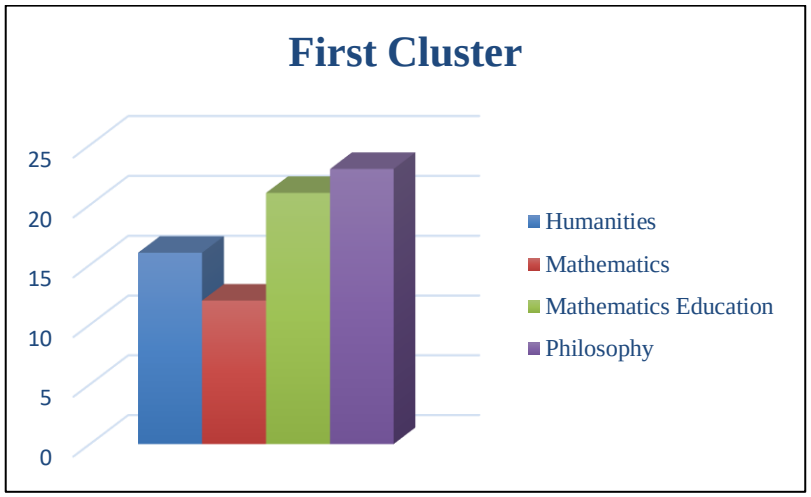

Figure 2. Visualization of the first cluster of research trend networks

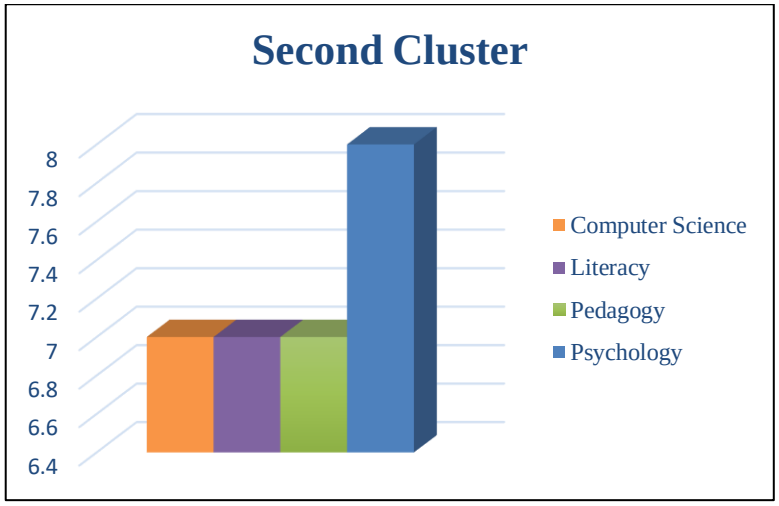

Figure 3. Visualization of the second cluster research trend network

Next, depth visualization (density visualization) of research trends was conducted using the VOSviewer application. This visualization aimed to display the density or frequency of keyword appearances in the mathematical literacy research network in Indonesia, enabling the identification of the most frequently discussed topics and the relationships between concepts within the context of PISA studies.

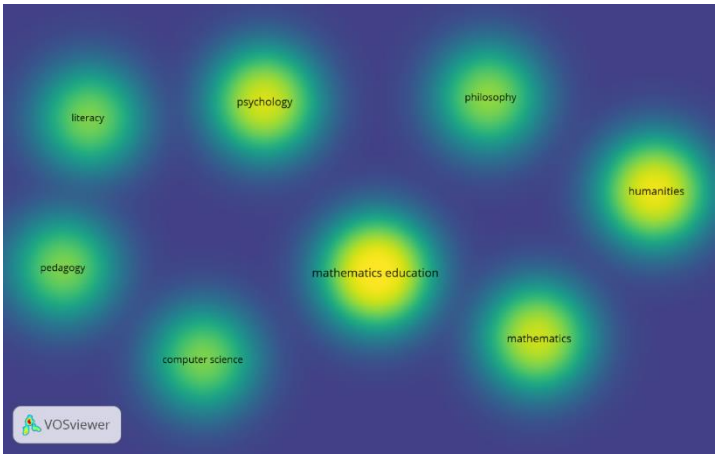

Figure 4. Depth visualization (density visualization) research trends

The density map produced using VOSviewer illustrates the frequency with which certain keywords occur within the bibliometric dataset related to mathematical literacy studies in Indonesia, particularly within the PISA context. The analysis results place mathematics education as the most dominant keyword, as seen from its position at the center of the map with the highest density intensity. This indicates that the majority of research in this field is deeply rooted in an educational perspective. Surrounding this main theme are several other keywords, including literacy, pedagogy, psychology, philosophy, humanities, mathematics, and computer science. Although their density is relatively lower, the appearance of these keywords suggests that mathematical literacy research is not limited to the realm of mathematics education, but also involves other disciplines. The words "literacy" and "pedagogy" emphasize a focus on instructional approaches and a broader literacy framework, while "psychology" highlights the cognitive and affective dimensions of learning. The presence of philosophy and humanities indicates a connection with theoretical and reflective studies, while computer science demonstrates a growing interest in utilizing technology to support teaching and assessment practices. Overall, this mapping confirms that research on mathematical literacy in Indonesia, particularly in relation to PISA, is not only rooted in the field of mathematics education but is also increasingly developing to involve various other disciplines, thereby expanding its relevance in a broader academic discourse.

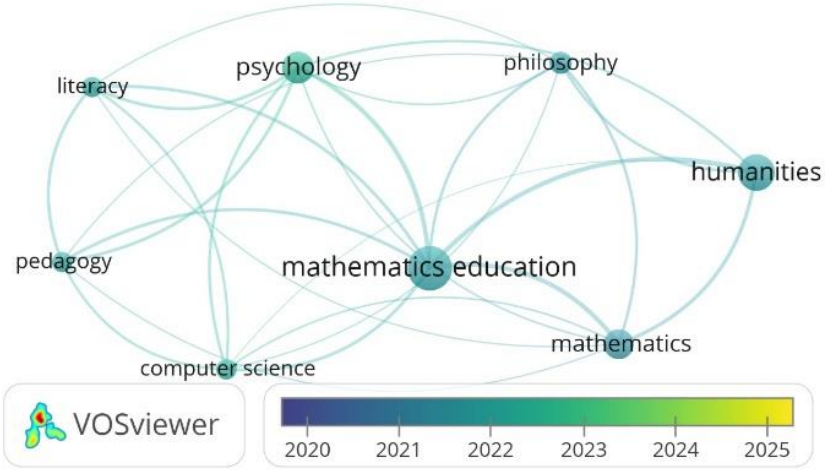

Figure 5. Overlay visualization research trends, mathematics literacy on PISA studies

Based on the VOSviewer overlay visualization shown in Figure 5, the development of research keywords from 2020 to 2025 is clearly observable. Blue represents keywords that appeared at the beginning of the period, while green to yellow indicates more recent keywords that became increasingly prominent toward the end of the analysis. The keyword *"mathematics education"* emerged earliest and has remained a dominant focus since 2020. Meanwhile, keywords such as *"computer science," "pedagogy,"* and *"literacy"* began to appear more frequently in the mid-period, reflecting a growing interest in integrating pedagogy and technology to support mathematical literacy. In contrast, terms like *"psychology," "philosophy," "humanities,"* and *"mathematics"* shifted toward younger color ranges in 2023–2025, suggesting that research on mathematical literacy has expanded into interdisciplinary areas involving psychological, philosophical, and humanities perspectives. Overall, this overlay visualization highlights a broadening and increasing complexity in research trends, moving from an initial emphasis on mathematics education toward cross-disciplinary themes that align with contemporary educational challenges.

4. CONCLUSION

The bibliometric analysis of mathematical literacy research in Indonesia from 2020 to 2025 reveals that, although studies remain concentrated mainly in mathematics education, there is emerging attention toward interdisciplinary fields such as pedagogy, psychology, humanities, philosophy, and computer science. From an initial pool of 200 articles retrieved via Google Scholar using the keyword "mathematical literacy," 25 publications were identified as relevant to the PISA framework after applying multiple filtering stages.

This study aimed to: (1) quantify the number of publications from 2020 to 2025, (2) evaluate researcher productivity, and (3) map the development of mathematical literacy research in Indonesia within the PISA context. Citation analysis indicated that the publications with the highest impact were those by Masfufah and Afriansyah, reflecting their significant influence in the field. VOSviewer visualizations further demonstrated that

"mathematics education" remains the dominant keyword, with strong connections to other related topics, highlighting ongoing research trends in mathematical literacy.

The findings suggest that while mathematics education continues to be the primary focus, there is considerable potential for future research to adopt interdisciplinary approaches and integrate technology, thereby enhancing students' mathematical literacy in alignment with PISA competencies.

Several limitations are acknowledged. First, the data were exclusively sourced from Google Scholar via Publish or Perish, which may have omitted relevant studies available in other databases. Second, only 25 publications met the PISA-related criteria, potentially limiting the comprehensiveness of the research mapping. Third, the bibliometric analysis was primarily based on citation counts and keyword visualization, without examining methodological rigor or research quality. Therefore, future studies are encouraged to expand the dataset, include a larger number of publications, and integrate bibliometric analysis with qualitative evaluations to achieve a deeper understanding of mathematical literacy research in Indonesia.

REFERENCES

[1] N. Sulfayanti, "Kajian Literatur: Faktor dan Solusi untuk Mengatasi Rendahnya Literasi Matematis Siswa," *Jurnal Jendela Pendidikan*, 2023, doi: https://doi.org/10.57008/jjp.v3i04.590.

[2] R. Rohati, A. Kumalasari, M. Marlina, and N. Junia, "The Development of Toondo Online Comic Based on RME To Support Student's Mathematical Literacy Skills," *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, vol. 10, no. 4, p. 2053, Dec. 2021, doi: https://doi.org/10.24127/ajpm.v10i4.3875.

[3] N. Sulfayanti, "Kajian Literatur: Faktor dan Solusi untuk Mengatasi Rendahnya Literasi Matematis Siswa," *Jurnal Jendela Pendidikan*, vol. 3, 2023, doi: https://doi.org/10.57008/jjp.v3i04.590.

[4] H. Muslimah and H. Pujiastuti, "Analisis Kemampuan Literasi Matematis Siswa dalam Memecahkan Masalah Matematika Berbentuk Soal Cerita," *Jurnal Pendidikan Matematika dan Sains*, vol. 8, no. 1, pp. 36–43, Apr. 2021, doi: https://doi.org/10.21831/jpms.v8i1.

[5] R. Setyaningsih and L. Munawaroh, "Analisis Kemampuan Literasi Matematis Siswa Dalam Menyelesaikan Soal Berorientasi PISA Konten Uncertainty and Data," *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, vol. 11, no. 3, p. 1656, Sep. 2022, doi: https://doi.org/10.24127/ajpm.v11i3.4948.

[6] M. Hayati and M. Jannah, "Pentingnya Kemampuan Literasi Matematika dalam Pembelajaran Matematika," *Journal of Mathematics Education and Application*, vol. 4, no. 1, p. 40, 2024, [Online]. Available: https://mathjournal.unram.ac.id/index.php/Griya/indexGriya.

[7] V. Yustitia and T. Juniarso, "Literasi Matematika Mahasiswa dengan Gaya Belajar Visual," *Malih Peddas (Majalah Ilmiah Pendidikan Dasar)*, vol. 9, no. 2, pp. 100–109, Jan. 2020, doi: https://doi.org/10.26877/malihpeddas.v9i2.5044.

[8] E. Fajriyah, "Kemampuan Literasi Numerasi Siswa Pada Pembelajaran Matematika Di Abad 21," *Seminar Nasional Pendidikan, FKIP UNMA*, 2022, Accessed: Nov. 21, 2025. [Online]. Available: https://prosiding.unma.ac.id/index.php/semnasfkip/article/view/824.

[9] Habibi and & Suparman, "Literasi Matematika dalam Menyambut PISA 2021 Berdasarkan Kecakapan Abad 21 How to Cite (APA 6 th Style): Habibi, H," vol. 6, no. 1, pp. 57–64, 2020, [Online]. Available: http://journal.lppmunindra.ac.id/index.php/jkpm/.

[10] OECD, *PISA 2022 Results (Volume I)*. in PISA. OECD, 2023. doi: https://doi.org/10.1787/53f23881-en.

[11] K. Atiyah and N. Priatna, "Kemampuan Literasi Matematis Siswa dalam Menyelesaikan Soal Matematika Berbasis PISA di Masa Pandemi Covid-19," *Jurnal Cendekia : Jurnal Pendidikan Matematika*, vol. 7, no. 1, pp. 831–844, Mar. 2023, doi: https://doi.org/10.31004/cendekia.v7i1.1648.

[12] OECD, *PISA 2015 Results (Volume I)*. in PISA. OECD, 2016. doi: https://doi.org/10.1787/9789264266490-en.

[13] OECD, *PISA 2018 Results (Volume I) What Students Know and Can Do*. 2019. doi: https://doi.org/10.1787/5f07c754-en.

[14] H. F. Atikah, I. Sarifah, and C. B. Yudha, "Analisis Kemampuan Literasi Matematika Dalam Pandangan PISA 2022," *Analisis Kemampuan Literasi Matematika*, vol. 15, no. 2, 2022, doi: http://dx.doi.org/10.21927/literasi.2024.15(2).152-161.

[15] S. Febrianti, T. Rahmat, and H. Fitri, "Kemampuan Literasi Matematika dalam Menyelesaikan Soal Pisa pada Siswa Kemampuan Tinggi Berdasarkan Gender," *INNOVATIVE: Journal Of Social Science Research*, vol. 3, no. 4, pp. 10100–10109, 2023, Accessed: Nov. 21, 2025. [Online]. Available: https://j-innovative.org/index.php/Innovative.

[16] H. Rahman, "Analisis Bibliometrik Perkembangan Penelitian Inovasi Kebijakan di Indonesia," *MATRA PEMBARUAN: Jurnal Inovasi Kebijakan*, vol. 7, no. 1, pp. 37–48, May 2023, doi: https://doi.org/10.21787/mp.7.1.2023.37-48.

[17] S. M. Soraya, Kurjono, and I. Muhammad, "Analisis Bibliometrik: Penelitian Literasi Digital dan Hasil Belajar pada Database Scopus (2009-2023)," *EDUKASIA: Jurnal Pendidikan dan Pembelajaran*, vol. 4, no. 1, pp. 387–398, 2023, doi: https://doi.org/10.62775/edukasia.v4i1.270.

[18] H. F. Atikah, I. Sarifah, and B. C. Yudha, "Analisis Kemampuan Literasi Matematika Dalam Pandangan PISA 2022," *Analisis Kemampuan Literasi Matematika* , 2024, [Online]. Available: www.ejournal.almaata.ac.id/literasi.

[19] O. R. Riyanto, I. Muhammad, N. H. M. Sari, and N. H. Azmy, "Self-efficacy in Online Learning: A Bibliometric Analysis," *Journal of General Education and Humanities*, vol. 4, no. 1, pp. 141–152, Feb. 2025, doi: https://doi.org/10.58421/gehu.v4i1.361.

[20] I. N. Anggraini and M. A. Mahdiannur, "Analisis Bibliometrik Penerapan Metode Pembelajaran Jigsaw untuk Meningkatkan Keterampilan Komunikasi Siswa pada Tahun 2017-2021," *JPPMS: Jurnal Penelitian Pendidikan Matematika dan Sains*, vol. 7, no. 2, pp. 57–63, 2023, doi: https://doi.org/10.26740/jppms.v7n2.p56-63.

[21] N. Donthu, S. Kumar, D. Mukherjee, N. Pandey, and W. M. Lim, "How to Conduct a Bibliometric Analysis: An Overview and Guidelines," *J Bus Res*, vol. 133, pp. 285–296, Sep. 2021, doi: https://doi.org/10.1016/j.jbusres.2021.04.070.

[22] D. Sitio and A. Y. Da Silva, "Pemetaan Analisis Bibliometrik Terhadap Metode Pengambilan Keputusan Analytic Network Process (ANP)," *IdeaLogist Journal*, vol. 1, no. 1, 2024.

[23] M. S. Kurdi, "Analisis Bibliometrik dalam Penelitian Bidang Pendidikan: Teori dan Implementasi," *Journal on Education*, vol. 03, no. 04, pp. 518–537, 2021, Accessed: Nov. 21, 2025. [Online]. Available: http://jonedu.org/index.php/joe.

[24] Y. Rostiany and E. Tjandra, "Analisis Bibliometrik Studi Perkembangan Metode Service Quality pada Database Google Scholar Menggunakan Vosviewer (Studi Literatur Tahun 2016 – 2020)," *SMATIKA: SIKI Informatika Jurnal*, vol. 12, no. 01, pp. 85–93, Jul. 2022, doi: https://doi.org/10.32664/smatika.v12i01.677.

[25] F. N. Zakiyyah, Y. Winoto, and R. Rohanda, "Pemetaan Bibliometrik Terhadap Perkembangan Penelitian Arsitektur Informasi Pada Google Scholar Menggunakan VOSviewer," *Informatio: Journal of Library and Information Science*, vol. 2, no. 1, p. 43, Jun. 2022, doi: https://doi.org/10.24198/inf.v2i1.37766.

[26] E. W. H. Budianto and N. D. T. Dewi, "Pemetaan Penelitian Rasio Biaya Operasional terhadap Pendapatan Operasional (BOPO) pada Perbankan Syariah dan Konvensional: Studi Bibliometrik VOSviewer dan Literature Review," *JAF: Journal of Accounting and Finance*, vol. 7, no. 1, p. 34, Jun. 2023, doi: https://doi.org/10.25124/jaf.v7i1.5995.